

**ESTIMATES COMMITTEE
(1977-78)**

(SIXTH LOK SABHA)

NINTH REPORT

**MINISTRY OF EDUCATION & SOCIAL WELFARE
(DEPARTMENT OF EDUCATION)**

Higher Technical Education



Presented in Lok Sabha on **21** MAR 1978

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(1977-78)

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*Elected w.e.f. 30-11-1977 *vice* Shri Samar Guha resigned and Shrimati Renuka Devi Barkataki and Sarvashri S. Kundu, Janeswar Mishra, Faziur Rehman and Sher Singh ceased to be members on their appointment as Ministers of State.

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Shri H. C. Bahl—*Senior Financial Committee Officer.*

SUB COMMITTEE ON HIGHER TECHNICAL EDUCATION

1. Shri Satyendra Narayan Sinha—*Chairman.*
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3. Shri N. K. Shejwalkar
4. Shri Ganga Bhakt Singh
5. Shri Nihar Laskar
6. Shri Mahi Lal
7. Shri S. B. Patil.

INTRODUCTION

I, the Chairman of Estimates Committee, having been authorised by the Committee to submit the report on their behalf, present this Ninth Report on the Ministry of Education and Social Welfare (Department of Education)—Higher Technical Education.

2. This subject was taken up for examination by the Estimates Committee (1976-77). Necessary information was obtained and evidence of non-officials and representatives of the Ministry of Education and Social Welfare (Department of Education), University Grants Commission and Planning Commission was taken by them. The Committee, however, could not finalise their report due to the dissolution of the Lok Sabha on 18 January, 1977.

3. The Estimates Committee (1977-78) appointed a sub-Committee to finalise the report on the subject. On the basis of the evidence tendered before the previous committee (1976-77) and the information furnished to them and also the additional information obtained by the Sub-Committee of Estimates Committee (1977-78) on Higher Technical Education, the Sub-Committee finalised the report at their sitting held on 1 & 2 September and 24 September, 1977. The report of the Sub-Committee was considered by the Estimates Committee (1977-78) at their sitting held on 12 December, 1977. The report was finalised on 3 January, 1978.

4. The Committee place on record their appreciation of commendable work done by the Chairman and Members of the Estimates Committee (1976-77) in taking evidence and obtaining information for this report.

5. The Committee wish to express their thanks to the officers of the Ministry of Education and Social Welfare (Department of Education) for placing before them material and information which they desired in connection with the examination of the subject and for giving evidence before the Committee.

6. The Committee also wish to express their thanks to Dr. K. A. V. Pandalai, Director, Indian Institute of Technology, Madras, Dr. N. M. Swani, Director, Indian Institute of Technology, Delhi, Dr. R. N. Dogra, Chairman, Board of Governors, Indian Institute of Technology, Delhi and Shri S. K. Bhattacharya, Dy. General Manager, Bharat Heavy Electricals Limited, New Delhi for furnishing memoranda to the Committee and also for giving evidence and making valuable suggestions.

7. The Committee also wish to express their thanks to all the other institutions, companies, associations and individuals who furnished memoranda on the subject to the Committee.

8. For facility of reference the conclusions/recommendations of the Committee have been printed in thick type in the body of the Report. Serial number of each conclusions/recommendations has also been indicated at the end. A summary of the conclusions/recommendations is appended to the report (Appendix).

New Delhi

January 3, 1978

Pausa 13, 1899(S)

SATYENDRA NARAYAN SINHA,

Chairman,

Estimates Committee.

CHAPTER I

INTRODUCTORY

A. Introductory

Since Independence, there has been a large scale increase in the number of institutions offering degree and post graduate degree courses in Engineering and Technology and also in the intake capacity of students in such institutions. In the famous Scientific Policy Resolution adopted by the Parliament in March, 1958, one of the aims of scientific policy was to "encourage and initiate with all possible speed programmes for training of scientific and technical personnel on the scale adequate to fulfil the country's needs in science and education, agriculture, industry and defence". It was in pursuance of this policy that considerable expansion of facilities for technical education has taken place over the years. Apart from the education and training of technical manpower, the leading institutions in the country are taking active part in the solution of scientific and industrial problems of national importance through the Consultancy Services offered to both the Government agencies and the industry.

1.2. The Estimates Committee (1957-58) had in their 10th and 15th Reports dealt with some aspects of higher technical education. With the rapid strides since made in the creation of facilities for technical education, the system of higher technical education in the country as a whole faces numerous problems. On the one hand, the large out-turn of engineers has created problems of unemployment, on the other, the industry complains that they are not able to get the right type of engineers they require. The situation calls for a thorough appraisal of the system of Higher Technical Education, particularly, the development of curricula, qualitative improvement of faculty Members, practical training of engineers, closer linkages between the institutions and industry, and technical manpower planning. Keeping in view the importance of Higher Technical Education in the context of the economic and industrial development of the country, the Committee decided to take up the subject for examination during 1976-77. The result of the study made by the Committee is contained in the present report.

B. Role of Higher Technical Education

1.3. Economic development of a country depends to a large extent on the adequate supply of industrial manpower. The Scientific Policy Resolution, 1958 laid down:

“The wealth and prosperity of a nation depend on the effective utilisation of its human and material resources through industrialisation. The use of human material for industrialisation demands its education in science and training in technical skills. Industry opens up possibilities of greater fulfilment for the individual. India’s enormous resources of manpower can only become an asset in the modern world when trained and educated.

* * * * *

Science has developed at an ever-increasing pace since the beginning of the century, so that the gap between the advanced and backward countries has widened more and more. It is only by adopting the most vigorous measures and by putting forward our utmost effort into the development of science that we can bridge the gap. It is an inherent obligation of a great country like India, with its traditions of scholarship and original thinking and its great cultural heritage, to participate fully in the march of science, which is probably mankind’s greatest enterprise today”.

1.4. In a memorandum submitted to the Committee it has been suggested that in our country the technical education system should have the following broad objectives:

- (i) relevance to Indian situation
- (ii) compatibility with Inter-national standards
- (iii) involvement in the development process of the country.

1.5. It has been further stated in the memorandum that in the early stages, our technical education system was fashioned on the models in the Western countries. As a result some of the assumptions made in the design of the programmes have not been appropriate to the Indian conditions. During the early stages of development of technical education in the country, it was desired only to produce trained manpower for industry and other technological organisations. However, in India, as also in other parts of the world, the highly trained manpower available in technological institutions are increasingly being employed to tackle the problem of economic development of the country. The degree of involvement of our teachers in this process has been rather slow due to the archaic structure of our industrial set up.

1.6. It has been further stated in the memorandum that technical education in our country cannot exist in complete isolation with what is happening in the rest of the world since science and technology knows no international frontiers. It is necessary for us to keep our standards the same as that of the most advanced countries. This requirement of international comparability requires considerable financial and manpower inputs into the educational system.

1.7. In Indian conditions, the higher technical education has also to play an important role in the rural development. It has been suggested in another memorandum submitted to the Committee that the adaptation and adoption of modern science and technology particularly in the Indian rural areas for the amelioration of human suffering and in raising the standard of living of the people, should form a part of higher technical education.

1.8. It has been stated in another memorandum that with the emphasis on rural development in India, one can easily foresee a time when many engineering graduates may find employment within our rural set up and thus uplift the village life within the existing framework. New but fairly practical implements and techniques may have to be devised by them. The Engineering graduates may act as Co-ordinators, engineers, technicians and teachers. In a developing country such as ours the engineering education must provide for these roles adequately.

1.9. The Committee have been informed by the Ministry of Education that the All-India Council for Technical Education in their meeting held in April, 1972 recommended that a Joint Committee of the University Grants Commission and All India Council of Technical Education should be set up to review the whole system of engineering education at the first degree level in the light of current advancements in science and technology and suggest the lines along which the first degree courses should be organised and further improved. On the basis of the recommendations of the All-India Council for Technical Education, a Joint Committee of the Council and UGC was set up in October, 1973 to review the whole system of engineering education at first degree level. The terms of reference of the Joint Committee are as follows:—

- (a) To examine the whole structure of the first degree courses in engineering and technology, their curriculum, examination and evaluation system, teaching methods and techniques and all other academic aspects of the courses;

- (b) to examine the type and quality of instructional facilities provided at the institutions, including laboratories and workshops and teaching staff;
- (c) to evaluate the place of science and mathematics and social sciences including management, in the total curriculum of engineering and technology courses and the interaction among different disciplines;
- (d) to prepare a blueprint for the reorganisation and further development of the courses to meet the country's future needs for engineers for research, design, construction, production and management functions.

1.10. The Joint Committee have set up 6 study groups to go into the various aspects of the system of engineering education. One of the Study Groups has been entrusted with the study of goals for engineering education in relation to the technological development in the next 10—15 years.

1.11. The Joint Committee at its meeting held on 4-9-1974 felt that a complete study of goals in Engineering Education would take 3 to 4 years and estimated the total expenditure at Rs. 5 lakhs. This amount has been sanctioned by the Government. It has been stated by the Ministry that "it is hoped that the study would be completed, by 1980." Similar to the review of the undergraduate programmes, a major review is in progress for the post-graduate education in engineering.

1.12. Asked to state the reasons for the delay of nearly two years in constituting the Joint Committee, the Department of Education has in a note stated that follow up action was initiated as soon as the minutes of the meeting were available, in early July, 1972 and the composition and terms of reference of the Joint Committee were formulated for consideration of the Minister of Education. It was then decided that since this Joint Committee will be a high-powered Committee and its recommendations will have far reaching implications in the system of engineering education, approval of the Prime Minister should be obtained regarding the composition and terms of reference of the Committee. Accordingly, a reference was made to the Principal Private Secretary in this behalf on 16 September, 1972. The approval of the Prime Minister was, however, available on 31 August, 1973 with a suggestion to include some representatives of private industry in the Committee. After obtaining the acceptance of the Chairman and other Members of their nominations, the constitution of the Committee was completed by the middle of October, 1973.

1.13. The Joint Committee held two meetings on 4 September, 1974 and 5 May, 1976. The progress of work of one of the Study Groups was reported to the Joint Committee. Reports of other Study Groups are not yet available. The work is in progress. No specific time limit was given to Study Groups for finalising Report.

1.14. It is well known that higher technical education is an essential prerequisite for economic development of a country. An industrial society cannot prosper unless it obtains on a continuous basis the services of people trained in various aspects of technology. The Committee consider it extremely important that the higher technical education system which was originally fashioned on the models existing in Western countries, should be reoriented to suit the Indian conditions. At the same time it should not remain in complete isolation from the latest developments in other countries. The higher technical education has particularly to play an important role in the rural development by helping the rural population in amelioration of their suffering and raising the standard of living. It is, therefore, necessary that the objectives of the higher technical education should be carefully redefined.

1.15. The Committee note that the All India Council for Technical Education in 1972 recommended that a Joint Committee of the University Grants Commission and the All India Council for Technical Education should be set up to review the whole system of engineering education at the first degree level in the light of latest advancements in science and technology and to suggest the lines along which the first degree courses should be organised. But surprisingly Government took two years to take action and the Joint Committee was appointed in October, 1973 only. One of the Study Groups of this Joint Committee has been entrusted with the study of goals for engineering education in relation to technological development in the next 10 to 15 years. Further, while the Joint Committee in September, 1974 expected that study of goals for engineering would take 3 to 4 years, according to the Ministry, the study would now be completed by 1980. The Committee are unhappy over the delay of 1½ years in appointing the Joint Committee to study this important matter. The Committee stress that the study now undertaken by the Working Groups of the Joint Committee should be completed and finalised well before the beginning of the Sixth Plan so that the conclusions are available by the time of drafting and finalising the Sixth Plan Document. The Committee expect that the studies be concluded and necessary conclusions drawn up in time.

C. Planning for Technical Manpower

1.16. With the establishment of the Institute of Applied Manpower Research (IAMR) in 1962, manpower planning became an organised effort at national level. Since then, the Institute has initiated and promoted, conceptually and in practice, manpower planning and manpower utilisation as an integrated part of our national development activities. The Institute has also sought to understand the complexity and magnitude of the problems of human resources development in India, to establish appropriate methodologies for forecasting the demand for, and supply of, different manpower groups and to set up an adequate manpower information system.

The Institute has carried out so far several studies on engineering manpower planning for the Third, Fourth and Fifth Five Year Plans.

1.17. The Education Commission (1964—66) while stressing the need to pay due attention to the relationship between enrolment and manpower requirements observed as follows:—

“If India is to achieve its targets of economic growth, it must have an adequate supply of educated specialists for each category of job to be performed. Conversely, if there is an excess of trained people in any category, it implies an imprudent use of scarce resources and also creates difficult problems of unemployment of the educated. Even from the point of view of the individual, some matching of educational patterns and job opportunities is vital. Nothing is more frustrating than to be under qualified or over-qualified for a job, or to be unemployed because there is no call ‘for one’s qualification’.”

1.18. The Committee desired to know the action taken to undertake studies and to relate the admission and out-turn of Engineering Institutions to the manpower forecasts. In a note, the Ministry of Education and Social Welfare stated:—

“The expansion of facilities for higher technical education during the successive Five Year Plans has kept in view the socio-economic requirements of the community. As the country’s industrial development increased and the manpower requirement for this class also increased, the

technical institutions already existing were developed and new institutions were established to cater to the technological development. As new disciplines and specialities were required in considerable number, special courses in these specialities were also offered. In the early stages of planning, forecasts of the Planning Commission about the requirement of technical manpower in the various sectors of the plans, taking into consideration each area of plan activity such as construction, transportation, communication, industry etc., the number of technical personnel required at a particular level was computed taking into consideration the position also of the State plans. However, not always a rigid and realistic relationship between the forecasts and the capacity in the institutions has been possible for the reason that because of economic difficulties and resultant slow tempo of industrial development and other development activities, the requirement of technical personnel has been reduced from what was envisaged. The Institute of Applied Manpower Research has also made studies of the requirement of technical manpower from time to time and these have been kept in mind while making admissions to the various courses in the technical institutions."

At the recent meeting of the All India Council for Technical Education the need for a more realistic manpower survey has been emphasised and the council has recommended that the Institute of Applied Manpower Research be requested to undertake this task to be completed during the coming two years."

1.19. In a subsequent note, the Ministry of Education and Social Welfare stated:—

"In the context of the earlier decision of the All India Council for Technical Education that the admission capacities in the institutions might be linked with the requirements in the various subject-fields the All India Council for Technical Education at its meeting held on 21st May, 1976, noted that the matter of a realistic study to assess the technical manpower requirements, so that a meaningful and comprehensive assessment of manpower requirements on a long-term basis could be worked out, was under consideration of the Government. It is in this context that the

Council recommended that the Institute of Applied Manpower Research be requested to undertake this task to be completed during the coming two years.”

1.20. During evidence the Committee pointed out that the All India Council for Technical Education at its meeting in May, 1974 recommended: that manpower requirements during the Sixth Plan period should be carefully assessed on a disaggregated basis after taking into account the specific requirements, discipline-wise, state-wise and region-wise and that selected institutions may be assigned the responsibility to assess the manpower requirements in all principal sectors of employment. The Council also recommended that the reports of such committees should be made available before the end of the current financial year so that the admission policy in technical institutions in the remaining years of the 5th Plan could be decided on the basis of the findings of these studies.

1.21. Asked about the action taken in this regard, the Additional Secretary, Department of Education stated:—

“.....We considered this aspect. We have already undertaken some studies to which I referred. Secondly, the Applied Manpower Research Institute has worked out tentative estimates for making a realistic study which is under our consideration in consultation with the Planning Commission and IAMR. These studies have to be related to the Sixth Plan about which no indications have yet been given, even of the broad framework, but we are going ahead with our preparatory work in this regard....”

1.22. The Department of Education has in a subsequent note stated that in accordance with the recommendations of the All India Council the Department of Education had requested Indian Institutions of Technology at Madras, Bombay and Kanpur to initiate immediately a study of the manpower requirements in the major branches of engineering viz. (i) Mechanical Engineering (ii) Civil Engineering (iii) Electrical Engineering. The I.A.M.R. was also requested by the Department of Education to provide the necessary technical and methodological assistance to these institutions in initiating the study. Simultaneously, the Department of Education requested the Manpower and Employment Division of the Planning Commission to initiate a study on the employment pattern of engineers as recommended by the Council. The IIT, Madras constituted a team to undertake the study but the IITs at Bombay and Kanpur have yet to formulate their proposals. The IAMR informed the

Department of Education that they were then engaged in an assessment of the manpower requirements in the 5th Plan and that when this was completed they would be initiating the preparations of a 15 year perspective plan for technical manpower. The Employment and Manpower Division of the Planning Commission informed the Department of Education that the working group on engineering manpower for the Fifth Plan had already gone into the question of the pattern of utilisation of engineering personnel to some extent and that if any further study was to be undertaken the objectives and coverage of such a study would have to be more clearly defined.

1.23. Two Groups were also appointed to estimate the manpower to potential. The Report of the two Groups were discussed in a meeting which was held under the Chairmanship of Union Minister of Education on 10 March, 1976. The Group decided that it would be necessary that a National Survey of manpower needs to be undertaken. The Ministry of Education will provide necessary financial resources and the IAMR would be entrusted with the responsibility to act a nodal point of the entire survey.

1.24. The position was reported to the All India Council at its last meeting held in May, 1976. The Council emphasised at the need for a national survey of scientific and technical manpower and recommended that the survey be undertaken on a priority basis.

1.25. Keeping in view the Council's last recommendations it was decided to undertake a National Survey of Manpower needs on a priority basis. It is in this context that the Council recommended that the IAMR be requested to undertake this task to be completed during the coming two years. The Institute of Applied Manpower Research has worked out the tentative estimates of the project and it is estimated that this would cost about Rs. 155 crores. The scope of the survey, the background information required for the same, the financial outlays for its activities and other related matters are being looked into by the Government.

1.26. On being asked to explain the latest position in this regard, the Department of Education stated as follows (October 1977):

“... the Ministry proposed a Budget provision under the Plan to the tune of Rs. 1.50 crores for approval of the Planning Commission/Ministry of Finance.

The matter is being pursued further in the light of the discussions of the educational policies and programmes in

regard to the 6th Plan at a meeting held on 21-7-1977 in the Planning Commission where it has been decided that as far as the Technical Education is concerned, it will have to be related to demand for Engineering personnel in the organised Sectors and also for Self employment. The matter regarding entrusting the work to IAMR and also the necessary provision for the work is being reopened."

Regulation of Admissions in Engineering Courses

1.27. In their Report on Engineering occupations in the Fifth Plan (1974), the Institute of Applied Manpower Research have come to the following conclusions:—

"Engineering employment per unit of Gross Value Added has increased. The extent of underutilisation can only be estimated by in depth studies.

"If economic growth as visualised in the Approach to the Fifth Plan is achieved, there will be a shortage of about 27,500 engineers by the end of the Fifth Plan period. The current unemployment in engineering can be viewed as a temporary phase. But, we must also remember that a rapid expansion of engineering education has affected the quality of engineers trained by an institution. The cut in admission in 1968 and following years especially in those institutions which are not well equipped with all the instructional facilities is an appropriate short-term remedial measures.

"In view of current unemployment and unsteady economic development, any further expansion of engineering education is undesirable. The restoration of admissions to engineering institutions to their full capacity should also be phased, to ensure quality and standards. Further since any further expansion of engineering education will have its impact only on the Sixth Plan, we must extend the study when more precise information is available on the nature and scope of the Sixth Plan.

1.28. The Estimates Committee (1964-65) in their Seventy-fourth Report on Ministry of Home Affairs—Directorate of Manpower and Institute of Applied Manpower Research observed:—

"The Committee note with concern that there would be a sizeable gap between demand and supply position of engineering personnel during the Fourth Plan. The Committee would stress that government should ensure that proper ratio among the three main categories of technical

personnel, e.g., graduates, diploma holders and craftsman is maintained in desirable proportion in keeping with the requirements of the industry and advances made in the technological field.”

1.29. A leading Public Undertaking in their Memorandum to the Committee expressed the following view of the technical manpower planning:—

“....technical manpower planning has been most unrealistic as a result of which there is so much glut of engineering graduates in the market. It is a strange paradox that on the one side, we have over-flow of the unemployed engineers and technologists in the country while on the other suitable candidates are not available to fill all the posts advertised by Public service Commissions. Similar is the experience of the Industry also. Obviously, correct type of students not, being produced by the engineering Institutions and even their number has got no rationale with the requirements of such personnel by the Industry. In certain disciplines there is a glut of engineers while in the others they are extremely wanting...”

1.30. In another memorandum to the Committee it has been stated that an integrated approach involving the Planning Commission, the Industries and the Ministry dealing with technical education, is essential. Perhaps the worst case of such lack of coordination is in the area of Aeronautical Engineering. The avenues of employment for graduates of Aeronautical Engineering in our country are so limited that unless a national policy is formulated and implemented, the present state of affairs which has been in existence for well over a decade would continue.

1.31. Asked to state the measures taken to ensure that the manpower surveys are realistic. Additional Secretary, Department of Education during evidence state:—

“....Instead of making a general survey and in view of our requirements, we have shifted the emphasis and have undertaken in depth studies of the sectoral requirements where there are gaps. The most recent study at the national level relates to the engineering education and the same was published in 1974. In addition, a study on the supply and demand of engineering requirements was undertaken by the Institute of Applied Manpower Research in a number of specialised fields such as metallurgy in 1971; civil engineering in 1971 and scientific personnel

for research and development in 1976. Other series of studies have also been undertaken to make technical manpower planning realistic and more sensitive of our requirements, in view of the technological changes that are taking place. There are various sectors which employ a substantial engineering manpower such as in the thermal power, petroleum refining, cement and paper and the studies in respect of all of them are in progress. Apart from that, we have also undertaken studies in regions where there are acute shortages for example, in the north-eastern region, Jammu and Kashmir and Karnataka. So, instead of general survey which was suggested by the All India Council for Technical Education we decided to proceed on a different basis....”

1.32. When pointed out that despite these surveys there is large scale unemployment amongst engineers, the witness stated:

“In 1955 the survey indicated that the facilities for engineering studies should be stepped up. That was done, Subsequently, when there was slowing of growth rate of economy, it was only natural that the engineers remained unemployed.”

He added:

“It is a known fact that today there are more engineers than the actual demand but it is the result of what has happened over so many years. We have taken note of the present position and in essence we have carried out what the Council wanted us to carry out... Once a distortion takes place in this case certainly it has taken place in view of the circumstances beyond the control of our Ministry, it does take time to set things right.... the action taken from 1967-68 onwards has to some extent lessened the distortion.”

Actual Admissions

1.33. The admission capacity in degree courses in engineering reached 25,000 by the beginning of Fourth Five Year Plan. However the actual admission was reduced during the middle of the Fourth Plan. Explaining the background leading to reduction in actual admissions, the Dept. of Education have in a note stated as follows:—

“The Third Five Year Plan of Technical Education (1961-62 to 1965-66) envisaged an admission capacity of 25,000 students to degree courses in engineering/technological institutions by the end of the Plan period. This target was achieved with the admission capacity obtaining during

the academic year 1966-67 i.e. the beginning of the Fourth Five Year Plan. During the academic year 1966-67 and 1967-68, the engineering/technological institutions had an admission capacity of 25006 and 25070 for degree courses.

During the year 1967, reports started coming from several parts of the country about the increasing unemployment among engineering graduates and diploma holders due to recession in industry. In early 1968, the unemployment among technical personnel became acute and it was considered essential to regulate the admissions in technical institutions so that the gravity of unemployment in future years could be minimised. As an immediate step, it was decided to effect an overall reduction of 30 per cent in the admission capacity to degree and diploma courses in the country. Accordingly, in February, 1968, the Ministry advised the State Governments, Universities and other authorities to reduce admissions to technical institutions on a selective basis. The actual admission was, however, to be implemented in each institution according to the physical facilities available. The suggestion was generally welcomed by most of the State Governments and Universities.

Due to recession in industry and consequential unemployment among technical personnel the admissions to degree courses in engineering/technological institutions dropped down to a considerable extent in subsequent years. A statement giving the actual admissions during the years 1966-67 to 1976-77 is given below:—

Year	Actual Admissions
1966-67	24934
1967-68	24571
1968-69	18445
1969-70	17853
1970-71	17907
1971-72	18197
1972-73	19997
1973-74	21199
1974-75	21870
1975-76	22454
1976-77	22309

Since the demand for engineering seats has now started picking up, we may have to increase the number of seats for certain selected courses in the 5th and 6th Plan but on the advice of All India Council for Technical Education it is proposed not to go beyond the overall admission capacity of 25,000 as a cautious approach, till the manpower requirements of technical personnel are assessed on scientific basis for the 6th and subsequent Plans."

1.34. Asked to state the details of the projections on the requirement of engineers and diploma holders made by the various agencies for each of the Five Year Plans, and the number of such technical personnel turned out by the various engineering institutions Department of Education in a note (November 1977) they stated that according to the assessment made by the Planning Commission, the estimated additional requirement of engineers from Second to Fifth Five Year Plan was as under:—

	II Plan 1956-61	III Plan 1961-66	Revised IV Plan 1969-74	V Plan 1974-79
	1	2	3	4
1. Graduate	29,000	51,000	*3,84,000	2,00,000
2. Diploma Holders	56,000	1,00,000		
	85,000	1,51,000	3,84,000	2,00,000

*indicate total (not additional) requirement of engineers.

The out-turn of degree and diploma holders from various engineering Institutions is as under :—

Degree Holders	23312	44310	84524	80,000
Diploma Holders	30418	68234	98964	90,000

According to the Department of Education, the number of Engineers "actually employed during each of the Plan period is not known."

Associating Industry in Manpower Planning.

1.35. It has been suggested in a Memorandum to the Committee that all leading employers of engineering graduates should be asked to forecast their manpower requirements of engineering graduates for the next 5 years. Keeping this and the scope for self-employment the number of seats in engineering institutions should be

fixed from time to time. Asked whether industries are associated in the manpower planning exercises, the Additional Secretary of the Department of Education stated during evidence:

“.....Manpower study programmes are being planned in full consultation and collaboration with industries both in public and private sectors. Secondly, in our assessment, we are approaching the industries directly to obtain whatever information they can furnish. But very often we come across this kind of reply that in view of the uncertainty of the overall planning they are not able to project their firm requirements. Then in respect of manpower requirement, advisory committees of industries are fully associated in regard to the planning of studies as also in their implementation. The technical institutions as also those which are engaged in manpower studies are doing more and more consultancy work for industries.”

1.36. A point was raised during evidence whether the manpower forecasts are made several years in advance as the duration of the engineering courses is 5 to 6 years. In reply the Additional Secretary of the Department of Education stated that manpower surveys are made for shorter periods.

1.37. When pointed out that engineers are trained in 5 to 6 years, the witness referring to the Sixth Plan projections stated:—

“.....We are planning on an assessment which would be realistic for the next 4-5 years upto the middle of Sixth Plan and further study based on the projections upto the end of the 6th Plan or so. That may take up to a period of 6—8 years, two years more of the Fifth Plan and five years of the 6th plan, that means 7 years. But we must have a very realistic assessment, placed as we are today in respect of the 6th plan; and certainly a very realistic assessment of what would be the requirement and what would be the position of supply in respect of the period for the next 4-5 years.”

Ratio between stock of Engineering Degree and Diploma holders.

1.38. Asked to state the Ratio between stock of Engineering and Diploma holders prevailing at present and how it is likely to change in future, the Department of Education have furnished the following statement.

Ratio between Stock of Technical Degree & Diploma Holders at the year end

Occupation	1955*			1960*			1974+			1978+		
	Degree	Dip- Ioma	Ratio	Degree	Dip- Ioma	Ratio	Degree	Dip- Ioma	Ratio	Degree	Dip- Ioma	Ratio
Civil .	10900	21100	1.936	19500	37100	1.903	50725	95493	1.883	60213	113115	1.879
Mechanical	7200	8500	1.181	12500	14100	1.128	58774	96123	1.636	69693	121747	1.748
Electrical	6200	7900	1.274	10200	12500	1.226	47175	69908	1.482	58106	92142	1.586
Chemical	2700	400	0.148	4000	400	0.100	12801	1365	0.107	15341	2208	0.135
Metallurgical	1100	300	0.273	1900	400	0.210	7247	1200	0.166	9200	1800	0.136
Mining	500	600	1.200	900	1000	1.111	2336	2566	1.098	2552	2917	1.143
Tele-communication	500	300	0.500	900	600	0.667	5659	2972	0.525	8702	4515	0.519
TOTAL (including other Branches)	34600	44600	1.289	58000	75100	1.295	209294	295915	1.414	257198	374523	1.456

*Source : IAMR Working Paper No. 11/1969-Employment outlook for Engineering, 1969-70.

+Source : Engineering Occupations in the Fifth Plan (IAMR Report No. 1/1974).

1.39. The Committee note that several studies have been undertaken since the early stages of planning regarding the requirements of technical manpower for the various sectors of the economy taking into consideration, each area of plan objective such as construction, transportation, communication, industry etc. The Institute of Applied Manpower Research has also made studies from time to time about the requirements of technical manpower and these were kept in view while regulating admission to various courses in the technical institutions. But according to Government, a rigid and realistic relationship between the forecast and the capacity in the institutions has not always been possible because of economic difficulties and resultant slow tempo of industrial development and other developmental activities.

1.40. The Committee regret to observe that the studies on the technical manpower planning made in the past have been unrealistic which resulted in large scale unemployment of engineering graduates. A view has been expressed before the Committee that it is a strange paradox that on the one side there is an over flow of unemployed engineers while on the other, suitable candidates are not available to fill all the posts advertised by Public Service Commissions and the Industry. Even in specialised branches of engineering like Aeronautical Engineering, avenues of employment for graduates in the country are limited. The Committee strongly feel that there is an imperative need for realistic assessment on scientific lines of the requirements of engineers, discipline-wise, and even sub-discipline-wise particularly in the context of the Sixth Five Year Plan.

1.41. The Committee need hardly stress that the assessment of the requirements of technical personnel of various categories on a long term basis should be undertaken in such a way that the availability of technical education facilities and the out-turn of technical personnel, broadly matches job requirements. It is also essential that the assessment is made for each sector and sub-sector of the industry as also for the various regions so as to meet the requirements in full. It is of the utmost importance in this regard that these studies are made in full consultation with the concerned industries both in the public and private sectors.

1.42. The Committee note that the All India Council for Technical Education recommended in May, 1974 that manpower requirements during the Sixth Plan period should be carefully assessed on a disaggregated basis after taking into account the specific requirements discipline-wise, State-wise and region-wise and that selected

institutions may be assigned the responsibility to assess the manpower requirements in all principal sectors of employment. The Committee were informed that on the basis of the recommendations of the All India Council, the Department of Education requested the Indian Institutes of Technology (IIT) Madras, Bombay and Kanpur to initiate immediately a study of manpower requirements in the major branches of Mechanical, Civil and Electrical Engineering. While the IIT, Madras constituted a team to undertake the study, the IIT Bombay and Kanpur are yet to formulate their proposals. The Committee are concerned to note that even after the lapse of 3 years since the All India Council recommended that selected institutions should undertake manpower surveys, all that has been done is that a team has been constituted by the IIT, Madras. The IIT Bombay and Kanpur are yet to formulate their proposals. The Committee are unhappy over the inordinate delay in the implementation of the recommendations of the All India Council for Technical Education. The Committee feel that the engineering institutions particularly Indian Institutes of Technology and Regional Engineering Colleges should be assigned suitable roles in conducting technical manpower surveys which should be completed according to time bound programmes.

1.43. The All India Council for Technical Education at its meeting held in May, 1976 again recommended that a realistic study to assess the technical manpower requirements should be undertaken so that meaningful assessment of manpower requirements on a long term basis could be worked out. The Council suggested that the Institute of Applied Manpower Research should undertake this task and complete it during the coming two years. The Committee have been informed that the Institute of Applied Manpower Research has worked out tentative estimates for this project which would cost about Rs. 1.5 crores. The Committee were informed in October 1977 that the Ministry of Education proposed a Budget provision under the Plan to the tune of Rs. 1.50 crores for the approval of the Planning Commission/Ministry of Finance. In the discussions regarding educational policies and programmes for Sixth Five Year Plan held in July 1977 in the Planning Commission, it was decided that as far as the technical education was concerned, it would have to be related to demand for engineering personnel in the organised sectors and also for self employment. The matter regarding entrusting the work to institute of Applied Manpower Research and also the necessary provision for the work was being

reopened. The Committee stress that early decision should be taken by Government in this regard so that results of the survey to be undertaken are available well in time for use in the implementation of the technical education programme for the Sixth Plan. The Committee also desire that while undertaking the manpower studies, the areas of study to be undertaken by the IITs, IAMR and other agencies should be clearly demarcated so as to avoid duplication of efforts.

1.44. The Committee stress that while undertaking manpower surveys, proper coordination amongst the Planning Commission, Institute of Applied Manpower Research, IITs, Ministry of Home Affairs and Department of Education should be maintained so as to ensure an integrated approach in preparing manpower surveys.

1.45. The Committee were informed that manpower surveys were made for short term duration of 4 to 5 years. The Committee need hardly emphasise that it takes 5 to 6 years to train engineers. If the manpower study is to serve any useful purpose, it should be undertaken atleast 8 to 10 years in advance. The Committee hope that Government will take necessary steps to expedite survey for the Sixth Plan.

1.46. The Committee note that the ratio between technical degree and diploma holders was 1 : 1.289 in 1955, 1 : 1.295 in 1960, and 1 : 1.414 in 1974 and it would be 1 : 1.456 in 1978. This indicates increasing trend in the out-turn of diploma holders as compared to degree holders. The Committee desire that keeping in view the requirements of the industry etc. and advances made in the technological field the optimum ratio among the three main categories of technical personnel, viz., graduates, diploma holders and craftsmen should be worked out and the programme for technical education training formulated accordingly.

1.47. The Committee would also suggest that Government should encourage engineering institutions/polytechnics and industrial units, particularly those employing a large number of workers to jointly organise courses designed to update the knowledge of the workers to help them in improving their productivity as also to train them to operate modern machinery etc. Such courses should obviously be of sandwich pattern giving both theoretical knowledge and inplant practical training. Adequate opportunities should be afforded to the craftsmen, skilled workers, etc., for upgrading their skills and for acquiring higher qualifications.

CHAPTER II INSTITUTIONS

A.—Number of Institutions

2.1. At present there are 146 institutions which offer first degree courses in engineering. Out of these, more than 65 institutions offer post-graduate courses leading to either a post-graduate diploma or a master's degree in engineering to about 2500 students.

2.2. The State-wise number of institutions and the sanctioned seats in under-graduate engineering courses are given below:

	1960-61		1969-70		1974-75		1976-77	
	No. of institutions	No. of seats	No. of institutions	No. of seats	No. of institutions	No. of seats	No. of institutions	No. of seats
1	2	3	4	5	6	7	8	9
1. Chandigarh .	..	..	4	505	4	355	4	365
2. Delhi .	2	260	3	580	3	505	5	581
3. Haryana .			2	310	2	320	2	333
4. Jammu & Kashmir .	1	120	1	250	1	150	1	220
5. Punjab .	6	585	3	460	3	438	3	420
6. Rajasthan .	3	405	5	800	5	514	5	715
7. Uttar Pradesh	11	1127	14	2749	14	2047	14	2085
8. Assam .	2	240	2	300	2	330	2	300
9. Bihar .	7	1346	7	1080	7	1233	7	1295
10. Orissa .	1	120	2	320	2	380	2	380
11. Tripura .	..	..	1	60	1	60	1	60
12. West Bengal .	10	1578	12	1644	12+2*	1873	12	1731
13. Gujarat	5	1020	7	1705	7	1839	8	1967
14. Madhya Pradesh .	7	1085	9	1402	10	1252	10+1*	1388
15. Maharashtra .	10	1556	13	2610	14+3*	2809	16+3*	2764

*Special institutions conducting courses in Architecture (G.D. Arch) and Pharmacy.

1	2	3	4	5	6	7	8	9
16. Goa . . .	..	..	1	60	2	84	2	87
17. Andhra Pradesh . . .	9	1085	11	1170	11	1450	11	1375
18. Kerala . . .	4	570	6	1210	6	1120	6+1*	865
19. Tamil Nadu . . .	13	1317	15	2355	15	2635	14+2*	2370
20. Karnataka . . .	11	1410	17	1470	19	1852	18+2*	3198
	102	13824	135	21340	141+5*	21235	143+9*	22499

*Special institutions conducting courses in Jute Technology, Marine Engg., Architecture (G.D. Arch) and Pharmacy.

State-wise information regarding number of institutions and number of seats in Post Graduate courses in 1975-76.

Name of State/Union Territory	No. of Institutions	No. of seats
1	2	3
<i>Northern Region</i>		
Delhi	3	321
Chandigarh	4	190
Haryana	2	50
Punjab	2	47
Rajasthan	4	156
Uttar Pradesh	9	1203
<i>Eastern Region</i>		
West Bengal	7	708
Bihar	4	129
Orissa	2	42
<i>Western Region</i>		
Maharashtra	10	699
Gujarat	6	169
Madhya Pradesh	6	214
Goa	1	5

1	2	3
<i>Southern Region</i>		
Andhra Pradesh	9	329
Karnataka	8	338
Kerala	3	108
Tamil Nadu]	13	568
Total	93	5216

NOTE:—1. The information given above includes some of the institutions which have so far not been approved by the AICTE/Govt. of India for grant purposes.

2. It also includes seats for some of the courses for which approval of the AICTE/ Govt. of India so far not been given.

3. The information regarding Pharmacy courses which are being conducted in Medical Colleges has also been included in this.

2.3. The Ministry have stated in a written reply that expansion of technical education in the country was generally made in the First, Second and Third Five-Year Plans. By the end of 1969-70, the total number of institutions offering degree courses in engineering technology was 136 with a total in take capacity of 21340. During the academic year 1966-67 and 1967-68, the engineering institutions had an admission capacity of 25006 and 25070 respectively for degree courses. During this process of expansion, particularly during the Second Plan Period, when the matter of establishment of more institutions and the dispersal of facilities for the technical education was considered by the All India Council for Technical Education, one of the major issues at its meeting held in March, 1958 was whether the Central Government in its efforts to expand technical education in the country as a whole should aim at parity or equity among all the regions.

2.4. Asked about the reasons for the concentration of technical institutions in some States and the measures taken to reduce the disparity, the Additional Secretary in the Department of Education

quoted the following extracts from the minutes of the discussion in the meeting of All India Council of Technical Education held in March, 1958 and added that these reasons still held good.

“The development of technical education is a process, the rate of which in a particular area is governed by a number of factors such as initiative and interest of State Governments, private enterprise, universities and other educational facilities, industrial progress, general educational standard of the people and their interest in higher education, occupational interests of different sections of the community etc. In fact, the state of technical education in the area reflects in large measure the way of life of the people concerned. Forces beyond the control of people may retard the progress of technical education in area but that is an exceptional situation. The existing differences in the state of technical education in different parts of the country are due largely to these various factors. Both in the southern and western regions progress is in a large measure due to the keen interest evinced by private enterprise in technical education. For instance whereas the Second Five Year Plan of the States in these regions included 4 new engineering colleges and 17 polytechnics, private enterprise has come forward to establish 5 colleges and 12 polytechnics in the last 2 years alone. In other regions the activity of private enterprise in technical education is extremely limited; only one engineering college and no polytechnic has been proposed for establishment by private enterprise so far.

Of the existing institutions in the country today over 30 per cent are private institutions excluding university institutions; over 65 per cent of the private institutions are in the southern and western regions. The number of private institutions in these 2 regions will increase further during the current plan period. This is so in spite of the fact that the assistance of the Central Government has been offered to private enterprise for all regions on the same basis. In view of this it seems that parity among the regions is possible only if all developments in the more progressive or advanced regions are retarded and

the efforts and resources of the Central Government are concentrated in other regions. That, however, is both impracticable and undesirable. There is no reason why these regions which are active in the field of technical education should not be assisted and encouraged further to progress further as long as other regions are not denied the same opportunity to advance. The Central Government should not supplant but should supplement local initiative and effort in an equal measure for all regions save when exceptional circumstances in a particular area call for special attention from the Centre. Further in Five Year Plans the special responsibility of the Central Government is to ensure an adequate supply of technical manpower for various projects on an all-India basis. The fact that the new steel plants or fertilizer factories or ship building yards are located in certain areas for technical reasons would not justify the recruitment of technical personnel required from these areas. Every State and Region should be given as equal opportunity to share in the enterprise."

2.5. The witness also stated that the disparity in the location of engineering colleges over the years had been reduced gradually.

2.6. The Department of Education have stated in a note that the facilities for engineering and technical education were expanded from time to time in various parts of the country. Generally depending upon the state of industrial development and other related factors, and on the basis of the proposals of the State Government. The proposals of the State Governments are generally discussed by the Planning Commission at the time of plan discussion. After the Planning Commission has made adequate plan provision, the question is examined in depth by the All India Council through its Regional Committees.

2.7. The Department of Education further stated that there has been a remarkable expansion during the first three plan periods on the advice of the All India Council. Since the beginning of the Fourth Plan period the emphasis has been on consolidation and diversification and quality improvement. State-wise details of the

number of seats available per lakh of population at degree level during the year 1976 are given below:

Name of the State/U.T.	No. of seats available	Population (in lakhs)	No. of seats per lakh of population
1	2	3	4
<i>Northern Region</i>			
1. Chandigarh .	365	2.55	143.13
2. Delhi	581	40.26	14.43
3. Haryana	333	99.49	3.30
4. Jammu & Kashmir	220	46.05	4.77
5. Punjab	420	134.52	2.30
6. Rajasthan	715	256.71	2.78
7. Uttar Pradesh	2085	882.37	2.36
<i>Eastern Region</i>			
8. Assam	300	149.16	2.01
9. Bihar	1295	562.45	2.30
10. Orissa	380	218.95	1.70
11. Tripura	60	15.53	3.80
12. West Bengal	1731	443.53	3.90
<i>Western Region</i>			
13. Goa	87	8.55	10.10
14. Gujarat	1967	266.30	7.38
15. Madhya Pradesh	1388	415.65	3.33
16. Maharashtra	2764	502.36	5.50
<i>Southern Region</i>			
17. Andhra Pradesh	1375	433.29	3.17
18. Karnataka	3198	292.10	10.94
19. Kerala	865	212.40	4.07
20. Tamilnadu	2370	410.36	5.77
All India Position	22499	5463.72	4.11

Notes :—Population figures have been taken on the basis of the 1971 census.

2.8. The Department of Education have also stated:

“It may be observed from this statement that except in the case of Chandigarh which is a Union Territory and is catering to the requirements of both Punjab and Haryana, the seat population ratio shows fair distribution of facilities at under-graduate level keeping in view the population of the individual States. (At post-graduate level the admissions are made on all India basis and do not cater to any particular area or territory. The students choose the institutions according to their choice of specialisation.”

Central Assistance to private institutions

2.9. During the first three Five Year Plans the pattern of assistance to approved non-government institutions was such that the Central assistance towards its matching share of the expenditure involved was being given direct to the institutions, once the State Governments concerned had matched the same according to the agreed proportions. The Ministry have furnished a statement showing Central assistance to private institutions for higher technical education. From this it is seen that a major portion of the assistance has been received by institutions located in Tamil Nadu, U.P., Maharashtra, and Karnataka as compared to other States.

(Rs. in lakhs)

	I Plan	II Plan	III Plan	Total
Tamil Nadu	61	115	160	336
U.P. .	8	14	92	114
Maharashtra	9	23	72	104
Karnataka	8	41	65	114
Orissa		15	2	17
Bihar .		20	9	29
Rajasthan . .		11	14	25
Andhra Pradesh .		15	29	44
Madhya Pradesh	9	14	80	103

Facilities in North-Eastern Region

2.10. Regarding the progress made in increasing the number of seats available in the North-Eastern Region the Ministry have stat-

ed in a note that the number of seats increased from 240 in 1960-61 to 360 in 1975 in degree courses and from 660 to 1285 in Diploma courses. According to the latest information furnished by the Ministry (October 1977), the number of seats in graduate engineering courses in the North-Eastern Region in 1976 was 360. Further to facilitate the opportunities for higher technical education for students from these regions, seats are being reserved in the institutions all over the country for those sponsored by the States. The number of seats so reserved during the year 1976-77 was:

Name of the State/Union Territory	No. of Degree seats reserved	No. of diploma seats reserved
Arunachal Pradesh	3	..
Assam	33	9
Manipur	37	8
Meghalaya	30	17
Mizoram	16	23
Nagaland	21	..
Tripura	7	1
	147	58

2.11. Asked about the number of Regional Engineering Colleges located in the North-Eastern Region, the Additional Secretary, Department of Education stated during evidence that a college was to be located in Silchar but despite—efforts made, the progress had been slow. Asked whether each State has got a Regional Engineering College, the witness stated “not yet, with Silchar we will have 15”. In a written reply (October 1977) the Department of Education informed the Committee that in the Regional Engineering College, Silchar admission to the first year is expected to be made in November, 1977.

2.12. The Committee desired to know when the proposal to set up a Regional Engineering College in Silchar was made and the reasons for delay in starting the college. The Department of Education in a note (October, 1977) stated that a proposal for the establishment of a Regional Engineering College tentatively at Silchar was made to the Government of Assam in 1962. The location for

the establishment of a Regional Engineering College in Assam was to be finalised by the Central Government in consultation with the State Government. It was only in 1965 that it could be finally decided that the Regional Engineering College may be established in Assam at Silchar. This was due to difficulties of terrain, communications and climate in Silchar and other considerations involved. An area of 1943 bigas of land was later on acquired by the State Government in November, 1966 for the college premises and thereafter the development of land was taken up. The society of the college was registered in February, 1967 and the first meeting of the Board of Governors was held during the same month. The Principal was appointed in October, 1967 to initiate the work of establishment of the college. The selection of Architects for preparing plans, etc. was finalised by the Board in November, 1968. A master plan for the college was approved by the Board in February 1970. The plans and estimates prepared by the college for the hostel building were sent to the State PWD for scrutiny and certification in July 1970. The estimates were later on prepared on reduced estimates and the same could be finalised by the PWD some time in June, 1971. Meanwhile due to outbreak of war in East Pakistan, the land went under occupation of the refugees from June, 1971 and the land could finally be released in October, 1972. There could be no progress of construction work during this period. Thereafter, the Board entrusted the construction work to the State PWD in May, 1972. A building grant of Rs. 4.50 lakhs and equipment grant of Rs. 2.25 lakhs and loan for hostel buildings of Rs. 5 lakhs was provided to the college during 1971 and 1972. There was some progress on construction work but the same had to be given up due to ban on construction imposed in June, 1973 on all capital works. The ban on construction works was removed by the Central Government in January, 1976. From 1975-76 there has been an increased activity for the establishment of this college. A detailed project report for the construction of the College was prepared by the State PWD and the same was submitted to the Central Government for approval. On this the Central Government advised the State Government to provide initial facilities, such as workshop buildings, lecture, tutorial and drawing halls and administrative building, students, hostel equipment for workshop and laboratories and library books for the first two years of the course. For this purpose, funds to the extent of Rs. 57.15 lakhs were provided during 1976-77.

2.13. In a further note (November 1977), the Department of Education have stated that Classes at Regional Engineering College, Silchar have started with effect from 2nd November, 1977 with an intake of 60. The Workshop building, Administrative building, Lecture, Tutorial and Drawing Hall, Staff quarters for Assistant Professors (7 units) and non-teaching staff (24 units) and a students hostel for 130 boys have been constructed out of the Non-recurring funds released by the Central Government so far."

Reservation of seats in engineering colleges

2.14. During their tour to Sikkim, the Committee learnt that 24 seats have been reserved for Sikkim in various engineering colleges as per details given below:—

Name of State	Course	No. of seats	Remarks
Chandigarh	B.E. Mech.	1	4 years course <i>Not suitable</i>
Jammu & Kashmir	B.E. Mech.	2	} 5 years course. Entrance qualification—50%
	B.E. Electrical	2	
Rajasthan	B.E. Civil	2	} 5 years course. Entrance qualification—60%
	B.E. Mech.	1	
	B.E. Elec.	1	
	B.E. Mining	2	
Uttar Pradesh	B.E. Mech.	1	} 4 years course <i>Not suitable</i>
	B.E. Elect.	2	
Assam	B.E. Mech.	1	} 5 years course. Entrance qualification—Class XII passed <i>Not suitable</i>
	B.E. Elec.	1	
Gujarat	B.E. Civil	6	5 years
Maharashtra	Architecture	1	Entrance qualification—First year —with Inter science drawing grade with 50% marks— <i>Not suitable</i> .
Kerala	Do.	1	4 years course— <i>Not suitable</i> .

2.15. The Committee also learnt that only 8 seats are being utilised by students from Sikkim. During Evidence the Committee enquired the reasons for allotting seats for Sikkim in Engineering Colleges, situated in far off places like Gujarat, Rajasthan, Kerala etc. The Committee also enquired how it is ensured that the seats are reserved in the institutions located near the State, having similar climatic conditions and the duration and curriculum of the courses are relevant to the level of secondary education prevalent. The Addl. Secretary, Department of Education replied:

"We try our best to do that. But in Calcutta we have to provide seats for other North-Eastern States also. Some

distribution has to be made. Kerala may be one odd case in some specific circumstances."

2.16. The Department of Education have subsequently furnished the following statement showing the actual reservations made in Regional Engineering Colleges for the States in the North Eastern Region viz., Assam, Nagaland, Meghalaya, Tripura, Manipur, Mizoram and Sikkim and the details of the actual utilisation of the seats.

Regional Engineering College at	No. of Seats reserved	Actual admission in 1976
1. Surathkal .	9	3
2. Calicut	2	2
3. Durgapur .	14	7
4. Allahabad .	2	..
5. Surat . . .	4	5
6. Jaipur	7	..
7. Bhopal	7	6
8. Nagpur .	5	4
9. Tiruchirapalli	3	2
10. Jamshedpur .	7	3
11. Rourkela .	7	6
12. Warrangal .	7	7
13. Kurukshetra	8	4
14. Srinagar	9	6

2.17. Asked whether any review to analyse the reasons for the under-utilisation of the reserved seats by the students belonging to these States has been made, the Department of Education has in a note stated that while no specific review of the under-utilisation of seats by any particular State has been made, it is the general experience that the better students of the State try to get admission to the colleges in the home State or in the States near about and only whenever they fail to do so, they take admission into a college in a far off State. This process of waiting for admission in the home State or nearby State entails delay on the part of the candidate chosen by the other colleges, who are prevented from

keeping the admission open beyond a particular date fixed by the concerned university, if the students selected do not turn up in time. This accounts for the non-utilisation of seats in some of the colleges.

2.18. The Committee note that expansion of technical education facilities in the country was generally made during the First, Second and Third Five Year Plans. By the end of 1969-70, the total number of institutions offering degree courses in engineering/technology increased to 135 from 102 in 1960-61. In 1976-77, 152 institutions having 22,499 seats offered first degree courses in engineering. Ninety-three of these institutions offer full time post-graduate courses leading to either a post-graduate diploma or post-graduate degree in engineering technology to 5216 students.

2.19. The Committee further note that there is concentration of engineering institutions in Karnataka, Maharashtra and Tamil Nadu with 20, 19 and 16 institutions respectively, while some bigger States like U.P., Bihar, Andhra Pradesh and Rajasthan have only 14, 7, 11 and 5 institutions respectively. In the matter of availability of seats also, there is concentration in Karnataka, Maharashtra and Tamil Nadu with 3198, 2764 and 2370 seats respectively while the States like Orissa, Rajasthan, Bihar, Andhra Pradesh and Uttar Pradesh have 380, 715, 1295, 1375 and 2085 seats respectively. The North Eastern States put together have only 3 institutions with 390 seats. From the State-wise seat-population ratio also it is seen that there is concentration of facilities for higher technical education in some States. For example, while for every lakh of population there are 10.94 seats for degree courses in engineering in Karnataka, 7.38 seats in Gujarat, 5.77 seats in Tamil Nadu and 5.5 seats in Maharashtra, the number of seats in other States are 1.7 seats in Orissa, 2.3 seats in Bihar, 2.36 seats in Uttar Pradesh, 2.78 seats in Rajasthan, 3.17 seats in Andhra Pradesh and 3.3 seats in Madhya Pradesh.

2.20. The Committee have been informed that as early as 1958 the All India Council for Technical Education had considered the question of having parity or equity among all the regions regarding the expansion of technical education facilities in the country. The Council observed that the development of technical education is a process, the rate of which in a particular area, is governed by a number of factors such as initiative and interest of State Governments, private enterprise, universities and other educational facilities, industrial progress, general educational standard of people and their interest in higher education, occupational interest of different

sections of community etc. According to the Council, the progress in the Southern and Western Regions in regard to technical education was in a large measure due to the keen interest evinced by private enterprises in technical education. The Council came to the conclusion that the Central Government should not supplant but should supplement local initiative and effort in equal measures for all regions, save when exceptional circumstances in a particular area called for special attention from the Centre.

2.21. The Committee note that the pattern of assistance to private institutions during the first three Five Year Plans was such that the Central assistance towards its matching share of expenditure was given direct to the institutions. The Committee find that during the first three Plans, the States of Tamil Nadu, Karnataka and Maharashtra received Central assistance for private institutions to the tune of Rs. 33.6 millions, 11.4 millions and 10.3 millions respectively, while other States got a meagre share e.g. Orissa Rs. 1.7 Millions, Bihar 2.9 millions, Rajasthan 2.5 millions and Andhra Pradesh 4.4 millions. The States in the North-Eastern region did not get any assistance.

2.22. It is well recognised that development of industries in a region or area also depends to a great extent on the technical man-power available there. Even the development and the setting up of agro-industries requires an industrial and technological base. It is therefore of utmost importance that for proper development of an area, adequately trained technical man-power is made available in that area for which requisite number of engineering colleges and institutes are necessary. In the absence of these facilities, there is bound to be a widening gap in the economic development of areas having technical man-power and those without it. The Committee consider that the existing imbalance in the availability of the engineering colleges in the various regions of the country had already adversely affected the equitable development of such areas and regions. The Committee are unable to appreciate that the Government's role is merely to supplement in equal measure local initiative and effort in the matter of setting up of technical education facilities in various regions of the country. The Committee consider that such an important matter cannot entirely be left to the initiative and interest of private enterprise, universities etc., particularly when the private technical educational colleges have largely been financed from public funds. In the opinion of the Committee, the Central Government should take positive steps to provide technical education facilities in those regions/States where they are deficient at

present so as to bring up the seat population-ratio in regions/States of the country where these are lagging, in the interest of equitable development of such regions/States.

2.23. The Committee are surprised to note that although the number of seats in the engineering institutions decreased from 25,070 in 1967-68 to 22,499 in 1970-77, the number of institutions increased from 136 in 1969-70 to 152 in 1976-77. It is all the more surprising that the increase was made in States like Maharashtra and Karnataka which already had the largest number of institutions, thus aggravating the regional imbalances, in the availability of these facilities. The Committee would like Government to go into this aspect in depth and take concerted measures to first remedy the existing imbalance in the availability of engineering education facilities in the various regions of the country.

2.24. The Committee find that in the whole of the North-Eastern region, the expansion of facilities in engineering education during all this period has been insignificant. The number of institutions increased from 2 in 1960-61 to 3 by 1976 and the number of seats from 240 to 360. It is distressing that a proposal made for the establishment of a Regional Engineering College at Silchar as early as 1962 has been processed in such a halting manner that Classes with an intake of 60 students could be started with effect from 2 November, 1977 i.e. after a lapse of 15 years. Surprisingly, the principal of the college has been in position since October 1967 to look after the work of establishment of the college.

2.25. The Committee have been informed that an increased activity for the establishment of the college was started from 1975-76 and funds to the extent of Rs. 57.17 lakhs were provided during the year 1976-77 for providing initial facilities such as workshop building, lecture halls etc. The Committee have been further informed that workshop building, administrative building, lecture, tutorial and drawing halls and staff quarters and a students hostel for 130 boys have been constructed out of the non-recurring funds released by the Central Government so far. The Committee would like construction of lecture halls, workshop, administrative buildings, acquisition of equipment, library books, recruitment of staff should be completed expeditiously so that the college starts working in full swing at the earliest.

2.26. The Committee are not satisfied merely with the plea that seats are being reserved for students from the North-Eastern States

in other engineering institutions in the country. The number of seats reserved for Arunachal Pradesh, Assam, Manipur, Meghalaya, Mizoram, Nagaland and Tripura are stated to be 147 during the year 1976-77. The Committee learnt that 24 seats have been reserved for Sikkim in the various engineering colleges in the country. The Committee however are perturbed to learn that out of 24 seats reserved for Sikkim, only 8 are being utilised by the students as the seats are reserved either in far off places like Rajasthan, Gujarat and Kerala or these are reserved in institutions having courses the duration of which does not correspond to the secondary system of education in Sikkim. Marked difference in climate could be another limiting factor.

The Committee are concerned to note that the reservations for the States in the North-Eastern Region made in the Regional Engineering Colleges have not been fully utilised as evident from the fact that only 3 out of the 9 seats reserved in Regional Engineering College, Surathkal, 7 out of 14 seats in Regional Engineering College, Durgapur, 3 out of 7 in Regional Engineering College, Jamshedpur and 4 out of 8 in Regional Engineering College, Kurukshetra have been utilised in 1976, while not a single seat out of the 7 seats in Regional Engineering College, Jaipur and 2 seats in Regional Engineering College, Allahabad has been utilised. The Committee feel that the reservation of seats in other institutions could be purposeful only if these are made available in the institutions nearer to these States and the courses are such as to be suitable to the educational background of the students. The Committee, therefore, desire that the Government should go in depth into the utilisation of seats reserved for the students from North-Eastern region in the various institutions in the country in order to remove the inhibiting factors which lead to non or under-utilisation of seats by these States. The Committee would like to be informed of the concrete measures taken in that behalf and the results achieved in the larger placement of students from these States in the North-Eastern region in the best suited engineering institutions.

B. Admissions

Admission system

2.27. At present different engineering institutions are adopting different methods for admission to the courses as given below:

Indian Institutes of Technology

Admission to the first year of five-year under-graduate B.Tech. programme in the Indian Institutes of Technology is made through the following sources:—

- (i) Joint Entrance Examination.
- (ii) Direct Admissions

Joint Entrance Examination

Joint Entrance Examination is held jointly by the Indian Institutes of Technology at various centres all over India annually. The subjects in which the students are examined are: in Group A: English, Physics, Chemistry and Mathematics; in Group B: English, Physics, Chemistry, Mathematics and Drawing. Students can either of the two Groups of subjects. Students are admitted on the basis of the merit list.

Direct Admission

Besides the admissions through the Joint Entrance Examination, a limited number of seats approximately 15 per cent of the seats are filled through direct admission amongst those who have secured ranks with at least 70 per cent marks in Chemistry, Mathematics and Physics in the qualifying examination. A few seats are also filled direct from amongst National Science Talent Search Scholars. A few seats are also filled from amongst foreign nationals and Indian nationals residing abroad and foreign students nominated through the Ministry of External Affairs.

Indian Institute of Science, Bangalore

The admission to the B.E. Degree Course in Electrical Communication Engineering; Electrical Technology; and Metallurgy at the Indian Institute of Science, Bangalore is made on the basis of a common All India Entrance Examination to be conducted at various centres. The minimum qualification prescribed for admission to the B.E. Degree Course is a First Class Bachelor's Degree in Science with Physics, Chemistry and Mathematics as optional subjects and with at least 60 per cent marks in the aggregate. For candidates belonging to Scheduled Castes and Scheduled Tribes, the minimum qualification is a Second Class Bachelor's Degree in Science with Physics, Chemistry and Mathematics as optional subject with at least 55 per cent marks in the aggregate.

Regional Engineering Colleges

Admissions to the under-graduate courses in the Regional Engineering Colleges are made into two parts. 50 per cent seats are

reserved for students of the State in which the institutions is situated and the remaining 50 per cent are reserved for applicants from other States; the seats being limited on the basis of population. Generally, a Selection Committee appointed by the Board of Governors, makes admission for the students of the two groups excepting in States like Karnataka, Tamil Nadu, Andhra Pradesh where the States quota is pooled with the seats for admission in other Engineering Colleges in the State concerned and a Common State Committee makes the admission for these seats in all the colleges. Admission to Scheduled Caste and Scheduled Tribe candidates is being made against the seats reserved for them.

Only in the State of Uttar Pradesh for the Motilal Nehru Regional Engineering College, Allahabad, an Entrance Examination is held for students from all over the country for admission to the College.

State Colleges

Admission to the State Colleges is made by the respective colleges on the basis of the marks in the qualifying examination and are generally coordinated by the Directorate of Technical Education.

Foreign Students

For admission of foreign students and reservation for admission for regions of the areas where facilities for Technical Education do not exist, a number of seats are reserved every year for foreign students coming under the various Cultural Exchange Programmes, as also on their own. For those coming under the specific Cultural Exchange Programme, admissions are made against reserved seats by the Ministry of External Affairs. For other students, who come on their own (to finance their education themselves in this country), who are recommended through the Indian Missions abroad, a number of seats are reserved and kept at the disposal of the Ministry of External Affairs for making appropriate placement for admission.

2.28. Regarding the present procedure of admission to engineering institutions, it has been represented to the Committee that a candidate has to apply to several institutions situated at various places and appear for a number of competitive examinations. It may perhaps be appropriate to conduct a common competitive examination all over the country for admission to all engineering institutions based on merit and preference indicated by the candidate.

2.29. Asked to state the feasibility of following a uniform method for admission to the courses, the representative of the Ministry of Education and Social Welfare explained during evidence:—

“Wherever it is under our control, we have already started it. The All India Council has already suggested it, but the States are finding it difficult to accept this proposition. The State Governments want to link it with admissions to their other colleges. A uniform system is thus difficult.”

2.30. The Committee desired to know the system of admission in the colleges affiliated to universities. The Secretary, University Grants Commission stated during evidence that in medicine, some States viz., Bihar, U.P. and Tamil Nadu have decided on a joint examination for all the medical colleges. The witness added that in engineering also, it would be a very good thing if at the State level they held a common examination. The Additional Secretary, of Education stated that the States were moving in that direction because they have now a common admission on the basis of marks obtained in the qualifying examination. The witness added that to some extent this idea was gaining acceptance, but the Ministry could pursue it so that the system was improved further.

Entrance Examination for Regional Engineering Colleges

2.31. The Review Committee of the Regional Engineering Colleges (1974) recommended that admissions to all the Regional Engineering Colleges should be made through an entrance examination for both the State quota of seats and the quota of seats for other States according to accepted pattern and preference indicated by candidates.

2.32. In a written reply in November, 1976, the Ministry have stated that the recommendation of the Review Committee regarding admission to all the Regional Engineering Colleges through an entrance examination for both the State quota and outside the State quota, is proposed to be placed before an Advisory Committee for its consideration with a view to evolving a uniform policy for admission to all these Colleges. In a note (November, 1977), the Department of Education have stated that the Advisory Committee has been constituted and that it held its first meeting on 26 July, 1977.

2.33. During evidence the Committee enquired the necessity for placing this matter before the Advisory Committee which is yet to be

appointed when this had already been fully considered by the Review Committee as far as back as May, 1974. The Additional Secretary of the Department of Education stated thus:—

“The main difficulty is that if the recommendations of the Review Committee are left to be considered and decided by the State Governments and the various universities involved, there may not be any uniformity at all. So, we thought it would be better if the matter is considered by the Advisory Council which is being set up for all the Regional Engineering Colleges combined. The setting up of the Council was delayed because of the decision about the financial arrangement.”

The witness added:—

“There are two ways to consider these recommendations. One is that the recommendations of the Review Committee can be remitted to the State Governments and the universities concerned and they can take their own decisions. But we cannot say that the State Governments or the Universities to which these Regional Engineering Colleges are affiliated would accept them. Therefore, we thought it would be better if they are considered by the advisory body in which these colleges will be fully involved.”

2.34. The Committee note that different methods are being followed at present by the various engineering institutions for admission to under-graduate courses. While the five IITs hold a joint entrance examination, the Regional Engineering Colleges, except the one at Allahabad, and the other engineering colleges admit the candidates on the basis of marks obtained by them in the qualifying examination. The result is that a candidate seeking admission to an engineering course has to apply to several institutions. Moreover as different standards of teaching and examination are followed in respect of the qualifying examinations, the existing system of admitting candidates on the basis of marks obtained at the qualifying examination, tends to be inequitable. In the interest of providing an equitable opportunity to the candidates and ensuring a broad uniformity in the standards, it would be ideal if a common national entrance examination for all the engineering institutes/colleges is held in advance and the candidates are admitted to the undergraduate engineering courses in the various institutions/colleges on the basis of the marks obtained by them at such examination.

2.35. The Committee note that the Review Committee on the Regional Engineering Colleges had recommended as far back as 1974, that admission to the under-graduate courses in all the Regional Engineering Colleges should be through an entrance examination for both the State quota as well as outside the State quota. The All India Council for Technical Education recommended in May, 1974 that an Advisory Committee to advise the Minister on all policy matters and lay down guidelines in respect of these colleges might be appointed. The Advisory Committee which has recently been appointed should examine the question of holding an entrance examination to all the Regional Engineering Colleges and that a time-limit should be laid down for the submission of its recommendations. The Committee consider that there should be no difficulty in holding a combined entrance examination for admission to all the Regional Engineering Colleges for both the State quota of seats and the quota of seats for other States as already a joint entrance examination for admission to IITs is being held.

Reservation of seats for Scheduled Caste and Scheduled Tribe Students

2.36. The Ministry have stated that 15 per cent of the seats in undergraduate courses has been reserved for Scheduled Caste candidates and 5 per cent of the seats for Scheduled Tribe candidates. In the Post-graduate courses 5 per cent of the seats are reserved for the students belonging to these communities. Regarding the system adopted for admission of Scheduled Caste and Scheduled Tribe candidates, the Ministry have stated the following:—

- (i) Admission to SC/ST candidates are made on the basis of their eligibility within themselves against the reserved quota irrespective of their performance in the Joint Entrance Examination (JEE).
- (ii) The SC/ST candidates are exempted from payment of registration fee. They are given return II class railway fare when called for interview for admission.
- (iii) As students belonging to these communities passing in the Joint Entrance Examination are not adequate to fill up all the seats reserved, the IITs directly admit students belonging to these communities from 1975-76 onwards who meet

the minimum qualification and medical standards on receipt of application on plain paper giving necessary details.

2.37. During evidence the Committee enquired whether the reserved seats are fully utilised by the candidates belonging to these communities. The Additional Secretary, Deptt. of Education replied that these reserved seats are not being fully utilised. He added that "there is wastage after joining also. Some candidates who were offered admission got settled somewhere else in other jobs or in other disciplines."

2.38. Explaining the measures taken to improve the position regarding the utilisation of the reserved seats, the witness stated:—

".....Apart from joint entrance examination we are offering seats direct to Scheduled Caste and Scheduled Tribe students. But more than that we are going into the difficulties etc. experienced by these candidates and for that we have started remedial courses and extra-watching in the various IITs...from this year we have started giving much wider publicity to the available seats all over the country."

2.39. In a statement furnished by Department of Education the following information has been given IIT-wise regarding the number of seats reserved for and utilised by scheduled caste/scheduled tribe candidates for the years 1971-72 to 1977-78.

	1971-72	72-73	73-74	74-75	75-76	76-77	77-78
I.I.T. Kanpur							
<i>U. Graduate</i>							
Reserved	Nil	Nil	50	50	50	50	50
Utilised	Nil	Nil	44	46	43	37	28
<i>P. Graduate</i>							
Reserved	22	17	19	18	21	21	15
Utilised	4	2	6	3	5	3	3
I.I.T. Madras							
<i>U. Graduate</i>							
Reserved	Nil	Nil	41	41	44	44	48
Utilised	1	2	35	34	34	39	43

	1971-72	72-73	73-74	74-75	75-76	76-77	77-78
<i>P. Graduate</i>							
Reserved	Nil	Nil	55	55	55	73	78
Utilised	Nil	Nil	7	12	16	3	3
<i>I.I.T. Kharagpur</i>							
<i>U. Graduate</i>							
Reserved	Nil	Nil	74	75	74	74	74
Utilised	13	8	68	81	63	71	58
<i>P. Graduate</i>							
Reserved	24	24	24	24	24	24	24
Utilised	Nil	1	6	44	4	6	9
<i>I.I.T. Delhi</i>							
<i>U. Graduate</i>							
Reserved	46	46	52	52	53	53	
Utilised	1	1	49	45	24	32	
<i>P. Graduate</i>							
Reserved	11	11	11	11	11	11	
Utilised	Nil	1	2			2	
<i>I.I.T. Bombay</i>							
<i>U. Graduate</i>							
Reserved	40	40	40	40	40	40	40
Utilised	4	2	18	31	21	25	38
<i>P. Graduate</i>							
Reserved	10	10	10	10	10	10	10
Utilised	1	3	2	1	1	2	6

2.40. Asked to state since when the reservation of seats for scheduled caste/scheduled tribe candidates has been made, the Department of Education stated that reservation by IIT Bombay was started in 1958, Delhi 1962, Kanpur in 1971 and Kharagpur and Madras in 1973.

2.41. The following steps have been taken to increase the intake of students belonging to Scheduled Caste and Scheduled Tribe (SC/ST) communities:—

1. After filling up the reserved quota for SC/ST up to a special concessional cut-off value of marks through JEE, for the remaining seats admissions should be made by inviting eligible applications directly.
2. It was also decided that advertisement should be made in all the leading newspapers in India widely so that candidates are aware of direct admissions.
3. In order that there can be a wider circulation of information, specific steps taken to issue advertisements in regional language newspapers.
4. Candidates were clearly told that they can apply on plain application forms and the essential particulars so required were given in the advertisement itself.
5. In addition to these steps, the Government have written to the Secretary Education Boards and other authorities to furnish on their own, the list of successful SC/ST candidates who are in the merit list and who are eligible for admission in the IITs with their addresses.
6. In addition, the Commissioner for SC/ST was requested to intimate all organisations looking after the welfare of SC/ST about the seats available to these candidates in IITs for direct admission.
7. The candidates who were called for interview were given railway fare both ways from their place of residence to the IIT by the IIT concerned. The above steps were repeated for admission in 1976.

2.42. Regarding the measures taken by universities, the Secretary, University Grants Commission (UGC) stated during evidence:—

“...The U.G.C. has decided that for such universities which are making admissions on all-India basis we will provide facilities to pre-train students for competitive examinations, apart from providing facilities to the universities. For extra-money involved we will provide free board and lodging to all the Scheduled Caste and Scheduled Tribe candidates who wish to take advantage of this.

This decision was taken three months ago only and it covers both engineering and medical Students."

2.43. Asked whether any systematic enquiry to find out as to why the students who were selected for admission do not join the courses, has been made, the representative of the Ministry of Education and Social Welfare stated that no systematic enquiry was made. An informal enquiry was made and it was found out that apart from the financial difficulty, most of these students being of lower standards were not able to catch up with the average-ones. They found it difficult to pursue the course. Some candidates also got jobs or selected other disciplines.

2.44. It was suggested in the memorandum to the Committee that bright Scheduled Caste and Scheduled Tribe candidates should be spotted and given facilities for special coaching during the plus (+)2 stage of higher secondary education to enable them to compete in the IIT entrance examinations along with other candidates. The experiments that have been done for special coaching for IAS, IFS and other Central Services could also be done effectively for these students. This method would eliminate the psychological barriers that now exist between the students coming in IITs through the Joint Entrance Examination and those through quota reservation. Asked about the reaction of the Government to this suggestion, the representative of the Ministry of Education and Social Welfare stated that it was a very desirable programme and that the matter was under discussion with the Ministry of Home Affairs.

2.45. The Committee are unhappy to note that there was delay in starting reservation of seats for Scheduled Caste/Scheduled Tribe candidates in the Indian Institutes of Technology. While IIT Bombay and Delhi started reserving seats from 1958 and 1962 respectively, the IIT Kanpur started reservation from 1971 for Post Graduate admissions and from 1973-74 for undergraduate admissions, IIT Kharagpur and Madras from 1973.

2.46. The Committee are also unhappy to note that the reserved seats for Scheduled Caste/Scheduled Tribe candidates in undergraduate and post-graduate courses in engineering are not fully utilised. In the case of IITs out of the 265 seats reserved in undergraduate courses in 1977, only 204 candidates have been admitted against these vacancies. The utilisation of seats in post-graduate courses is very disturbing. Out of 139 reserved seats in post-

graduate courses only 16 seats have been utilised by Scheduled Caste/Scheduled Tribe candidates. The Committee would urge the Government to take concerted measures to improve the intake of students belonging to these communities by giving wider publicity and offering concessions and incentives to attract them.

2.47. The Committee further suggest that special coaching facilities may be afforded at plus (+)2 stage in schools to promising scheduled caste and scheduled tribe students who desire to compete in the entrance examination of engineering institutions. Such a special coaching, besides improving the educational standard of these candidates, would also go a long way in reducing the psychological barrier that may exist between the students coming to IITs through the Joint Entrance Examination and those admitted directly through quota reservation.

Reservations for students from backward regions

2.48. In the Motilal Nehru Regional Engineering College, Allahabad some seats are reserved for students hailing from hill tracts and border areas besides reservations for scheduled caste and scheduled tribes. During evidence when it was enquired whether similar reservations are made in other Regional Engineering Colleges, the representative of the Ministry of Education & Social Welfare, stated that in the Regional Engineering College, Allahabad, the U.P. State Government has made reservations out of the Uttar Pradesh State quota of 100 seats for candidates from their border and hilly areas. Asked whether it is not possible to allocate seats to rural and backward areas, the witness stated that partly this is met by the reservations made for Scheduled Castes & Scheduled Tribes. Reservations for rural areas as such was not considered by Government, as rural areas may not always mean weaker sections.

2.49. The Committee note that some seats have been reserved in the Motilal Nehru Regional Engineering College, Allahabad for students hailing from hill tracts and border areas, by the State Government of U.P., out of the quota for Uttar Pradesh. They feel that such reservations help the students from these backward areas in getting admissions to these colleges as they may be comparatively at a disadvantageous position in competing with the students hailing from cities and towns. The Committee would like the Central Government to examine in consultation with the State Governments, the question of making similar reservations in other Regional Engineering Colleges for students hailing from backward regions so that these students are afforded greater opportunities for

higher technical education, which would help in the development of these areas.

Aptitude Test

2.50. Under the present system of admission the IITs hold Joint Entrance Examination on subjects such as Physics, Mathematics and Chemistry while other institutions admit students on the basis of marks obtained in the qualifying examination. A leading non-official organisation has opined that:—

“..... the securing of relatively high or higher percentage of marks in particular subjects need not necessarily prove to be a fair guide to the aptitude of the prospective candidate for the subject which he intends to undertake. A system of judging the aptitude of prospective candidates, might help to avoid losses which might occur of a fair proportion of talent and manpower in going along with the general trends in selecting the technical courses of study sheerly on the basis of the percentage of marks scored by them.”

2.51. During evidence the representatives of the Ministry of Education and Social Welfare stated that the question of introduction of aptitude test as part of the admission procedure had not been considered by the Government so far.

2.52. The Committee note that at present no aptitude tests are provided for admission to engineering colleges and institutions. The Committee feel that it may be desirable if suitable aptitude tests are introduced as part of the admission procedure to these institutions as the marks obtained by the students in the qualifying examinations or in the competitive entrance examinations may not be proof of the aptitude of the students to work with their own hands on the shop floor. The Committee would like Government to examine the feasibility of introducing suitable aptitude tests as part of the admission procedure to these institutions.

Capitation Fee

2.53. The Government of India have accepted the recommendation of the All India Council of Technical Education that no capitation fee should be charged for admission to technical institutions. The Ministry have, however, informed the Committee that four approved institutions in Karnataka State (Manipal Engineering Col-

lege in Manipal, R.V. College of Engineering, Bangalore, M.S. Ramaiya College of Engineering. (Tumkur near Bangalore Affiliated to the Universities of Mysore and Bangalore are charging capitation fee from students admitted to these institutions. A percentage of the sanctioned seats in the approved non-Government professional institutions in the State of Karnataka is kept at the disposal of the sponsors as the "Management quota".

2.54. During evidence the Committee wanted to know why some engineering institutions were allowed to charge capitation fee when Government have decided that capitation fee should not be charged for admission to engineering courses. The representative of the Ministry of Education and Social Welfare replied "although we disfavour capitation fees, some are still charging it." When asked if it was not feasible to withhold affiliation to make the institutions to discontinue this unhealthy practice, the Secretary, University Grants Commission stated "there is no power with us to disaffiliate a college. It is only with the university."

2.55. Subsequently the Ministry have stated that the following engineering institutions in Karnataka State used to charge capitation fee:—

1. Manipal Engineering College, Manipal
2. Sidhaganga Institute of Technology, Tumkur
3. Jayachamarajendra College of Engineering, Mysore,
4. PES College of Engineering, Mandya. (affiliated to Mysore University).
5. M.S. Ramaiah College of Engineering, Bangalore.
6. R.V. College of Engineering Jayanagar, Bangalore. (Both the above affiliated to the Bangalore University).
7. Basaveswara College of Engineering, Bagalkot. (Affiliated to the Karnataka University).

All these colleges were established during the years 1957 to 1963. The Institutions charged 'Capitation Fee' for admitting students, on the basis of donations given by them against the seats offered. Such donations it is said, range from Rs. 3000 to Rs. 10,000 per seat. The precise information about the exact capitation fee charged by these institutions is however, not available.

2.56. "During the successive Five Year Plans, the Central Government encouraged the establishment of engineering colleges and polytechnics by private agencies all over the country under what came to be known as 'open Door' policy. Under this policy, the establishment of technical institutions by private agencies was approved, on the recommendations by the All India Council for Technical Education, for financial assistance both by the Central and State Governments on an agreed pattern. The State Governments were also requested to draw up Grants-in-Aid Code on the basis of which the recurring expenditure at these institutions is to be shared between the State Government and the institutions concerned after the first five years of establishment/development of the institutions during which Central assistance also was available for the purpose. All the seven institutions were started without the specific approval of the All India Council and the Central Government and hence they did not receive any grants either from the Central Government or from the State Government towards their recurring and non-recurring expenditure. The institutions, therefore, collected considerable amount as capitation fee to meet their cost of investment in their Engineering Colleges."

2.57. Regarding the steps taken to curb the practice it has been stated that "the All India Council for Technical Education expressed serious concern over the establishment of these institutions and urged the State Governments and Universities concerned to rectify the situation by insisting that these institutions be brought under the Grant-in-aid Code and that they developed according to the pattern prescribed by the AICTE and stop charging capitation fee for admission. However, during those days when the demand for admission was quite high in the engineering colleges, the Central Government's instructions were not heeded and the institutions continued to function on their own outside the grant-in-aid code. The matter was taken up on a number of occasions with the State Governments and Universities concerned through the U.G.C. and finally with the assistance of the State Government of Karnataka, the following three institutions have been persuaded to accept the standards and pattern prescribed by the All India Council and work under the grants-in-aid code of the Karnataka State Government:—

1. PES College of Engineering, Mandya.
2. Basaweswara Engineering College, Bagalkot.
3. Sri Jayachamarajendra College of Engineering, Mysore.

2.58. "The other institutions have not received any assistance so far from either the Central or State Government and will not be given any assistance either till they conform to the pattern suggested by the All India Council and the Central Government. No approved college will be permitted to charge capitation fee. Every effort will be made to see that the system of capitation fee is abolished, particularly since the admission capacity at the degree level in the approved Engineering Colleges is adequate for the Fifth Plan requirements."

2.59. The Committee note that seven engineering institutions were started during 1957 to 1963 in the Karnataka State without the specific approval of the All-India Council for Technical Education and Central Government and hence did not receive any grants either from the Central Government or from the State Governments towards their recurring and non-recurring expenditure. These institutions collected considerable amounts as capitation fee for admitting students to meet their cost of running the engineering colleges. Three of these seven institutions which were charging capitation fee, have with the assistance of the State Government of Karnataka been persuaded to accept the standard pattern prescribed by the All India Council for Technical Education and come under grants-in-aid code of the State Government. The four remaining institutions viz. Manipal Engineering College, R.V. College of Engineering Bangalore, Sidhaganga Institute of Technology Tumkur and M.S. Ramaiah College of Engineering Bangalore, are still charging capitation fee from students, admitted to these institutions.

2.60. The Committee are surprised to note that all these institutions were allowed to be established without prior approval of the All-India Council for Technical Education and Government of India and have started the undesirable practice of charging of capitation fees by them. The Committee are concerned at the helplessness of the Government and the University Grants Commission in stopping the practice of charging capitation fees from students for admission to engineering courses by the four engineering institutions in Karnataka. They are not satisfied with the reply of the representative of University Grants Commission that "there is no power with us to disaffiliate a college. It is only with the University." The Committee feel that the Universities concerned should have been persuaded to follow up the matter conclusively with these colleges to give up the undesirable practice of charging capitation fees. The Committee would like to be informed of the concrete measures taken in pursuance of their recommendations

and the success achieved. The Government should also see that in future no institution is set up without the specific prior approval of the All India Council for Technical Education. If there are any legal or procedural loopholes which make it possible for an institution to get round this requirement, the Committee expect Government to take effective action to plug all these loopholes.

Higher Fees charged by Institutions

2.61. The Ministry of Education and Social Welfare have stated that the following non-Government institutions are charging higher-fee than the corresponding Government institutions in their respective States:—

	Fee in Corresponding Govt. institutions	Fee charged by the non-Govt. institution.
	(per year)	(per year)
1. Birla Vishvakarma Mahavidyalaya, Anand (Gujarat)	Rs. 270	Rs. 500
2. Birla Institute of Technology, Mesra, Ranchi (Bihar)	Rs. 120—125	Rs. 600
3. Guru Nanak Engg. College, Ludhiana (Punjab)		Rs. 360
4. Thapar Institute of Engg. and Technology, Patiala		Rs. 360

2.62. Government of India have accepted the recommendations of the All India Council for Technical Education made from time to time that the fee charged by all the institutions, whether Government or non-Government, should be uniform.

2.63. The Ministry have stated that in the following approved non-Government engineering colleges in the State of Karnataka 20 per cent of the overall sanctioned intake is placed at the disposal of the Management, Society or Trust sponsoring the particular institution. It has been stated that this practice is being allowed as the concerned Society or Trust is meeting an agreed proportion of the

non-recurring and recurring expenditure involved in the establishment/development of the institutions concerned:—

1. Malnad College of Engineering, Hassan
2. National Institute of Engineering, Mysore
3. B.V.S. College of Engineering, Hubli
4. B.M.S. College of Engineering, Bangalore
5. P.E.S. College of Engineering, Mandya.

2.64. As per the Karnataka State Grant-in-aid Code, the non-Government institutions approved by the State/Central Government are permitted to levy twice the fee obtaining in the Government colleges. The Institutions mentioned above, have, therefore, been permitted by the State Governments to levy this higher fee to enable them to meet their share of recurring expenditure in the running of the institution.

2.65. The Committee note that in five non-Government institutions in Karnataka, 20 per cent of the sanctioned seats is placed at the disposal of the Management, Society or Trust sponsoring the institution. These institutions are also permitted by the State Government to levy higher fee which is twice the fee charged in Government and running the institutions. The Committee find that there are 4 other institutions in Gujarat, Bihar and Punjab charging higher fees than that charged by the corresponding Government institutions in the State. In view of the fact that Government have accepted the recommendations of the All India Council for Technical Education that the fee charged by all institutions whether Government or non-Government institutions, should be uniform, the Committee desire that necessary steps may be taken to persuade the State Governments to ensure that these institutions charge the normal fees applicable in Government institutions.

2.66. The Committee are not quite happy over the system of reserving 20 per cent seats as management quota followed in 5 engineering institutions in Karnataka on the ground that the respective managements contribute a proportionate amount for running the engineering institutions. The Committee desire that this matter may be gone into in depth and such reservation quotas, which militate against admission on merits, done away with at the earliest.

Domicile Restrictions on admission

2.67. It was represented in a memorandum to the Committee that in some institutions only candidates belonging to a particular State

are admitted, and that this system needs review as this affects those in transferable jobs. Asked about the views of the Government on such restrictions, the Additional Secretary, Department of Education stated during evidence that "we disfavour such restrictions. Actually at a high level, the Chief Ministers are being requested to do away with such restrictions...." In reply to Starred Question No. 94 dated 16th August, 1976 the Minister of Education and Social Welfare and Culture stated:—

"There is no ban on admission of students from outside the States in the Central Universities and the Institutes of Technology...."

The All India Council for Technical Education in 1960 and again in 1963 had recommended that admission to technical institutions should not be restricted on the basis of domicile or nativity or similar factors. The National Integration Council also in 1968 had recommended that:—

'A student should not be required to produce a certificate of domicile in a State for the purpose of admission to educational institutions in the State. This should be brought into operation in all the States as early as possible. It would be within the competence of educational institutions in a State to give preference in admissions to students passing the School Board, University or College examinations of that State'.

The Central Government had urged the State Governments to accept and implement this recommendation."

2.68. The Ministry have stated in a written note that there is no ban on admission of candidates from outside States in most of the State Universities. However, some Universities have imposed certain restrictions in this regard. A statement giving the information received from the Universities and State Governments is reproduced in Appendix I.

2.69. The Ministry have stated that the institutions affiliated to a particular University situated in the jurisdiction of a particular State who assists the institutions by way of grants either departmentally (in respect of State Government institutions) or under the grants-in-

aid code of the respective State Governments (in respect of non-Government institutions) follow the rules prescribed by the State Government and the University concerned.

2.70. The Committee are distressed to note that a number of universities and engineering institutions have imposed restrictions on admission to engineering courses on the basis of domicile or nativity. According to the Department of Education the institutions affiliated to a particular university situated in the jurisdiction of a particular State who assists the institutions by way of grants either departmentally (in respect of State Government institutions) or under the grants-in-aid code of the respective State-Governments (in respect of non-Government institutions) follow the rules prescribed by the State Government and the university concerned. The All India Council for Technical Education recommended in 1960 and 1963 that admission to technical institutions should not be restricted on the basis of domicile or nativity or similar factors. In 1968 the National Integration Council also recommended that a student should not be required to produce a certificate of domicile in a State for the purpose of admission to educational institutions but it would be within the competence of educational institutions to give preference to students passing the school boards, University or College examinations of that State. The Committee emphasise that necessary steps should be taken by Government to ensure that these recommendations are implemented in letter and spirit by the universities and institutions.

2.71. The Committee also suggest that Government should examine the question of enacting a legislation to stop the practice of charging capitation fee, higher tuition fees, reservation of seats as management quota by private educational institutions and to abolish domicile restrictions for admissions placed by educational institutions for admitting students, in order to bring about uniformity in this regard.

C. Facilities

Indian Institutes of Technology

2.72. In pursuance of the recommendations made by the Sarkar Committee appointed by the All India Council for Technical Education in 1945, the Government of India established five higher technological institutes to meet the large demand of technical personnel for post-war industrial development in the country. The Indian Institutes of Technology were established at Kharagpur (1950), Bombay (1953), Madras (1959), Kanpur (1960) and Delhi (1961). The Institutes of Technology have been established with the objectives of providing facilities on an extensive scale for advanced work and research in various branches of engineering and technology and training students to specialised fields for which facilities do not exist in the country elsewhere. The Institutes are expected to improve the tone of engineering and technological education in the country as well as to meet the special needs of Industry. In order to enable these institutes to function effectively these have been established as fully autonomous institutions and were declared institutes of National Importance under the Institutes of Technology Act of 1961.

2.73. The funds required for IITs are provided in the Budget Estimates of the Union Ministry of Education and Social Welfare. The actual expenditure incurred by IITs during the Fourth Plan and during 1974-75 and 1975-76 is given below:—

(Rs. in lakhs)

	I.I.Ts.					Total
	Kharagpur	Bombay	Madras	Kanpur	Delhi	
Fourth Plan (1969-74)	285	352	459	478	355	1929
1974-75 Plan	108	93	99	100	105	505
Non Plan	195	207	207	266	163	
1975-76 Plan	160	120	125	100	115	620
Non Plan	260	273	282	319	227	

2.74. In March, 1970, Reviewing Committees were appointed by the President of India in his capacity as Visitor for each of the five Indian Institutes of Technology. In the order appointing these Committees no specific time limit for completing the review was laid down. The reports of the Reviewing Committees were submitted during the period August, 1971 to March, 1973 (i.e. IIT Madras—August, 1971, IIT Delhi—September, 1972, IIT Kharagpur 1972, IIT Delhi—January, 1973 and IIT Kanpur—March, 1973). The Reports of the Reviewing Committees were considered by their respective Boards of Governors. The matter was also considered by the Council of Indian Institutes of Technology. Based on these reports of the Reviewing Committees, orders of the Visitor were issued on 5 September, 1974. A copy of the orders of the Visitor is given at Appendix II. The orders contain directions on the following aspects:

- (i) Admission in IITs.
- (ii) Collaboration with Industry.
- (iii) Faculty Development.
- (iv) Inter-disciplinary programmes.
- (v) Training and Placement Department.
- (vi) Teacher-pupil ratio.
- (vii) Inter-action with other Institutions in the region.

2.75. The five I.I.Ts have been asked to implement the recommendation of the Reviewing Committees in accordance with the Visitor's directions within the actual financial provision made available to the Institutions out of the total financial outlay for educational development under the Fifth Five Year Plan.

2.76. Asked whether it is proposed to review the working of IITs again, the Additional Secretary stated during evidence that orders of the Visitor based on earlier Review Committee reports were passed in September, 1974 and that it was too early to conduct another review and the Ministry have not given thought to this. He added that in 1970, the Reviewing Committees were formed institute-wise. The Ministry might decide to appoint committees discipline-wise for further review.

2.77. The Committee were further informed that in connection with the Plan discussions with the Planning Commission, the Ministry have proposed to undertake a limited review of the requirements of the IITs. The Ministry have in a subsequent written reply stated that during the Plan discussion, it was decided that a review commit-

tee be appointed in consultation with the Planning Commission to examine the progress of the Plan schemes in IITs during the first 3 year of the Fifth Plan and also the future programmes during the next 2 years.

2.78. The Department of Education have in a note (November, 1977) stated that this review committee was set up in January 1977 and it submitted its report in June, 1977. The Committee recommended that the Plan allocations for IITs may be raised from Rs. 31.90 crores to Rs. 39.41 during the Fifth Five Year Plan.

2.79. The Reviewing Committees on IITs, Delhi and Madras recommended that IITs should lay emphasis on postgraduate and research programmes. The Reviewing Committee on IIT, Kanpur recommended that the strength in undergraduate and postgraduate courses should be 1:1 by the end of Fifth Plan. In the orders of the Visitor dated 5 September, 1974, it has been stated that the admission to the undergraduate courses in IITs should be restricted to the same level of in-take as obtaining at present (1974) and that admission to postgraduate and research courses should be increased.

During the academic session 1974-75, the actual admission in various engineering courses in IITs was as follows:—

I.I.T.	Under-graduate	Post-graduate	Research
Madras	255	212	40
Kharagpur.	492	239	n.a.
Kanpur	251	225	79
Delhi	294	203	n.a.
Bombay	234	147	n.a.

n.a. = not available.

2.80. During evidence the Committee enquired whether the Institutes of Technology have served the objectives for which they were set up, particularly regarding improving the tone of engineering education in the country and meeting the special needs of the industry. The Additional Secretary, Department of Education replied:—

“By and large, I would submit that the Institutes have served the purpose for which they were set up. They have provided additional—more than additional specialised faci-

lities for the higher education and research in technical fields.”

2.81. Regarding the steps taken to improve the quality of engineering education, he referred to the Quality Improvement Programme and stated that under this programme teachers engaged in teaching were given further training and education. He added:—

“Also they have taken steps in regard to curricula which have to be modified to meet the growing needs of education and industry. Further, in regard to relationship between higher education and industry, they have, by their consultancy work, provided the lead. Thus in all the objectives, they have made a very good beginning and the impact of the IITs is being increasingly felt now in the general standard and level of technical education.”

2.82. The Committee find that five IITs have been established as fully autonomous institutions and declared as Institutes of national importance. The main objective of establishing these institutions was to provide facilities on an extensive scale for advanced work, research in various branches of engineering and technology, and training students in specialised fields for which facilities did not exist elsewhere in the country. The Institutes are expected to improve the tone of engineering and technological education in the country as well as to meet the special needs of the industry.

2.83. The working of the five Institutes has been reviewed by five different Reviewing Committees, appointed in March, 1970 by the President in his capacity as the Visitor. No time limit was prescribed for submitting the reports by the Reviewing Committees. The Reviewing Committees submitted their reports between August 1971 and March 1973. Based on these reports orders of the Visitor were issued on 5 September, 1974 laying down specific directions for implementing the recommendations of the Reviewing Committee, within the actual financial provision made available to the Institutes, out of the total financial outlay provided in the Fifth Five Year Plan. The Committee are distressed to note that there was inordinate delay in submission of the reports by the Reviewing Committees particularly by the Reviewing Committees on IIT, Kanpur, and IIT, Delhi. There was further delay in processing and taking action on the reports submitted on the five IITs. The Committee are unable to appreciate why such a long time has been taken by the Reviewing Committees in submitting their Reports and by the Ministry in processing them. It is normally expected that time limits are laid down for the submission

and processing of such reports. It is unfortunate that this was not done.

.. 2.84. In view of the fact that these institutes have special responsibility to improve the tone of engineering and technological education in the country as well as to meet the special needs of the industry, the Committee hope that the directions of the Visitor which are of far reaching nature, will be implemented by the Institutes. The Ministry should also monitor the progress of implementation of these directions by each Institute. The Committee trust that the Institutes will also take necessary action on the other recommendations made by the Reviewing Committees in respect of individual IITs.

2.85. Having regard to the fact that these Institutions are of national importance and are expected to play a leading role in setting a high standard of education and in meeting the technological requirements of development, the Committee feel that it is but appropriate that the activities of the Institutes are reviewed by a Committee of experts drawn from the fields of education, industry, applied research etc. The Review Committee may be asked to go specifically into areas where deficiencies are known to exist as also in disciplines and research programmes which are of special relevance to the developmental requirements of the country. The Review Committee may be asked to report within a specified time and it should be obligatory for the Ministry to process the matter with expedition and obtain and issue Visitor's directions thereon.

2.86. The Committee suggest that such a review should be undertaken and completed well before the Plan period so that its findings may provide a firm basis for planning for the next plan period.

2.87. Needless to say that conclusive and timely action should be taken to rectify all deficiencies which are brought to notice and to see that the high standard which has earned these Institutions a name for excellence both within and outside the country, is not only sustained but continuously improved upon.

2.88. The Committee note that the Ministry set up a Review Committee in consultation with the Planning Commission to examine the progress of the Plan schemes during the first three years of the Fifth Plan and the projected schemes for the remaining two years of the plan. The Committee has recommended that the Fifth Plan allocations for IITs may be increased from Rs. 31.90 crores to

Rs. 39.41 crores. The Committee desire that additional funds required for the IITs may be made available so that the Plan Schemes of IITs do not suffer due to shortage of funds.

2.89. The Review Committees on IITs have recommended that IITs should concentrate on post-graduate and research programmes. In the Visitor's orders of September 1974 also it has been emphasised that admission to Post-graduate and Research Programmes should be increased. From the admission figures, the Committee, however, note that there is larger intake of students in undergraduate courses as compared to Post-graduate courses in all IITs.

2.90. The Committee would like this aspect to be specially examined by the Government so that a proper balance is maintained between the under-graduate and post-graduate courses in the best overall interests of meeting the technological requirements of development.

Regional Engineering Colleges

2.91. The Engineering Personnel Committee (1955) in their report estimated that by 1960-61 there would be shortage of engineering personnel. For fulfilling the recommendations of the Engineering Personnel Committee, a scheme was formulated for expansion of some of the existing engineering colleges and setting up new engineering colleges. After further examination of the needs of technical personnel for future Five Year Plans, the Regional Engineering Colleges were set up as follows:—

	Year
1. Warangal .	1959
2. Surathkal .	1960
3. Nagpur ¹ .	1960
4. Bhopal	1960
5. Durgapur .	1960
6. Jamshedpur	1960
7. Srinagar .	1960
8. Allahabad	1961
9. Surat	1961

	Year
10. Kozhikode	1961
11. Rourkela	1962
12. Jaipur	1963
13. Kurukshetra	1963
14. Tiruchirapalli	1964
15. Siichar	started in November 1977

2.92. The objectives of the establishment of the Regional Engineering Colleges were (i) to create institutional facilities for providing undergraduate education and training in different branches of engineering with a view to supplying engineering manpower for the industrial projects and development envisaged during the Third and subsequent Plan periods and (ii) generally as pace-setters for the other State Colleges.

2.93. According to the scheme of establishment of the Regional Engineering Colleges, the pattern of assistance for the undergraduate course is:—

- (1) The entire non-recurring expenditure (excluding land) shall be borne by the Central Government.
- (2) The recurring expenditure is to be shared on 50 : 50 basis by the Central Government with the State Government concerned for a period of five years from the date of establishment of each college. (However, the Government have decided that this pattern of sharing recurring expenditure would be continued to be followed till the Fifth Plan period.)

2.94. A Review Committee headed by Dr. Jai Krishna, Vice-Chancellor of Roorkee University, was set up in January, 1972 to review the working of the Regional Engineering Colleges and it presented its Report in February, 1974. The Review Committee recommended that a Statutory Council of the Regional Engineering Colleges may be set up under an Act of Parliament.

2.95. The All India Council for Technical Education, felt in May 1974, that it might not be desirable to establish a Council with statutory powers for the management of the Regional Engineering Colleges. The Council however, recommended that an Advisory Committee for all these colleges to advise the Union Minister of Education on all policy matters and lay down guidelines in respect of these colleges, may be constituted.

2.96. In a note (November 1977) the Department of Education have stated that the Advisory Committee has been constituted and that the Advisory Committee held its first meeting on 26 July 1977. The Composition of this Committee is given in Appendix III.

2.97. During evidence the Committee pointed out that even though the Review Committee presented its report in 1974, the important issues like constituting the Advisory Committee on Regional Engineering Colleges, reconstituting the Board of Governors of the Regional Engineering Colleges etc. were still under correspondence. Explaining the reasons for the delay, the Additional Secretary in the Department of Education stated:—

“The whole question of the set up of the Regional Engineering Colleges came up for consideration. The composition of the board of governors has also been changed. The idea was first the board of governors would be changed and then the advisory committee should come into existence because that would have been a more logical consequence. Above all a basic question had to be considered. Upto the end of the Fourth Plan the Central Government was sharing in the recurring expenditure of these colleges. Unless a decision was taken on the Central Government's continuous liability in this regard, this exercise had to be suspended. Once a decision had been taken we could proceed to take up other matters. Now the decision is: the Central Government will continue to share the recurring expenditure with the States upto the end of the Fifth Plan. Thereafter the position will be reviewed again.”

2.98. On the basis of the recommendations of the Review Committee and in consultation with the Governments, a revised composition of the Board of Governors was suggested by the Government of India to all the Regional Engineering Colleges. All the Regional Engineering Colleges except the college at Srinagar have agreed to constitute the Board of Governors according to the revised composition suggested by the Government.

2.99. The details of the original composition of the Board of Governors of the Regional Engineering Colleges (Prior to the appointment of the Review Committee, 1972) and the revised composition of the Board of Governors are given at Appendix IV.

2.100. Explaining the position regarding reconstitution of the Board of Governors, the Department of Education in a note furnished in October 1977, have stated that two position in the constitution provide for nomination of two industrialists/technologists (non-official representatives) in the region to be nominated by the Central Government in consultation with the State Government. Nominations against this constituency for all the Colleges have been made except for Colleges at Jamshedpur, Kurukshetra and Silchar. These nominations will be made as soon as proposals are received from the concerned State Governments. The Central Government representatives and AICTE nominee per constitution of the Board have also been made in the above Colleges. For other constituencies, the above colleges have taken up the matter with the concerned agencies and almost these nominations are complete.

2.101. Asked about the reasons for delay on the part of the Regional Engineering College at Srinagar in agreeing to the revised composition of the Board of Governors particularly when 50 per cent of the expenditure is borne by Central Government, the Additional Secretary during evidence stated that the State Government had some reservations and the matter was under discussion with the Ministry of Home Affairs. In a written reply furnished in October, 1977, the Department of Education have stated that the question of reconstitution of the Board of Governors of Regional Engineering College Srinagar was discussed with the State Government authorities and that the matter was at present under active consideration of the State Government of Jammu and Kashmir.

2.102. The Review Committee on Regional Engineering Colleges in their report finalised in February, 1974 recommended that a Council with statutory powers be set up for management of Regional Engineering Colleges. After consideration of their recommendation, the All India Council for Technical Education suggested in 1974 that an Advisory Committee be constituted. The Committee were given to understand that the constitution of the Advisory Committee was deferred till the reconstitution of the Board of Governors of Regional Engineering Colleges and the final decision on the Central Government's liability to share the recurring expenditure of these colleges.

2.103. The Committee note that a decision to continue the liability of the Central Government to share the recurring expenditure upto the end of the Fifth Plan has been taken. The Advisory Committee on Regional Engineering Colleges has been constituted and

the Committee has held its first meeting in July, 1977. As regards the reconstitution of Board of Governors, all Regional Engineering Colleges excepting the one at Srinagar have agreed to reconstitute the Board of Governors according to the revised composition suggested by Government. But the actual reconstitution of the Board of Governors of the Regional Engineering Colleges is not yet fully complete.

2.104. The Committee were informed that the State Government of Jammu and Kashmir have some reservations about the reconstitution of Board of Governors of the Regional Engineering College, Srinagar, and that the matter was stated to be under active consideration with the State Government. The Committee desire that effort may continue to persuade the State Government to adopt the revised pattern and accordingly reconstitute the Board of Governors.

2.105. The Committee feel unhappy at the dilatory manner in which important recommendations having a bearing on the management of the Regional Engineering Colleges and of taking advice from Central Advisory Committee to improve their functioning has been handled. The Committee stress that Government should see that Boards of Management are duly constituted for all the Regional Engineering Colleges and that the Central Advisory Committee should function effectively to provide advice and guidance in the urgent matter of improving of the facilities in the Regional Engineering Colleges.

Facilities in Engineering Institutions

2.106. Regarding the facilities available in engineering institutions, a leading educationist in a memorandum submitted to the Committee divided the existing institutions into four categories thus:—

“.....in our country, the IISc at Bangalore, which is nearly 70 years old, and the five IITs are considered to be institutions of national importance. The second tier consists of the fourteen Regional Engineering Colleges and the third tier is represented by the Engineering Colleges numbering about 120, distributed all over the country. The fourth tier consists of the polytechnics. There are very sharp distinctions in the inputs, the quality of the faculty, infrastructure, equipment, laboratory facilities and so on amongst these four-tier system, which is somewhat reminiscent of the caste system.”

2.107. In another memorandum a leading Public Sector undertaking has stated thus:—

“Present facilities for higher technical education and research in the various institutions like IITs, Regional Engineering Colleges, seem to be adequate but some of the private institutions suffer from inadequacy as a result of which standards of technical education differ widely. It is necessary that All India Council for Technical Education looks into harmonising the pattern of instructions of all institutions alike so that definite norms of standards can be established.”

2.108. During their visit to Orissa the Committee learnt that the facilities in Regional Engineering Colleges, Rourkela were not adequate. They also learnt that the college required equipment worth Rs. 10 lakhs for development and consolidation of the existing courses.

2.109. In the course of evidence before the Committee an eminent educationist stated:—

“.....These six institutes (5 IITs and Indian Institutes of Science, Bangalore) have been set up as centres of excellence. They must not remain in isolation, saying that they are pursuing highly scientific and technological programmes. They have a role to help those who are less privileged. A fundamental task should be assigned to these 6 Institutes in their respective areas, to tone up the quality of technical education in that region.”

2.110. In a memorandum to the Committee it has been suggested that the following forms of collaborative links between IITs and other institutions should be established:—

- (i) Exchange of academic staff between IIT and other institutions.
- (ii) Visits by lecturers from other institutions to IIT during vacation.
- (iii) Special training by IIT to the teachers of the other institutions for doing research.
- (iv) Undertaking of joint research projects (by IIT and other institutions).

- (v) Availing of library and computer facilities in IIT by other institutions.
- (vi) Representation on the Departmental Research Committees and academic boards of the institutions by the other institutions.
- (vii) Jointly inviting specialists to give lectures in areas of mutual interest.

2.111. Regarding the difference in the facilities available in the institutions, the Ministry have stated that the objectives of setting up of Higher Technological Institutes and Regional Engineering Colleges vary from those of other colleges in that the Higher Technological Institutes were set up by the Central Government primarily for research and post-graduate education in engineering and technology. Because of the difference in objectives, the inputs, quality of faculty etc. also vary. The Higher Technological Institutes were set up as a sequel to the report of the Sarkar Committee submitted to the All India Council for Technical Education during May, 1946. That Committee recommended provision of facilities in selected centres for higher technical education with adequate facilities for research in advanced branches of engineering and technology. These Institutes being residential institutes have to provide municipal services, for which additional funds are required. The intake capacity in these institutions is also being regulated to gradually attain a ratio of 1.1 as between undergraduate and post-graduate courses. In view of this specific emphasis on postgraduate and research work at these institutions, the inputs have to be higher.

2.112. The Regional Engineering Colleges were set up as a sequel to the Engineering Manpower Committee's recommendations to the All India Council for Technical Education. These institutions are meant to be pace-setters for other technical institutions in the State/region offering special industrial-oriented courses with a general all-India complexion, both with regard to the students and faculty. In Regional Engineering Colleges also there is emphasis on post-graduate studies and further, these Colleges being residential, have to provide municipal services. The inputs, therefore, vary with regard to the Indian Institutes of Technology and Regional Engineering Colleges as compared to other Colleges.

2.113. During evidence the Committee were informed that another Committee headed by Dr. Jai Krishna to look into the developmental needs of the Regional Engineering Colleges was set up and that this Committee had given its report in March, 1976.

2.114. The important recommendations of this Committee are given below:

- (a) Each College may be provided a grant of Rs. 5 lakhs for the modification and replacement of obsolete equipment.
- (b) The Regional Engineering Colleges at Warangal, Surathkal, Tiruchirappalli, Allahabad, Nagpur and Durgapur should be provided immediately with small computers (TDC-12) and the other colleges later.
- (c) The original library provision of Rs. 3 lakhs per college, should be increased to Rs. 5 lakhs.
- (d) Visiting Committees may be appointed to examine proposals for development at undergraduate level.

2.115. Regarding the action taken on the recommendations of this Committee, the Ministry have stated that due to drastic cut in the Fifth Plan allocation for the development of Regional Engineering Colleges from Rs. 10.50 crores to Rs. 5.793 crores, it has not been possible to provide any new developmental facilities in these colleges. Accordingly, it has been decided to defer the implementation of the recommendations made by the Development Committee in its report to the Sixth Plan period. The available Fifth Plan allocation of Rs. 5.793 crores is not enough even to meet the committed liabilities for these colleges as envisaged in the scheme of development of these colleges.

2.116. The Ministry have further stated that it has not been possible to provide equipment to all the Regional Engineering Colleges as per standard of syllabus laid down by the affiliate Universities for these institutions. Ten colleges which are approved for post-graduate programme also, have been provided equipment at the rate of Rs. 1.5 lakhs only for each post-graduate programme. This ceiling for provision of equipment for post-graduate programme was not considered adequate. It has been clarified that equipment available in the laboratories and workshops of the colleges are fully utilised for undergraduate|postgraduate programme and there is no idle capacity available.

Utilisation of equipment available

2.117. It was stated in a memorandum to the Committee that though some of the Institutions are doing appreciable work, still, by

and large, the utilisation of equipment for research and development is rather limited. Asked whether any study regarding utilisation of equipment available in engineering institutions, particularly in IITs has been made, the Additional Secretary, Department of Education stated during evidence that "no formal study has been made but we do hope that with the setting up of consultancy centres, there would be additional utilisation of idle capacity."

2.118. The Ministry in a written note have stated that there is very little or no idle capacity in the laboratories and workshops of the IITs and Regional Engineering Colleges.

Visiting Committees

2.119. At their meeting in May, 1976, the All India Council of Technical Education decided that a Visiting Committee for each state should be appointed to make an overall assessment for development and consolidation of engineering colleges in each State and to evaluate the academic standards of both under-graduate and post-graduate courses. During evidence, the Additional Secretary, Department of Education informed that these Visiting Committees have to be broad based as these have to look into various types of proposals and also to make an overall assessment of the facilities available in a State.

2.120. In a note the Ministry have stated that eleven Visiting Committees are being set up to cover the following areas:—

1. Maharashtra & Goa
2. Gujarat
3. Madhya Pradesh
4. Andhra Pradesh
5. Tamil Nadu
6. Karnataka
7. Kerala
8. Punjab, Haryana, Chandigarh & Rajasthan

9. Uttar Pradesh and Delhi

10. West Bengal, Assam, Manipur, Nagaland and North-Eastern States.

The visiting Committees would consist of:

1. Three members on behalf of the All India Council for Technical Education of which one would be from Industry;
2. Two nominees of the University Grants Commission;
3. One representative of the State Government concerned; and
4. The Regional Officer of the Ministry of Education and Social Welfare.

2.121. The terms of reference of the Visiting Committees are as under:—

- (i) To make an overall assessment for development and consolidation of all engineering colleges and University Departments of Engineering and Technology.
- (ii) To evaluate the academic standards of both undergraduate and post-graduate courses and make suitable recommendations for further improvement and development of these institutions|University Departments.
- (iii) To locate one Centre, in each State or a Group of States which is easily accessible to other institutions and where costly and sophisticated equipments can be provided as a common facility.

2.122. Asked where the Visting Committees have actually been set up, the Department of Education in a note in June, 1977 stated that "the nominations have been made by the Chairman, All India Council for Technical Education and the acceptance of the nominees has been obtained. Nominations of the members of the University Grants Commission in each of these Committees as also nominations in respect of the representatives of some of the State Government are yet to be received. However, a proforma asking for information which gives a background for the Visiting Committee to work upon has been devised and sent to all the institutions with the request that this information should be furnished urgently. By the time returns are available from the institutions, it is hoped that the nominations of the UGC and the State Governments also could have been completed; the Visting Committees will start their working."

2.123. The Committee are concerned to note that the Regional Engineering Colleges which are designed to serve as pace-setters for other technical institutions in the States/Regions are not adequately equipped. According to the Ministry, it has not been possible to provide equipment to all the Regional Engineering Colleges as per standard of syllabus laid down by the affiliate Universities for these institutions. The ten colleges which are approved for postgraduate programme also, have been provided equipment at the rate of Rs. 1.5 lakhs only for each postgraduate programme. Even this ceiling for provision of equipment for postgraduate programme was not considered adequate.

2.124. Due to a drastic cut in the allocation for the development of Regional Engineering Colleges during the Fifth Plan from Rs. 10.50 crores to Rs. 5.793 crores, it has not been possible to provide new development facilities such as computer facilities, development of libraries, consolidation of equipment etc. as recommended by Development Committee headed by Dr. Jai Krishna. It has been decided to defer this programme to the Sixth Plan. In view of the importance of the development of the Regional Engineering Colleges which have to play the role of pace-setters for other colleges in the States, the Committee feel that the Government should take necessary steps to equip these colleges adequately and provide funds for this purpose.

2.125. The Committee have been informed that the equipment available in the laboratories and workshops of IITs is being utilised and that there is very little or no idle capacity. The Committee desire that an in-depth study may be undertaken to assess the extent of utilisation of the costly and sophisticated equipment available in the IITs with a view to taking necessary measures for their fuller utilisation.

2.126. The Committee note that the All India Council for Technical Education at its meeting in May, 1976 decided that Visiting Committee for each State should be appointed to make, inter alia an assessment for development and consolidation of engineering colleges. It is however, surprising that the Department of Education are still in the process of setting up these Visiting Committees. The Committee feel that the tasks assigned to these Visiting Committees are very important and that steps in this direction were overdue. The Committee are particularly anxious that the Visiting Committee should identify the centres where adequate facilities exist and ensure that these centres are notified to other institutions and made available for their use. The Committee hope that the Visiting Com-

mittees will complete this work as early as possible so that their findings are available at the time of formulation of the programmes for the Sixth Plan.

2.127. Since the IITs have got excellent facilities in terms of equipment, facilities etc., the Committee emphasise that they should act as leaders in engineering education and develop co-laborative linkages with other institutions and identify the areas in which the IITs could help these institutions in upgrading the standard of education. Steps like exchange of academic staff between the IITs and other institutions, and affording laboratory and library facilities to other institutions etc. would go a long way in improving the quality of engineering education provided by other institutions. The Committee desire that this matter should be seriously considered and the areas in which IITs and Regional Engineering Colleges can help other institutions, identified and concrete measures taken in pursuance thereof.

Cost per student

2.128. The Institute of Applied Manpower Research has made a study on cost per student in some 49 selected engineering colleges for the years 1968-69 and 1971-72. The cost per student in IITs, Roorkee University, Jadavpur University, Regional Engineering Colleges and other colleges as per the study is given below:—

Figures in Rupees

	1968-69		1971-72	
	Under-Graduate	Post-Graduate	Under-Graduate	Post-Graduate
I.I.Ts.	5511	10368	6794	10643
Roorkee University	3543	8587	5670	11306
Jadavpur University	2097	5704	3816	6136
Regional Engineering Colleges	2460		3496	
Other Colleges	3290	7395	4772	9832

2.129. It has been stated by the Ministry that the following factors have contributed to high cost per student in IITs as compared to other institutions.

1. Teacher-student ratio is high in IITs than in other colleges.
2. Pay scales in IITs are higher as compared to other colleges.
3. All students and faculty members, and 50 per cent of the supporting staff are required to stay on the campus.
4. A number of services normally provided by the Municipality are to be provided by the Institutes at their own cost.
5. A large number of University functions are to be provided by the Institutes at their own cost.
6. The Institutes are conceived of and planned as Centres of Learning with emphasis on Post-graduate education and Research.

2.130. Asked about the reasons for high cost in Roorkee University, the Secretary, University Grants Commission stated that the pattern of expenditure differs from institution to institution due to varying number of teachers, teacher-student ratio, scales of pay etc. While working out per capita figures, only the teachers' pay, the expenditure on laboratories and expenditure on other contingencies directly related to the academic sphere has been taken into account.

2.131. The Department of Education has in a subsequent note stated that "the different institutions have different items of expenditure, apart from their common normal faculty and supporting staff expenditure. For example the IITs and the Regional Engineering Colleges being residential institutes have to provide for municipal services for which additional funds are required. Intake capacity in the institutions also varies so also the ratio between post-graduate and under-graduate students. In normal engineering colleges the number of undergraduate students is much larger and hence the per capita student expenditure also is lower. Many of the items of the expenditure in the Government controlled institutions (State Government Colleges) do not also reflect the expenditure incurred on municipal services, maintenance of buildings hostels and staff quarters etc. since these are within the purview of the Public Works Departments of the respective State Governments. The quality of faculty, the number, as also the pay scales vary from one type of institution to another. In view of these differences the per capita student cost as collected also varies."

2. 132. Asked whether it would be possible to collect the figures by adopting a uniform basis for all the institutions, the Department of Education have stated that the Institute of Manpower Research who had earlier calculated these per capita student cost figures have been requested to make an effort to have a uniform basis of calculation to project the differences in expenditure in different types of institutions after taking into consideration the different norms.

2.133. The Committee note that the cost per undergraduate engineering student during 1971-72 ranged from Rs. 3496 in Regional Engineering Colleges to Rs. 6794 in IITs. Similarly, the cost per post-graduate engineering student varied from Rs. 6136 in Jadavpur University to Rs. 11306 in Roorkee University during the same period.

2.134. The following reasons have been adduced for the differences in the cost per student among the various institutions:

- (i) Intake capacity in the institutions varies so also the ratio between undergraduate and postgraduate students. In normal colleges the number of students in under-graduate course is much larger and hence the per capita student expenditure is lower.
- (ii) The quality of Faculty, the number as also the pay scales vary from one type of institution to another.
- (iii) The IITs and Regional Engineering Colleges being residential institutions have to incur expenditure on municipal services.
- (iv) Expenditure incurred by the Government controlled colleges does not reflect the expenditure incurred on municipal services, maintenance of buildings, hostels; staff quarters etc. as these are within the purview of the public Works Departments.

2.135. The Committee note that the Institute of Applied Manpower Research has been requested to prepare cost per student by adopting a uniform basis of calculation to project the difference in expenditure in different types of institutions after taking into consideration the different norms.

2.136. The Committee suggest that the study should be comprehensive covering all IITs, Regional Engineering Colleges and other selected institutions.

2.137. In the light of the study being made by the Institute of Applied Manpower Research, Government may critically analyse the reasons for wide variation in the per capita cost of engineering education in the various institutions with a view to effecting rationalisation. They may also evolve norms of educational facilities including equipment per student for various categories of engineering institutions so as to initiate measures to raise the standard to the optimum level.

D. Students Amenities

2.138. The Review Committee on IIT, Bombay (1972) in its report stated that "although the hostel accommodation for the students has been provided, a number of amenities are still lacking. These involve only a small outlay of funds and should be provided without delay."

2.139. "In addition, it is very necessary to have a student community centre to get the best out of a residential campus. It is only then that it will be possible for the students to come together as groups, for various types of activities in which they are interested and which have a creative element. They also can form a composite faculty and student group and come together in a much more meaningful way. The funds required for this Centre, therefore, should be made available."

2.140. Asked about the factual position, the Additional Secretary, Department of Education stated:

".....by and large adequate attention is being given to this aspect and even in our Plan provision we have provided money for students amenities to each IIT."

2.141. In a subsequent written reply the Ministry have stated that all the IITs have facilities for students recreation activities such as in-door and out-door games, other sports physical training, music club, dramatics club etc. depending upon the initiative of the elected representatives of the general body of students, different social and cultural activities are organised at the IITs. During the present Plan period the following amount has been provided for each of the IITs for these facilities:—

I.I.T. Bombay	Rs. 35 lakhs
I.I.T. Madras	Rs. 22 lakhs
I.I.T. Kanpur	Rs. 20 lakhs
I.I.T. Kharagpur	Rs. 13 lakhs
I.I.T. Delhi	Rs. 10 lakhs
Total	<hr/> Rs. 100 lakhs <hr/>

2.142. The Committee note that the Review Committee on Indian Institute of Technology, Bombay (1972) observed that a number of students amenities were lacking in the students hostel, and pointed out the need for a student community centre. The Committee were assured that by and large adequate attention was given to students amenities and that funds to the extent of Re. 1 crore have been provided for the purpose in the Fifth Plan period. They, however, find that there were large scale variations in the allotment of funds to the different Indian Institutions of Technology for providing students amenities. While Indian Institute of Technology, Bombay has been given Rs. 35 lakhs during the current Plan period, the Indian Institute of Technology, Delhi has been allotted only Rs. 10 lakhs. They would like the Ministry to lay down norms for provision of such amenities depending upon student-population the status of present amenities, so that there is equitable allotment of funds among the Indian Institutes of Technology.

Career Counselling Bureau

2.143. It was suggested in a memorandum to the Committee that Career Counselling Bureau should be established in engineering institutions to help the young students in deciding the future course of his career, choice of specialisation and giving ideas on openings in industry and entrepreneurship. During evidence, the Committee enquired whether such counselling Bureaus have been established in engineering institutions, particularly in IITs and Regional Engineering Colleges. The Additional Secretary, Department of Education replied:—

“The IITs have these units of Career Counselling and Guidance Bureau. Most of the Regional Engineering Colleges have also set up such units. The only difference is that in some of the Colleges, the chief man is on a part-time basis, that is, a particular Professor is assigned this task to help this unit in addition to his own duties. The A.I.C.T.E. has recommended these units be set up and this recommendation has been passed on to the Colleges. All the colleges do not yet have these cells. In a matter like this, no particular guidelines could be indicated because it depends on local conditions and circumstances. These units are in touch with local developments and they provide guidance to students. No review has so far been made of the work done by these units.”

2.144. The Committee stress that technical institutions in India should not merely limit themselves to imparting of formal educa-

tion, but should also help the students in identifying their particular aptitudes, encourage and motivate them to develop these aptitudes, provide opportunities for education and training, help them in getting suitable employment where their knowledge and skills may make the best contribution to industrial and economic development. The Committee understand that IITs and some Regional Engineering Colleges have established Career Counselling and Guidance Bureaus. In some institutions, these units are under the charge of a full time faculty member, while in some others, these are attended to part-time by a faculty member. The Committee sugggst that a review of the working of these bureaus may be conducted to effect improvement and streamline their functioning in the interest of rendering better service to the students. The Committee desire that such units may be established in those institutions where they do not exist at present taking care to see that the set up of the Bureaus is right from inception on the lines which would best serve the interests of the students.

E. Wastages in Technical Education

2.145. During evidence the Committee desired to know the position regarding wastages in higher technical education. The Additional Secretary, Department of education replied:—

“.....We have made a quick survey on the basis of available material and it is heartening to note that the percentage of wastage has gone down during the last 4-5 years. For instance, in Jammu & Kashmir in the earlier years the wastage was 30 per cent, it has now come down to 3.8 per cent almost no wastage. Similarly in Rajasthan it has come down from 20 to 15 per cent; in Assam from 30 to 16 per cent; in Orissa there has been no appreciable improvement.....For Tripura it has come down from 30 to 20 per cent; in West Bengal, it has come down from 20 to 10 per cent; in Andhra Pradesh for the 1965-66 batch the wastage was 35 per cent; it rose to 47 per cent in 1966-67 but it has now come down during the last two years to 31 and 13 per cent. In Karnataka from 20.24 per cent it has come down in 1973-74 to 14 per cent and during the last two years there is no wastage at all or it is negligible.”

2.146. Regarding the All-India average wastage in technical education, he stated that earlier it was between 30-40 per cent but now it has come down to 15—20 per cent. Asked how this All India figure

of 20 per cent wastage in undergraduate courses in technical education compared with the wastages in other disciplines, the Secretary, University Grants Commission stated that at the undergraduate level in technical education the wastage is much less. The wastage in science subjects is 30 to 40 per cent.

2.147. Asked about the reasons for the wastage in undergraduate courses in technical education, the Additional Secretary in the Department of Education stated:—

“According to a survey made by the Indian Institute of Manpower and Applied Research a few years ago some findings based on the replies given by students were arrived at: lack of institutional facilities like accommodation and equipment, quality of teachers, student’s aptitude, financial condition, overloaded curriculum in some subjects which the students find it difficult to follow in the period of time allowed etc. Those were the main points derived from the replies given by the students.”

2.148. Asked about the measures taken to reduce the wastages, the witness stated that Government were concentrating on the provision of additional funds for equipment, more hostel accommodation, more scholarships for students belonging to weaker sections and Quality Improvement Programme, better scales to teachers etc.

2.149. The Department of Education subsequently furnished the following statement indicating the state-wise actual admissions in undergraduate courses in 1971/1972, the out-turn in 1976 and percentage of wastage.

Name of the State/U.T.	Admissions		Out turn in 1976 No. of Students	Percentage of Wastage %
	Year	No. of students		
1	2	3	4	5
<i>Northern Region</i>				
1. Chandigarh	1972	377	305	19.8
2. Delhi	1971	538	468	13.1
3. Haryana	1971	315	244	22.6
4. Jammu & Kashmir	1971	65	75*	N.A.

1	2	3	4	5
5. Punjab	1972	367	215	41.5
6. Rajasthan	1971	406	518*	N.A.
7. Uttar Pradesh	1972	2156	1724	20.2
<i>Eastern Region</i>				
8. Assam	1971	233	110	52.8
9. Bihar	1972	966	895	7.4
10. Orissa	1971	334	252	24.6
11. Tripura	1971	15	5	66.7
12. West Bengal	1971	1430	1299	9.2
<i>Western Region</i>				
13. Goa	1972	41	45*	N.A.
14. Gujarat	1971	1895	1394	26.5
15. Madhya Pradesh	1971	1124	820	26.3
16. Maharashtra	1972	2625	2285	13.0
<i>Southern Region</i>				
17. Andhra Pradesh	1971	1145	1223*	N.A.
18. Karnataka	1971	1843	1405	23.8
19. Kerala	1972	955	529	44.7
20. Tamil Nadu	1971	2295	1699	26.0
Total		19215	15519	19.3

NOTE : In case of institutions conducting 4-Year courses admission figures for the year 1972 have been taken. In case of institutions conducting 3-year courses the 1971 figures have been taken into consideration in working out the percentage of wastage.

*out-turn figures include repeaters.

2-150. The Department of Education have also furnished the following information regarding admission in IITs in post-graduate courses in 1974 & 1975 and out-turn in 1976 and 1977.

Name of I.I.T.	Admissions		out-turn	
	1974	1975	1976	1977
I.I.T. Kharagpur	424	429	297	325
I.I.T. Bombay	305	373	264	241
I.I.T. Kanpur	302	351	182	268
I.I.T. Madras	290	264	216	177
I.I.T. Delhi	288	280	149	169

2.151. The Committee are distressed to note that there have been considerable wastages in technical education in the past. They however understand that the All India average wastage of 30—40 per cent has now been brought down to 15—20 per cent, but in some States like Tripura, Assam, Kerala and Punjab the wastage rate is as high as 66.7 per cent, 52.8 per cent, 44.1 per cent and 41.5 per cent; The Committee consider that the present wastage rate is still high and should be further brought down and special attention should be paid to the institutions/States where the wastage rate is higher than the national average.

2.152. The Committee note that as a result of a survey made by the Institute of Applied Manpower Research a few years ago, the factors leading to wastages have been identified. These include lack of institutional facility like accommodation and equipment quality of teachers, students' aptitude, financial conditions; overloaded curriculum in some subjects etc. The Committee would like Government to examine critically the various reasons for these wastages in consultation with the Universities and engineering institutions and take effective remedial measures. The Ministry should keep a constant watch over the progress made in this regard.

Special arrangement for Scheduled Caste and Scheduled Tribe Students

2.153. Regarding the steps taken by Indian Institutes of Technology to improve the performance of the Scheduled Caste and Scheduled Tribe students, it has been stated by the Deptt. of Education in a note that the Indian Institutes of Technology take different steps to provide special coaching to the weaker sections of students particularly Scheduled Caste and Scheduled Tribe (SC/ST) students. Special classes are held for SC/ST students twice a week in the evening and subjects are taught in regional language also. The standard of these courses was of lower level in subjects such as Chemistry, English, Mathematics and Physics. This was continued during second semester also so that SC/ST students do not suffer by being clubbed with other students. Classes were relatively small mostly 15 as against 30 in a normal class. This enabled individual attention to SC/ST students by the teachers. In some cases, post-graduate students were also put on this job to teach special courses. There is also arrangement to give reduced load to weaker students. As against 5 courses, the load is reduced to 4 or 3 in order to help them improve their performance index and they are allowed to carry forward the load the next year.

2.154. The Department of Education have further stated that a thorough review of performance of each student is made at the end of each year. Those whose performance shows promise, are put on regular stream; others are given due credit but asked to continue in the special programme for some more time. By this process most of the SC/ST students join the main stream in 2 to 4 semesters.

IITs take care of every candidate admitted to them particularly those belonging to SC/ST students and weaker sections of the society by having a free tutorial system by which a group of students is kept under the charge of a teacher in the day-to-day activities. Each IIT has arrangement to provide text books to SC/ST students on loan on term basis. The Senate Under-graduate Committee, Academic Performance Evaluation Committee etc. continually watch the performance of the students and make report to the Senate for the final decisions.

2.155. In their 21st Report, the Committee on Scheduled Castes and Scheduled Tribes (5th Lok Sabha) recommended that each Indian Institute of Technology should set up a separate cell to deal with all matters relating to admission of Scheduled Castes and Scheduled Tribes as also representation of Scheduled Castes and Scheduled Tribes in the services of the Institute. The Ministry of Education and Social Welfare should also consider the setting up of a separate cell under their Liaison Officer for dealing with coordination and implementation of decisions pertaining to Scheduled Castes and Scheduled Tribes in so far as the Institutes are concerned.

2.156. Asked about the action taken on this recommendation, the additional Secretary, Department of Education stated during evidence:

“Each IIT has set up a cell to look after the interests of SC/ST students. One of its officers of faculty members is named liaison officer for the purpose. The IITs have taken special measures to bring up the standard of SC/ST students to the level of others. They are in the nature of slow programmes, special classes and individual attention to their problems.....It is noticed that in spite of coaching and other concessions, the progress of these candidates depended upon their initial performance in the JEE. Another experiment being tried is that candidates belonging to SC/ST are taken with two-third of the marks obtained by the general candidates. During the last two years, the experience is that this method has improved the performance

of these candidates. The main point I wanted to emphasise was that there are special arrangements in IITs to look into the problems of SC/ST students and that depending upon their peculiar problems, remedial action and other measures are being taken. The Commissioner of SC/STs is also kept fully informed."

2.157. The Committee desired to be informed about the percentage of wastage of scheduled caste and scheduled tribe student, in IITs. The Deptt. of Education furnished the following statement indicating the wastage of Scheduled Caste and Scheduled Tribe Students in IITs.

IITs	Admission in 69-70		Out turn in 1974-75		Percentage of wastage		Remarks
	other than SC/ST	SC/ST	other than SC/ST	SC/ST	other than SC/ST	SC/ST	
IIT Kharagpur	390	7	294	3	26%	57%	*
IIT Bombay	282	7	256	2	9%	71%	@
IIT Madras	251	4	247	4	1.8%	Nil	
IIT Kanpur	281	2	230	2	18%	Nil	
IIT Delhi	215	Nil	154	Nil	28.37%	—	

@Wastage include :
not joined 1
left 2
and trans-
ferred to IIT
Madras 1

*Wastage include :
Discontinued 1
left 2
and expired 1

2.158. Asked whether any special coaching is given to improve their performance in viva-voce tests when these candidates attend interview for employment, the representatives of the Ministry of Education and Social Welfare stated that on the basis of a study made long ago, Government have reduced the importance of viva-voce tests in scheme of examinations as well as for recruitment. Also the institutions are having language laboratories and whenever/somebody is found lacking in expression skill, they are given special attention in these laboratories for improving their expression skill.

2.159. The Committee note that special cells have been established in Indian Institutes of Technology to look after the interests of the Scheduled Caste and Scheduled Tribe students. IITs have also taken special measures to bring up the standard of the Scheduled Caste and Scheduled Tribe candidates. The Committee desire that the working of the special cells and the impact of the special coaching programme on the performance of SC/ST students should be kept under constant watch with a view to effecting improvements. The Committee need hardly point out that the efficacy of the special coaching programmes would be judged by the reduction in the wastage of Scheduled Caste and Scheduled Tribe students.

2.160. The Committee recommend that based on the experience gained from the working of the special cells in IITs and other arrangements made for raising the standard of Scheduled Caste/Scheduled Tribe students, necessary steps should be taken to provide similar facilities in Regional Engineering Colleges, and other engineering colleges.

2.161. The Committee understand that the engineering institutions have language laboratories where special attention is given for improving the expression skills of students. The Committee recommend that Scheduled Caste and Scheduled Tribe students should be given special training for improving their performance in viva-voce for employment purposes so that they are able to face the interviews with confidence.

F. Developmental Activities

2.162. The Task Force and Steering Group on Education (1973) observed in their report that the technical education system as a whole comprises the technical institutions with their teams of highly qualified engineers and scientists on the faculty and modern facilities for experimentation, development, design and testing in the field of science and technology. The immense potentialities of this system could be gainfully utilised for solving the practical

problems of the society. It is also generally held that the benefits of science and technology have not yet reached the rural areas. In this connection the Committee asked for a note indicating the programmes taken up by the institutions for rural development. The Ministry have stated in a note that the following institutions have taken up certain steps in this regard.

Indian Institute of Technology, Madras

2.163. A rural development centre was started on 14th March, 1976 in IIT Madras. About 300, students are involved as a part of NSS Schemes. Under this scheme the IIT has adopted Narayanapuram village on the Velachery-Tambaram road for concentrated work continuously for a period of three to five years. IIT Madras is setting up a centre for Rural Development with its focus on appropriate education and technological inputs to generate the maximum number of jobs in and around the village of Narayanpuram. A rural technological complex is to be set up, consisting of several industrial units which are agro-based and of small and village type. A comprehensive plan for the rural technological complex is being drawn up and one of the leading banks has agreed to finance the scheme.

Indian Institute of Technology, Kharagpur

2.164. An agro-socio-economic survey of a village in West Bengal was made to study resources availability and its interaction with new technology of production and processing. With this background, the Rice Process Engineering Centre is participating in the IIT-JNU collaborative research project on Integrated Rural Area Development with the object of developing village based processing industry for all agricultural products and increasing the farmer's income thereby:

Indian Institute of Technology, Kanpur

2.165. The Institute took up 5 projects out of which three have been completed. The completed works are:—

- (i) Production of cement from rice husk. The machinery for this is already being made by Saran Engineering Works. This project is now working in Banda district of U.P.
- (ii) Science Education Film for villages under SITE programmes.

- (iii) Low cost housing for villages round Kanpur where the Institute perfected a pre-fabricated school building which has already been constructed.

There are two projects in progress. One is a general programme for use of agricultural waste to make particle gold, straw gold, rice bran oil and paper from bagasse. The second project in progress is concerned with solar devices for villages and solar pumps and dryer.

Indian Institute of Technology, Bombay

2.166. IIT, Bombay in their Resources Engineering Centre has identified the Chandrapore district in the state of Maharashtra for intensive development of resources. The relevant area photos have been obtained for study and interpretation. Investigations will be done to obtain information regarding soil, rock formations, geomorphic and ground attenuation characteristic mineral and water resources. A study in agricultural resources, including forestry will be one of the major fields of investigation. Data processing, storage and computer applications in the field will be taken up.

Indian Institute of Technology, Delhi

2.167. The NSS Unit of the IIT Delhi has adopted a village named Gwalpahari for their activity on rural development.

The village is mainly dependent upon agriculture and the most serious problem was the undulated terrain, so they have taken up project of land-levelling. Now some fields have already been levelled and the work is in progress in other fields. The impact of this has been to create greater confidence amongst the farmers about their bonafides with the result that many more farmers are coming forward to seek their help and guidance in getting their lands levelled.

Next project was that of soil testing. Samples of soil were collected and got tested at the Indian Agricultural Research Institute, Pusa.

Their next projects are of getting some villages stimulated to take to dairy farming and poultry farming. They have got a batch of their students trained at National Dairy Research Institute, Karnal who are busy enlisting the willing youths of village for training in poultry farming. Arrangements for their training are being

made in collaboration with the Block Development Officer. Efforts are also being made with the Delhi Milk Scheme for starting Milk Collection Centre.

Indian Institute of Science, Bangalore

2.168. It formally created on August 20, 1974 a Cell for the Application of Science and Technology to Rural Areas, in response to the increasing concern over the strong bias shown by major educational, scientific and technological institutions towards urban problems and relative neglect of rural problems. This Cell named ASTRA, is intended:

- to catalyse the development/testing of village-oriented technologies on the Institute campus;
- to establish an Extension Centre amidst a cluster of villages near Bangalore; and
- to accomplish and monitor the transfer of the developed/ tested technologies to rural areas through the Extension Centre and through established rural development agencies.

ASTRA has stimulated the interest of faculty and students in rural problems by holding seminars and discussion meetings on a wide variety of subjects such as bullock carts, bicycles, rural schools solar energy, bio-gas plants, rural housing; hand-pumps for drinking water wells, monsoon prediction and agricultural planning, fuel and fertilizer, and small-scale manufacture of cement and paper. These seminars have attracted unprecedented interest on the campus as a result of which work on about 10 projects has been initiated since August, 1974. This work involving about 25 faculty members is at present focussed on windmills, hand pumps, bullock carts, bicycles, rural housing; low-cost teaching materials; bio-gas plants, small-scale lime pozelana cement plants, sodium silicate from rice husk, and fluidyne engines and humphery pumps.

A number of ASTRA problems have been offered as M.E. projects.

The response from the Institute faculty has exceeded expectations, and the cooperation on ASTRA projects which extends beyond departmental frontiers, has made ASTRA into a genuine interdisciplinary activity which may prove of considerable significance to the institute. A number of official and non-official organisations in the country have come forth with encouragement and in some cases, help and offers of support.

Regional Engineering College, Warangal

2.169. The students constructed a bus terminus. The Kazipat Jagir village has been adopted and it has taken up repairing work of primary school of the village. Survey for water bound macadam road from the village to the main road has also been taken up.

A camp was also conducted at a predominantly Harijan and Girijan rehabilitation village and completed the following works:—

- (i) Construction of cattle sheds.
- (ii) Removal of silts and deepening all the wells in the fields.
- (iii) Levelling of fields and contour bunding to make the fields suitable for cultivation.
- (iv) Completion of half-finished Community Hall and green-gardens.

Regional Engineering College, Calicut

2.170. The College has taken up the following schemes for rural development:—

- (i) Conducted detailed survey and layout for one lakh housing scheme for most villages in Calicut district.
- (ii) Designed, constructed and supervised 50 houses.
- (iii) Surveyed the inaccessible mountains for a possible dam site for power generation.

Regional Engineering College, Allahabad

2.171. The Allahabad College has established a Rural Industries Development Centre with the activities as follows:—

- (i) Setting up rural industrial estates—two such estates are being set up with the collaboration of State Industries Department. All help on technical and management side will be provided by the College. The administration of these estates, will be under the charge of the college.
- (ii) Providing training to enterprising rural youth for setting up industries as well as other specialised practical training in technical trades. Successful training programmes have been organised in the last three years.

2.172. During evidence, the Committee wanted to know whether any assessment of the impact of these activities taken up by the

institutions has been made. The Additional Secretary of the Department of Education stated that these activities were taken up recently and that no independent assessment of these activities has been

Techno-economic surveys

2.173. During evidence the Committee pointed out that engineering institutions have expertise in a number of fields having a bearing on the economic development like agriculture, manufacture, construction, irrigation, etc. and asked whether any role has been assigned to the IITs and Regional Engineering Colleges in undertaking techno-economic surveys. The Additional Secretary Department of Education replied:—

“.....no formal role has been assigned to the IITs or engineering colleges in respect of plans or techno-economic surveys. During the last few years, there is an increasing realisation on the part of Government as well as these institutions themselves that they must come forward and take a hand in this type of work.....”

Regarding the scope of such surveys, he stated:—

“...Perhaps an IIT may not be equipped to undertake a techno-economic survey as it is generally understood. It requires expertise in certain fields which may not be available there. There can, however, be a very wide area where an IIT can do the preparatory work in formulating a project or a scheme.”

2.174. The Task Force and the Steering Group on Education (1973) suggested that technical institutions should not represent merely an educational complex but must contribute effectively in certain well defined areas, like (i) research into practical engineering problems, (ii) design and development of technological processes and equipment, (iii) preparation of feasibility studies and project reports, (iv) technical service to engineering enterprises for the improvement and upgrading of technology, (v) quality control of products and processes, (vi) formulation of detailed projects for the development of the social infra-structure in rural areas as or town planning, (vii) communications, (viii) water supply, drainage, and sewage disposal, (ix) processing locally produced or available materials, (x) rural electrification, etc. This new approach demands a change in the attitude and values of our technical institutions.

2.175. The Task Force recommended that all technical institutions should undertake some of these activities as an integral part of their educational programmes. The need to promote this type of extension service is underscored by two important factors. First, we must establish a social relevance for our engineering education system. Second, the new strategy visualised in the Fifth Five Year Plan of providing the minimum standards of living to the majority of our people and technological self-reliance cannot be fulfilled without effective participation of technical institutions.

2.176. Asked about the measures taken by the institutions to actively involve themselves in these developmental activities, the Additional Secretary, Department of Education stated during evidence thus:—

“As far as our Ministry is concerned, we take the view that the fundamental and basic purpose of these institutions is education. Other activities are a support to the educational programme.....All these schemes which are mentioned will provide support to educational programmes in the practical side. Therefore, these are being undertaken. The second point is all our institutions have not reached that stage of development where they could undertake such a programme. In this regard undertaking of such programme by institutions will depend on the quality of the institution and the stage of development..”

2.177. Subsequently, the Department of Education furnished a copy of the note of Planning Commission which states:

“The Task Forces and Steering Group on Education were constituted by the Planning Commission to advise it on the formulation of the Fifth Plan for educational development. The recommendations made and the views expressed in the reports of the Task Forces/Steering Group are, however, not necessarily the views of the Commission. In formulating the Fifth Five Year Plan, the feasibility of these recommendations and views will be examined in the context of the overall social and economic situation.”

2.178. The Department of Education have further stated in a note that in view of the Planning Commission's note, the Department have no specific comments to offer on the recommendations of the Steering Group as such.

2.179. Indian economy, like that of most of the other developing nations, is predominantly based on agriculture. More than seventy per cent of the population live in rural areas. It is, therefore, important that science and technology must not only be utilised for building the industrial infra-structure, but also help solving the day-to-day problems of the country-side by improving the age-old implements used by agriculturists, craftsmen, artisans for increasing their productivity and efficiency. The rural transportation system also needs improvement. The Committee stress that the engineering institutions with their teams of highly qualified engineers and scientists should involve themselves in this task of development of rural areas.

2.180. The Committee are happy that some of institutions like IIT Madras have established Rural Development Centres and have taken up some steps in the cause of rural development.

2.181. The Committee also note that Indian Institute of Science, Bangalore has set up a Cell for the Application of Science & Technology to Rural Areas with the objectives of (i) development/testing of village oriented technologies, and (ii) establishing Extension Centres to accomplish and monitor the transfer of the developed technologies to rural areas. The Cell has also held seminars on subjects such as bullock-carts, bicycles, solar energy, rural housing, hand pumps etc. The Committee suggest that the important areas in which the engineering institutions could undertake rural development schemes should be identified and the various institutions encouraged to take up such schemes depending upon their place of location, facilities available etc.

2.182. The Committee also feel that the efforts should as far as possible be directed towards achieving integrated development of rural areas. Particular attention should be paid to (i) the development of technologies suited to rural areas so as to utilise the rural manpower, (ii) setting up rural industrial estates, (iii) development of low cost houses, (iv) training enterprising rural youths for setting up industries as well as other specialised practical training in technical trades to local artisans, craftsmen etc. The Committee also suggest that the progress of these schemes should be properly monitored and the results exchanged amongst the institutions so that improvements could be made in the light of experience gained.

2.183. The Committee feel that the immense potentialities of the engineering institutions, particularly Indian Institutes of Technology could be utilised for undertaking techno-economic surveys and

planning work. The Committee would like Government to assess the potentialities of Indian Institutes of Technology in this regard so that suitable roles in the preparation of preliminary surveys, project reports etc. could be assigned to them to meet the development needs of the surrounding areas. Although there has been increasing realisation on the part of the Indian Institutes of Technology that they should take in hand this type of work, no formal role has been assigned to them. The Committee note that Indian Institute of Technology, Kharagpur undertook an agro-socio-economic survey of a village in West Bengal to study the resources availability and its inter-action with new technology of production and processing. The Committee would like that the results achieved by the Kharagpur institute as a result of their survey should be studied and if found useful, commended to other institutes and engineering colleges for adoption. The Task Force and Steering Group on Education had as early as 1973 urged that technical institutions should not represent merely an educational complex but must contribute effectively in certain well-defined areas of common interest and solving important problems which the country face. The Task Force recommended that technical institutions should undertake these activities as an integral part of their educational programmes. The Committee appreciate that undertaking such programmes will depend on the quality of the institutions and their stage of development. The Committee urge Government to examine this question seriously and define the roles of the various institutions in this task depending on their stage of development, and the economic condition of the areas surrounding them. A beginning in this behalf may well be made with the Indian Institutes of Technology and Regional Engineering Colleges.

2.184. The Committee stress that in a developing country like India the technical institutions must keep foremost in mind their rôle not only as centres of imparting formal education but also of extending a helping hand in devising and implementing schemes of social relevance which would upgrade the economic and technological skills of the people.

CHAPTER III

CURRICULUM

A. Courses

Diversification of Courses:

3.1. According to the Annual Report of the Ministry of Education & Social Welfare (Department of Education) for the year 1975-76, one of the main programmes in technical education taken up for implementation was diversification of courses. In a written reply furnished to the Committee, the Ministry have stated that the rapid development of technology requires people equipped with special knowledge of particular area in the various disciplines. To meet the situation the various agencies of the All India Council for Technical Education (Board of Studies and the Regional Committees) have from time to time been assessing the need for diversified courses and whenever the needs in particular areas were felt, action was taken to introduce these courses. Some of the diversified courses introduced are:—

1. Refrigeration & Air-conditioning.
2. Production Engineering
3. Industrial Engineering
4. Industrial Electronics
5. Automobile Engineering
6. Instrument Technology.
7. Industrial Structures
8. Town & Country Planning.
9. Marine Structures
10. Design of High Pressure Boiler Plant.
11. Welding Technology
12. Power Systems.
13. Heat Power Engineering.
14. Building Technology.
15. Bio-Medical Engineering.

3.2. It has been suggested in a memorandum to the Committee that Degree Courses in the following fields should be started:—

- (1) Printing Technology
- (2) Paper Making Technology
- (3) Aviation Engineering
- (4) Energy Systems
- (5) Plant Design
- (6) Technology of Steel making
- (7) Urban Development Engineering.

3.3. The Department of Education were asked whether the facilities for their courses were available in the engineering institutions. In a written reply the Ministry have stated that courses as such on the following subjects are not available, but courses on the related fields are available:—

Courses for which facilities as such are not available	Related fields in which facilities are available
(a) Aviation Engineering . . . . .	. . . . . Aeronautical Engineering
(b) Energy Systems . . . . .	. . . . . Electrical Engineering (Power System)
(c) Plant Design . . . . .	. . . . . Chemical Plant Design
(d) Technology of Steel making . . . . .	. . . . . Metallurgical Engineering
(e) Urban Development Engineering . . . . .	. . . . . Architecture and Town and Country Planning.

3.4. During evidence, the Additional Secretary, Department of Education stated that "the related courses cover this ground and by and large there is no need for starting courses in these disciplines separately."

3.5. The Ministry have also stated in written reply that facilities for the following courses are not available at degree/post-graduate level. However, sufficient facilities are available for these courses at diploma level in the country:

- (a) Printing Technology Post-Matric Diploma
- (b) Paper Making Technology (1) Post-B.Sc. Diploma
(2) Post-Matric Certificate.

3.6. During the course of evidence the Committee enquired about the reasons for not starting courses at degree level in printing technology. The Additional Secretary, Deptt. of Education stated:—

“...A survey was made in 1968-69 and the result of the survey showed that need was for technicians more than that of engineers. I am told that, the world over, except for U.K. no university elsewhere has got this course. The Northern Regional Council of the All India Council has undertaken survey to find out as to whether the course should be started or not and the result is awaited. The Western Region has also conducted a survey and the conclusion arrived at was that the Diploma Course is adequate but that there should be some augmentation of the special arrangements at the post-Diploma level ...these have not been started because of lack of funds

3.7. In a subsequent note (October, 1977) the Department of Education stated that a Survey of the employment position in printing industry in India and also the need for advanced level courses in printing technology conducted by an expert committee of the Northern Regional Committee of the All India Council for Technical Education. The expert Committee recommended that there was need to have degree courses in Printing Technology with an engineering and science bias. The Northern Regional Committee approved the recommendations of the expert Committee in May 1977 and decided that the same might be sent to the All India Council for Technical Education for getting the curriculum/syllabus framed by the All India Board of Undergraduate Studies in Engineering and Technology.

3.8. The All India Board of Undergraduate Studies in Engineering and Technology considered these recommendations at its meeting held on 21st September, 1977, and felt that even though greater advances in printing had taken place during the last two decades, these advances and developments were not in the field of printing technology per se but in the related fields such as mechanical and Electrical Engineering, Electronics, Printing Materials and Management etc. It was because of this situation that in spite of development of sophisticated printing machinery all over the world the trend was not towards the provision of degree or postgraduate course in printing technology but upgrading the necessary instructional and printing facilities in the related fields. The Board considered that at this stage it was not necessary to have a degree course in printing technology in the country. Managerial personnel and the technicians

in the printing industry should be adequately trained to be able to handle the problems that arise in industry. The Board was further of the view that this purpose could be well served by arranging sandwich type courses at the technician level and at the post-graduate level, in different areas of felt needs such as printing machinery, maintenance operation of electronic-printing machinery, printing materials, printing management etc. in cooperation with industry in the existing schools of Printing Technology.

Courses on Industrial Management/Industrial Engineering

3.9. The Ministry have informed the Committee in a written reply that in IIT, Madras, post-graduate courses are available in Industrial Engineering and Industrial Management. These courses are made up of lectures based subjects, followed by full time thesis work. The duration of the courses vary from 2 to 3 years (the variation being the consequence of the thesis content). The Industrial Management course was started in 1972 and so far 5 candidates have been awarded the M. S. degree in Industrial Management. The Industrial Engineering course was started only in 1974 and nobody has yet got the award of the degree. The Institute's experience is said to be satisfactory. So far no review of these courses has been made. Such courses are not available in other IITs.

3.10. The Committee understand that one of the important programmes in technical education taken up during the Fifth Plan was diversification of courses, and that the All India Council for Technical Education has from time to time been assessing the need for diversified courses and whenever there was need in a particular area, new courses were introduced. The Committee, however, note that in certain important branches of engineering like Aviation Engineering, Energy System, Plant Design, Steel Technology, Urban Development Engineering, no separate courses are available but facilities are available in related fields. The Committee would like a critical survey to be undertaken of the requirements of the industry in the various specialised fields in consultation with industries concerned with a view to modifying the existing courses/introducing separate courses, wherever necessary.

3.11. The Committee note that in some other specialised branches, such as Printing Technology, facilities at degree/post-graduate level have not been introduced on the plea that the survey made in 1968-69 showed that there was need for technicians in printing technology and not for engineers. The survey made in the Western Region re-

vealed that diploma courses were adequate, but there should be some special courses at the post-diploma level which have not been introduced due to shortage of funds.

3.12. The Committee however note that a survey recently made by an expert committee of the Northern Regional Committee of All India Council for Technical Education in this regard revealed that there was need for starting a degree course in Printing Technology with an engineering and science bias. The Northern Regional Committee approved the recommendation of this expert committee. The All India Board of Under-graduate Studies in Engineering and Technology considered this recommendation and felt that even though greater advances had taken place in printing during the last 2 decades, these developments were not in the field of printing technology per se but in the related fields such as mechanical and electrical engineering, electronics, printing material, etc. It was because of this situation that inspite of development of sophisticated printing machinery all over the world, the trend was not towards the provision of degree or postgraduate course in printing technology but upgrading the necessary instructional and printing facilities in the related fields. The Board considered that at this stage it was not necessary to start a degree course in printing technology and that this purpose could be well served by arranging sandwich type course at the technician level and at the postgraduate level in different areas of felt needs such as printing machinery, printing materials etc.

3.13. The Committee suggest that similar surveys may be undertaken in Eastern and Southern Regions expeditiously. They would like to point out that large printing units have already come up in the country and the demand for technologists in this field is bound to increase. The Committee desire that as recommended by the All India Board of Undergraduate Studies in Engineering and Technology sandwich type courses at technician and postgraduate level in different areas of felt needs such as printing machinery, printing material, etc. should be started at the earliest.

3.14. The Committee note that Indian Institute of Technology, Madras has introduced Industrial Management & Industrial Engineering courses at postgraduate level and the experience of the Institute regarding these courses has been satisfactory. The Committee suggest that in view of the growing importance of these two courses in the context of industrial development, the desirability of introducing similar courses in other IITs and Regional Engineering Colleges be explored.

Curriculum Development

3.15. The Ministry have stated in a note that the curriculum in technical institutions takes into account the fast changing pace of science and technology. The improvement of standards of institutions in the institutions very much depended on the curriculum prescribed for the courses. The continuous review of the curriculum of the courses in the institutions is, therefore, necessary and for this purpose, as one of the schemes of improvement of standards, curriculum development centres with 100 per cent assistance from the Central Government have been set up in the five IITs and University of Roorkee.

3.16. The six Curriculum Development Centres deal with the following disciplines:—

1. I.I.T., Madras	.	.	.	Mechanical engineering and Chemical engineering.
2. I.I.T., Delhi	.	.	.	Electrical engineering.
3. I.I.T., Bombay	.	.	.	Civil and mechanical engineering.
4. I.I.T., Kharagpur	.	.	.	Electrical Engineering.
5. I.I.T., Kanpur	.	.	.	Core curriculum.
6. University of Roorkee	.	.	.	Civil Engineering.

3.17. The Curriculum Development Centres consist of expert groups in the discipline, both academic and the field/industry. These centres work in close liaison with the institutions, the industry and other employing agencies so that the needs of the developing economy are fully reflected in the subject topics to be included for study in the courses to be offered in the various disciplines. The experts from the industry and senior academicians from the institutions in the respective fields, discuss the latest technological developments and the proposed needs for changing the curriculum in the various fields and these along with the necessary observations of the Centres concerned are forwarded for trial and comments to the various institutions. When the feedback is received back by the Curriculum Development Centres about the syllabus so prepared, along with the support material for the use of students and the Faculty also in the concerned field, steps are taken to incorporate after due consideration/changes in the curriculum. Thereafter the revised curriculum is communicated to the various academic bodies incharge of introducing these courses such as State Boards of Technical Edu-

cation in the case of Polytechnics and the Universities in the case of engineering colleges. The Curriculum Development Centres also suggest appropriate teaching material to help in the implementation of these revised curricula in the institutions.

3.18. The Ministry have further stated that "since the curricula developed in these Centres in the various disciplines from the basic material for the curriculum in the various institutions/universities, it is hoped that desirable level of uniformity in standards is reached throughout the country". Asked about the scope of work of these centres, the Additional Secretary, Department of Education stated during evidence that these Centres were set up in 1973 and that their functions include the development of laboratories, preparation of laboratory guides, instructional material etc.

3.19. In the Report of the Steering Group on Education (1973) it has been observed that "the present curricula are entirely technology-oriented and theoretically structured so much so that a graduate while being thorough, in the engineering sciences, is unable to appreciate, and be familiar with the actual elements and sequences of that process in industrial organisation".

Drawing attention to this observation the Committee asked about the remedial action taken by Government. The Additional Secretary, Department of Education stated during evidence:—

"Government have taken note of this deficiency in the present arrangement. That is why in the current plan the emphasis is on a continuous review of curricula. We have set up Centres where revised and new curricula are being developed in collaboration, where necessary, with industry....

"...We have developed a model curriculum which has been sent to all the State Governments and the Technical institutions."

3.20. Asked to state the details of the curriculum revised by these Centres since they were set up, the Department of Education have in a note stated that the curriculum in chemical engineering was first framed in July, 1972. Consequent upon introduction of 10+2 system of education this syllabus needed revision. The IIT, Madras has revised the syllabus only recently. This will be circulated to all degree level institutions conducting courses in chemical engineering. The IIT, Kanpur and Roorkee University have also revised syllabus once after 1970. Other centres are also doing useful

work in this direction. The instructional material etc. prepared by these Curriculum Development Centres have been circulated to technical institutions for utilisation. The Curriculum Development Centres offer detailed guidelines to the various agencies/institutions regarding updating/upgrading the Curriculum. But the institutions are affiliated to different Universities and hence those bodies after appropriate study, adopt these guidelines.

The Department of Education have in a note (October 1977) stated that the Curriculum Development Cell in IIT Delhi is preparing Instructor Manual for Basic Electrical Engineering Laboratory. The Curriculum Development Cell in IIT, Bombay has formed various groups for the preparation of instructional material including text books and the development of laboratory equipment. The Curriculum Development Cell in IITs, Kharagpur has published a laboratory manual on Basic Electronics.

Study Group on Curriculum Development Process

3.21. As already stated, elsewhere in this report, in pursuance of the recommendation of the All India Council for Technical Education made at their meeting held in April, 1972, a Joint Committee of the University Grants Commission and All India Council for Technical Education was set up in October, 1973 to review the whole system of engineering education at the first degree level. One of the Study Groups of the Joint Committee has been entrusted with, the study of "curriculum Development process" (Methodologies in developing Curricula, introduction of flexibility to meet changing circumstances etc.) The Study by the Joint Committee according to the Ministry would be completed by 1980.

Duration of under-graduate courses

3.22. The All India Council for Technical Education at its meeting held on 21 May, 1976 recommended that there should be a uniform pattern of four-years first degree engineering course followed by all engineering colleges and institutions, and that the entry to these courses should be after 12 years of schooling. However, due to the fact that during the transitional period, from 1976-77 to 1980-81, when both the 11 year higher secondary and the 12 year Higher Secondary Course would be in existence and at the initial stages, laboratory facilities in science might not have been fully developed in the schools which have switched over to the 10+2 system, the Council recommended that the engineering colleges/institutions which have at present 5-year programme should continue this programme also up to 1980-81.

3.23. These institutes might make admissions to the 5-years degree course from both the systems in accordance with the existing procedures. After the admissions were made, the students who had come from 10+2 systems of schooling shall be given exemption from the first year course on the basis of the test conducted in the individual institutions.

3.24. Curriculum Formulation in other countries

(i) In Federal Republic of Germany

Formulation of curriculum is the responsibility of the faculty. The faculty reviews the curriculum as and when necessary and in consultation with the industry.

(ii) In United Kingdom

The formulation of the curriculum in Engineering degree in the United Kingdom is based on the experience and judgement of the degree course organisers and their advisers. Appropriate standards are maintained by the use of senior academics from other universities as External Examiners.

(iii) Curricula Formulation in U.S.S.R.:

In a paper on the USSR higher technical establishments curriculum for technical engineering specialities presented at the UNESCO Seminar held in Delhi in April, 1976 the following salient features of curriculum formulation in USSR have been mentioned:

“The form of a curriculum adopted throughout the U.S.S.R. comprises a schedule and a plan of study. The schedule establish time limits for carrying out the various kinds of studies, these being theoretical training, examinations, educational and production practice, diploma project and vacations. The schedule is normally a unified one for technical engineering specialities and it embraces the whole period of study at an institution.”

“The curricula for all specialities are worked out and approved by the Ministry of Higher and Secondary Special Education on a centralized basis. The Curricula are subdivided into standard and individual. The standard curricula are supposed to be used compulsorily in all higher educational institutions which have no right to work according to the individual curricula. The individual curricula are worked out for specific higher educational establishments. The standard curricula aim at training specialists in accordance with the general requirements they are supposed to meet for this or that speciality.”

"Individual curricula apart from general requirements, reflect the specific character of the scientific scale and the experience in training accumulated by the given higher educational institution. They may differ from the standard curricula in the time-table and also in the plan of training process. The higher educational institutions working according to individual curricula usually develop new methods of teaching test their effectiveness and conduct other activities aimed at improving the system and methods of specialist training."

3.25. In another paper on "Strengthening the Links between the Higher Education and the Industry in Training Engineers in U.S.S.R." presented at the same Seminar it has been stated:

"The views and considerations of the industry's representatives play an important role in the formation of the so-called "model of a specialist" which is necessary to elaborate before each revision of curricula in order to ensure that an engineer, trained at an establishment of higher learning meet in the best possible way the demands which will be placed on him by his work in the industry at every stage of its development.

"The representatives of industry sit as plenipotentiary members in the Councils of the establishments of higher learning and exert their direct influence on the formation of the main element and stages of training.

"The curricula drawn up on the basis of the "models of specialists" in every speciality are submitted to the industrial organisations for consideration which make detailed conclusions and recommendations.

"No curriculum has a chance of approval by the USSR Ministry of Higher and Specialised Secondary Education unless it is first approved by the industry."

3.26. According to the same paper, in U.S.S.R., the curricula for undergraduate engineering courses provide 450—510 hours for study of mathematics and 272 hours for study of physics so that students have adequate background in these important subjects.

3.27. Asked to state the total hours of study spent on mathematics, physics, general engineering subjects, etc. the Department of Education have furnished the following statement:

Sl. No.	Name of subject	Time in hours/Year												
		1st year		2nd Year		3rd Year		4th Year		5th Year		M		
		Common to Civil and Mech.)	Elect. and Mech.)	Common to Civil and Mech.)	Elect. and Mech.)	C	E	M	C	E	M			
1	Mathematics . . .	198	132	99	89	99	66	66	66	66	..	..	..	..
2	Physics . . .	264	99	..	..	..	..	66	..	..	..	..	..	..
3	General Engineering Subjects . . .	198	495	891	891	891	462	462	462	429	363	561	462	462
4	Social Science like Economics etc. . .	..	66	..	..	..	..	..	..	66	..	66	..	..
5	Practical Tg. . .	165	297	198	198	198	660	594	627	825	561	726	726	726

NOTE— (1) C—Civil
E—Electrical
M—Mechanical

(2) The syllabus has been drawn up so as to provide a minimum of 200 working days in a year with 36 working hours in each week.

(3) This is according to the model syllabus prepared by the All India Board of Technical Studies in Engineering.

3.28. The Committee enquired whether any detailed study of the system of admission, courses, curricula, practical training etc. in regard to engineering Degree/Post-Graduate Courses, prevailing in USSR, Federal Republic of Germany, German Democratic Republic, U.K., U.S.A., Japan was made. In a written reply the Ministry have stated that no detailed study of the system of education, courses, curricula etc. prevailing in the USSR, Federal Republic of Germany, etc. was made. However, the Board of Assessment, an agency under the auspices of the Ministry to recognise qualifications and to set up equivalence for examinations/qualifications, considers the detailed curricula, system of admission, practical training requirement etc. undergone by the candidate in the country concerned before giving the recommendations of the Board for the approval of the Government of India for recognition/equivalence of a particular foreign qualification/degree. On the basis of this, protocol is signed with foreign countries recognising the award by that country. Such protocol have been signed with USSR, Bulgaria, Yugoslavia, Czechoslovakia, German Democratic Republic and Hungary.

3.29. As regards other countries, the Department of Education in a note (October, 1977) state that one of the items in the current Cultural Exchange Programme with following countries provides for establishment of equivalence of degree/diplomas awarded in India and the foreign country concerned:

1. Algeria
2. Arab Republic of Egypt
3. Belgium
4. Federal Republic of Germany
5. Iraq
6. Mexico
7. Poland
8. Romania
9. Senegal

Action through Board of Assessment for Educational Qualification has already been taken with regard to the equivalence of degree and diploma between India and the Arab Republic of Egypt. Information regarding the system/structure of education in engineering/technology fields in India at different levels has been sent to the authorities concerned to the countries mentioned above. Further action regarding equivalence and finalisation of Protocol would be taken thereafter.

3.30. Asked about the reasons for not making any detailed study of the system of technical education prevailing in other countries such as USSR, Federal Republic of Germany, etc. the Additional Secretary, Department of Education stated during evidence thus:—

“We have a Board of Assessment which does this. The Board’s responsibility is rather limited. It is being done in a limited manner whenever we discuss the question of equivalence of degrees.”

3.31. Asked whether the delegation or deputation consisting of the officers of the Ministry and/or the Members of the Faculty of the IITs etc. sent abroad, do not study and report the system of education prevailing in those countries, the Department have stated in written reply that “in most of the cases they are sent on some specific purposes. So, it may not be possible for them to find enough spare time to study the system of technical education there in detail at depth for adopting the same in this country. The whole gamut of education system in any country needs a special study which the specialists in the delegations sent for short durations can ill afford to do”.

3.32. The Department of Education have in their note further stated that the social set up in other countries is very much different from that of India. The students of the Western countries are exposed to the technological environment even before they go to school. This is so due to large scale industrialisation in these countries, whereas in India more than 70 per cent of our schools are in rural areas. The system of technical education in India is, therefore, required to be such as to mould the students and fit them to technological needs of the country. So, it may not be possible to straight away adopt the pattern of education in advanced countries in India. Only the new innovations in technical education made in the developed countries could be successfully adopted through vocational training and sandwich courses. Attempts to do so are constantly made wherever possible.

Non-technical subjects in Curricula

3.33. In his address at the meeting of the All India Council for Technical Education in April, 1972, the Chairman of the Council suggested that Engineering Institutions should also give to all their graduates an insight into the organisation and structure of industry, human relations and productivity and that all technical institutions should have sciences including management with their engineering curricula.

3.34. Asked about the action taken in this regard, the Additional Secretary, Department of Education stated during evidence thus:—

“This is being done. A Joint Committee of the Indian Council of Social Sciences and Research and the University Grants Commission had examined this question and made recommendations on the basis of which these subjects were included in the curriculum.”

3.35. The Department of Education have stated in a note that the subjects other than technical subjects commonly taught as part of the curricula in engineering institutions include English, Economics including Engineering Economics, Industrial Administration, Business Management, etc. No specific review on all-India level has been made of the utility of these courses. These courses are included as per the guidelines given by the All India Council for Technical Education in its model syllabus prepared for degree courses by its Board of Undergraduate Studies in Engineering and Technology. The affiliating degree Institutions include these courses in their curriculum as per the decisions of the affiliating authorities i.e., the University concerned. The academic bodies of the Universities, the Boards of Studies, the Academic Council, etc. from time to time decide about the desirability and the quantum of time devoted in the total curriculum to specific subjects like these, depending upon the generally accepted needs and patterns in education.

3.36. The coverage of the subjects vary from institution to institution. However, a general picture of the present practice could be had from the extracts of the subjects covered in this category at two of the engineering colleges (a) the Delhi College of Engineering, and (b) Regional Engineering College, Warangal:

(a) *Delhi College of Engineering, Delhi:*

- (i) Topics on management are taught to Mechanical and Civil students at final year level and to Electrical Engineering students at fourth year level. For Mechanical and Civil students, the time allotted is equivalent to that of one full paper (i.e. about 4 periods per week) and for Electrical students it is roughly equivalent to half a paper (i.e. 2 periods per week).
- (ii) Topics on Economics (2 papers) (for all students).
- (iii) Topics on Labour laws taught to Civil Engineering students in V year.

(b) Regional Engineering College Warangal

One course (4 lectures per week) on management topics is offered to the students of all the branches during one of the semesters. Approximately about 10 per cent of the time is devoted to Social Sciences and Humanities over the entire 5 year period.

The following subjects are included in the curriculum for all the branches:—

- (a) Economics
- (b) Cost Accountancy
- (c) Entrepreneurship
- (d) Social psychology and Leadership
- (e) Factories Act
- (f) Productivity Study
- (g) Inventory Control
- (h) Financial Planning & Control
- (i) Personnel Management
- (j) Inspection and Quality Control
- (k) Work Study
- (l) Operations Research.

3.37. The All India Council for Technical Education at its meeting in May, 1976 recommended that a Joint Committee of All India Council for Technical Education, University Grants Commission and Indian Council for Social Science and Research be set up to work out a curriculum in order to give the students of engineering courses a proper perspective to understand human behaviour and culture.

3.38. In a subsequent note, (October 1977) the Department of Education stated that a Joint Committee in this regard was set up and this committee met on the 14th of September, 1977 under the Chairmanship of Dr. A. Ramachandran, Secretary, Department of Science and Technology. The report of this committee was considered by the All India Board of Undergraduate Studies in Engineering and Technology (of the AICTE) at its meeting held on 24th of September, 1977 and the Board having approved the recommendations of this Joint Committee suggested that these recommendations may be included in the curriculum being drafted by the Curriculum Committee for undergraduate course.

3.39. The Committee note that 6 Curriculum Development Centres were set up in 1973 in the 5 Indian Institutes of Technology and Roorkee University. The functions of these Centres include development of curriculum, development of laboratory experiment, preparation of instructional materials, laboratory guides etc. Each of these Centres has been entrusted with the responsibility of looking into the problems of one or two major engineering disciplines allotted to these Curriculum Development Centres. For instance, Civil Engineering has been allotted to IIT Delhi, IIT Bombay and Roorkee University. Mechanical engineering is being looked after by IIT Madras and IIT Bombay.

3.40. The Committee note that since the setting up of the Curriculum Development Centre in IIT, Madras in 1973, the curriculum in mechanical engineering has been revised twice. The Curriculum Development Centres in IIT, Kanpur and Roorkee University have also revised the syllabus once after 1970. The Committee have been informed by the Government that the other Curriculum Development Centres in IIT, Bombay, Kharagpur and Delhi are also doing useful work in this direction.

3.41. The Committee would like the Government to evaluate the work done by all the Curriculum Development Centres and take suitable follow up action to ensure that the Centres continuously review the curriculum, revise and update the curricula, develop teaching material, laboratory manual etc. in the light of the current advancements made in science and technology, teaching methodology, and the requirements of the industry so that the curricula truly reflect the technological advances and innovations, changing professional practice, and the technical manpower requirements of the country.

3.42. The Committee further note that one of the Study Groups of the Joint Committee of All India Council for Technical Education and University Grants Commission which was set up in October, 1973 to review the whole system of engineering education at the first degree level, has also been assigned the task of studying the curriculum development processes. This study by the Joint Committee is expected to be completed by 1980.

3.43. The Committee also note that in pursuance of the recommendations of the All India Council for Technical Education made in May, 1976, a Joint Committee of the All India Council, University Grants Commission and Indian Council of Social Sciences and Research was set up under the Chairmanship of Secretary, Department of Science and Technology to work out a curriculum in order to give the students of engineering courses a proper perspective to

understand human behaviour and culture. The recommendations of this Committee were approved by the All India Board of undergraduate studies for Engineering and Technology in September 1977. A curriculum incorporating the recommendations of this Committee, is being drafted by the Curriculum Committee for undergraduate courses. The Committee hope that the revised curriculum will be finalised and adopted early.

3.44. The Committee note that in USSR Curricula for all specialities are worked out and approved by the Ministry of Higher and Secondary Education on a centralised basis. The curricula are subdivided into standard and individual. The standard curricula are to be used compulsorily without any modification while the individual curricula are worked out for specific institutions. No curriculum is approved by the Ministry without its approval first by the Industry.

3.45. The Committee are concerned to note that no detailed study of the system of technical education, courses, curriculum etc., prevailing in other advanced countries like USSR, Germany, Japan etc. has been made by the Ministry. It is normally expected that before the development of curriculum in technical education, a detailed study of the systems prevailing in other advanced countries, should have been made so as to benefit from their experience.

3.46. The Committee suggest that the systems followed in the curriculum formulation, method of updating the curriculum, its adoption by engineering institutions in technically advanced countries like U.S.A., U.K., USSR, Japan, Federal Republic of Germany and German Democratic Republic may be studied on a regular basis with a view to adopting the useful aspects of the same in India.

3.47. The Committee would also like Government to examine the feasibility of introducing a system whereby the experts in technical education or members of the faculty in the engineering institutions sent abroad by Government are encouraged to give suggestions, in their reports, on the system of technical education particularly the curricula, the teaching methodology and practical training in industry in the light of their studies. Their Reports may be examined by the Curriculum Development Centres and made use of in the process of revising the curricula.

3.48. The Committee consider that the setting up of 6 Curriculum Development Centres, a study Group of the Joint Committee for the Development of curriculum in technical subjects and a Joint Committee to work out a curriculum for understanding human behaviour and culture has resulted in diffusion of responsibility and lot of delay.

The Committee would like Government to critically review the position and devise an institutional arrangement for continuous development of curricula and teaching material to reflect the known and projected needs of industry. The Committee need hardly point out that for this purpose there should be close coordination with the Planning Commission, the manpower projection authorities and the industry both in public and private sectors.

Post-Graduate Courses

3.49. The Ministry have stated in a written note that the All India Council for Technical Education at its meeting held on 21st May, 1976 recommended that the All India Board of PG Engineering Studies and Research may constitute a Group to re-examine the entire Post-graduate diploma courses. The Council also desired that the Visiting Committees set up to make an overall assessment for development and consolidation of all engineering colleges and University Departments of Engineering and Technology, may also evaluate the academic standards of both under-graduate and Post-graduate courses and make suitable recommendations for further development of institutions/university departments. The Board of Post-Graduate Studies has been recently reconstituted and the matter regarding appointment of committee to review the issue of Post-graduate diploma programmes was being processed.

3.50. During evidence the Committee enquired whether the Committee to review the post-graduate courses has been appointed and whether any time limit for completing the review has been laid down. The Additional Secretary, Department of Education replied:—

“...the Board has just been reconstituted and it will meet shortly when it meets, we shall keep this in mind.”

3.51. In a further note (October, 1977) the Department of Education have stated that the review committee will be constituted by the post-graduate Board when it meets.

3.52. The Committee note that the All India Council of Technical Education in May, 1976 recommended the constitution of a group to re-examine the entire post-graduate diploma courses by the Board of Graduate Studies which has been recently constituted. The Committee regret the delay in the constitution of the group to re-examine the entire system of post-graduate courses. They would like Government to expedite the matter and ensure that the review is completed within a specified period. The Committee would like to be informed about the progress made in this regard in six months.

3.53. The Committee need hardly point out that in reviewing the post-graduate courses, special attention should be given to the desi-

rability of providing specialised practical training in the selected discipline and of providing a wide background in production and management techniques.

B.—Workshop Practice

Norms for Provision of Workshop Facilities

3.54. The Ministry have stated that the All India Council for Technical Education has laid down certain norms for provision of workshop facilities in engineering institutions both at degree level and at diploma level and that these norms are only in the nature of a guide list and the institutions concerned can equip their workshops on the basis of the requirements of their affiliating agencies i.e. universities in respect of engineering colleges and State Boards of Technical Education in respect of Polytechnics. The differences in the norms so prescribed by these various agencies are, however not much and more or less conform to the All India Council norms.

3.55. The affiliating agencies during their inspection of the institutions ensure that the facilities prescribed by them with regard to the workshop facilities are followed by the institutions.

3.56. The All India Council for Technical Education at its meeting held in May, 1974 felt that any *ad hoc* increase in the ceiling of expenditure for purchase of equipment in engineering college, on account of increase in prices, might not be an appropriate solution in the present context. The Council, therefore, recommended that the Curriculum Development Cells, while revising the existing curriculum for engineering degree courses, should also lay down the detailed guidelines, according to which the laboratories and workshops in engineering colleges should be equipped. The detailed list of equipment could then be prepared by the institutions concerned in accordance with these guidelines and after taking into account the requirement of their course-content etc.

3.57. Asked to state whether the Curriculum Development Centres have laid down detailed guidelines for equipping the laboratories and workshops in engineering colleges, the Department of Education have in a note stated that the Curriculum Development Centres have developed the necessary instructional manuals for laboratories and workshops equipment and for revised methods of the teaching in class rooms and workshops. The Curriculum Development Cen-

tres at IIT Kharagpur and IIT Bombay have compiled and circulated the following materials to all engineering colleges in the country:

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|------------------|--|
| I.I.T. Bombay . | . A discovery approach to laboratory programme in Fluid Mechanics. Teaching Aids in Physical Sciences. |
| I.I.T. Kharagpur | . Laboratory Instructional Manual for the core courses on Basic Electronics. |

3.58. The Centre at IIT Delhi also taken the work of making out manuals of laboratory experiment.

As and when these Curriculum Development Centres finalise their material they are circulated to all the institutions concerned. Before adoption of the guidelines|guide lists, the institutions have to get academic approval of the affiliating university and then the financial support from the funding agencies i.e. the university or the State Governments concerned. In view of this even when the model material devised by the Curriculum Development Centres is accepted in principle for adoption, there is bound to be a time lag before its actual implementation. The Curriculum Development Centres have been requested to start a follow up study about the adoption of their material.

3.59. In a memorandum to the Committee, it has been stated:

“The workshop facilities in most of the Engineering institutes are inadequate in view of the large number of students admitted. Similarly, the machines and tools in many cases are out-dated. It is, therefore, necessary to replace these machines and augment the facilities by adding some of the latest machinery available.”

3.60. In another memorandum to the Committee it has been stated:

“It is felt that in many engineering institutions, workshop and laboratory facilities are woefully inadequate. The importance of workshop practice has to be emphasised, particularly in view of the general background of students who enrol. It is possible, with good workshop facilities, to undertake jobs for industry of a production nature, which will give students a realisation of industrial requirements. To the extent possible, modern and sophisticated machines should be acquired and old ones replaced regularly.”

3.61. The Committee are distressed to learn that workshop facilities in many engineering institutions including some Govern-

ment and private institutions are not adequate and often the equipment available is obsolete. The Committee need hardly emphasise that proper workshop facilities are necessary to ensure that the engineering course students gain practical knowledge on latest equipment. In the absence of these facilities, the engineering education imparted in the institutions will lack proper practical orientation which is so vital in making a successful engineer. It is imperative that the engineers turned out by these institutions should have first hand experience of working on up-to-date machinery and equipment to be able to play the role of innovators and leaders in industry. The Committee were informed that the question of augmenting workshop facilities had been taken up with the State Governments. The Committee desire this matter should be vigorously pursued with the State Governments.

3.62. Although the All India Council for Technical Education recommended as early as 1974 that the Curriculum Development Centres should lay down detailed guidelines for equipping the laboratories and workshops in engineering colleges, only two of these cells i.e., Curriculum Development Centres at IIT, Bombay and Kharagpur have prepared and circulated the necessary material on a few subjects. The Curriculum Development Centre at IIT Delhi has taken up the work of preparing manuals of laboratory experiment. The Committee would urge the Government to ensure that the Curriculum Development Centres finalise detailed guidelines for workshop and laboratory facilities for all the subjects and communicate to the State Governments|Engineering Colleges|Universities for necessary action. The Committee would like to be informed about the progress made in laying down these guidelines as well as their implementation by engineering colleges.

Supply of workshop items by Public Sector Undertakings

3.63. It has been suggested to the Committee by a Public Sector undertaking that the Public Sector units may be persuaded to supply items of workshop equipment required by the educational institutions on no-loss-no-profit basis. Also surplus stores and machinery could be disposed of to the institutions at book or scrap value. Asked whether any attempts were made to get workshop items from public undertakings on no-loss-no-profit basis, the Additional Secretary, Department of Education stated during evidence "this idea has to be welcomed. We have not considered it."

3.64. The Committee feel that the suggestion that the Public Sector Undertakings may be persuaded to supply items of workshop equipment required by educational institutions on no-loss-no-profit basis and surplus stores and machinery at book or scrap value, merits serious consideration. The Committee would like Government to examine this matter in consultation with the Bureau of Public Enterprises and Standing Conference of Public Enterprises and lay down guidelines to Public Sector Undertakings so that engineering institutions which often face shortage of funds, are able to procure workshop items at a comparatively cheaper price.

3.65. The Committee also feel that leading private enterprises could also be persuaded to supply workshop items required by the educational institutions on a no-loss-no-profit basis. They suggest that this may be pursued through their leading associations like Federation of Indian Chambers of Commerce and Industry, All India Manufacturers Organisation, Associated Chambers of Commerce and Industries of India, etc.

3.66. The Committee also suggest that leading Public Sector undertakings may adopt an engineering college or IIT Regional Engineering College in their regions for giving assistance in modernising workshop machinery and equipment and devising workshop assignments of relevance to industry.

The Committee would like to be informed in due course of the action taken by Government in this regard and the results thereof.

Modernisation of workshops

3.67. It has been stated in the Draft Fifth Plan document that as part of the Quality Improvement Programme, the workshops and laboratories will be modernised and obsolete equipment in the older institutions replaced to keep pace with the changing technical requirements.

3.68. Regarding the progress made in implementing this Fifth Plan programme, the Ministry have stated in a note that the All India Council for Technical Education at its meeting held during May, 1974, noted that an amount of about Rs. 5.08 crores was provided for modernisation of laboratories and workshops. This amount was provided in the State sector out of a total plan outlay of Rs. 79 crores in the State Plan. However, in the various stages of the finalisation of the Fifth Plan provision, the amount of outlay for technical education got reduced and as per the final provision approved now, the proposed outlay for the State sector is only Rs. 59

crores. Further, because of various other measures such as increase in staff salary, cost of consumables, etc., as also because of the technical education provision being not an earmarked provision, State Governments have not been in a position always to provide the amount indicated in the Plan outlay for the purposes of technical educational developmental programmes. As such, this scheme of modernisation and replacement of obsolete equipment in the State sector has not received any priority consideration by the State Governments, in spite of request from the Regional Committees and the All India Council for Technical Education in this regard.

3.69. Asked about the final provision made in the Fifth Plan for State Sector for modernisation of laboratories and workshops, the Additional Secretary Department of Education stated thus:—

“We do not have the final figures. The States would be doing this exercise. The plan was finalised only a couple of months ago. On behalf of the Ministry we are associating ourselves with discussions that each State is having with the Planning Commission regarding its education plan. We would be collecting this information but it will take some time because only after all these discussions are over and the States decide upon their allocations, we would have a complete picture.”

3.70. The Department of Education have in a subsequent note stated that no specific provision for modernisation of laboratories and workshops as such is provided in the State Plans. However, at the time of the plan finalisation and annual plan discussions, the importance of modernisation of laboratories and workshops is brought home to the State authorities.

3.71. It has been stated by the Ministry that recently it was agreed that an amount of Rs. 1.5 crores annually may be given during the current plan period as direct Central assistance over and above the State Plan provision, to non-university institutions (i.e. all affiliated colleges) for modernisation of laboratories and workshops. Since this amount is very small, an expert Committee has been constituted to select institutions which could be given assistance under this scheme. The Committee is likely to finalise its recommendation shortly. During evidence, the Additional Secretary Department of Education stated that a first report has been received in which 19 colleges have been identified.

3.72. The Committee note that as part of the Quality Improvement Programme, workshops in engineering institutions were pro-

posed to be modernised and that for this purpose a sum of Rs. 5.08 crores had been provided out of the State Sector provision of Rs. 79 crores for technical education in the Draft Fifth Plan. The Committee were informed that in the final Fifth Plan outlay only Rs. 59 crores had been allotted in the State Sector for technical education. The Committee were also informed that due to increase in staff salary, cost of consumables etc., the States were not always able to allocate funds for developmental purposes and hence the scheme of modernisation of workshops did not receive any priority in the State Sector despite requests from the All India Council for Technical Education in this regard.

3.73. The Committee are distressed to note that the scheme of modernisation of workshops has not received the priority that it deserved from the State Governments. The Committee suggest that the State Government should be persuaded to make adequate provision of funds for improvement of workshops in engineering institutions.

3.74. The Committee also note that recently Central Government have decided to provide Rs. 1.5 crores annually during the current plan period as direct Central assistance to non-university institutions for modernisation of laboratories and workshops.

3.75. The Committee feel that this decision should have been taken at the commencement of the Fifth Plan and plan of priorities and implementation worked out so that the modernisation of workshops and laboratories could be completed in a phased manner during the plan period. They urge the Government to complete expeditiously the process of identifying institutions that require assistance and disburse the funds so that these institutions can modernise their workshop facilities.

3.76. The Committee are anxious that the Central Government act as pace setter in assisting the engineering institutions in modernising their workshops and laboratories and also involve the State Governments in this task to make effective contribution.

Provision of funds to meet contingent expenditure in workshops

3.77. The Ministry have stated that the All India Council for Technical Education had prescribed certain norms for the recurring expenditure with specific intake of students of technical institutions

to provide for their practical training, to allow sufficient funds for contingencies, for raw materials, for lubricants, power consumption, etc. On account of increase in the cost of various consumable items, salaries and other items of recurring expenditure, the Council had desired in 1974 that the norms earlier prescribed should be revised and requested the Regional Committees to revise the existing norms for calculating the recurring expenditure in technical institutions. The expenditure on these items has to be met by the State Governments for both Government and non-Government institutions. The present level of expenditure will have therefore to be revised by the State Governments to allow for increased grants to the institutions, both State Government and non-Government.

3.78. It has, however, been stated by the Ministry that with the meagre provision made in the State Plans, bulk of the funds go towards the salaries of staff and hence the funds for contingencies, as recommended, have not been given. This matter was again considered by the All India Council for Technical Education at its meeting held in May, 1976 when the Council recommended that the proposals of the Technician Board of the Council for generation of resources in polytechnics by way of consultancy work, entrepreneurship practice for students, repair and maintenance work, including testing, etc., might also be adopted by the engineering colleges and requested the State Governments to encourage the institutions to undertake the activities, as proposed so that the resources generated could be utilised for consumables, raw materials etc.

3.79. The Department of Education have in a subsequent note stated that all the five IITs and the Regional Engineering Colleges at Kurukshetra, Warangal, Tiruchirapally, Allahabad and Nagpur have established Consultancy Services Centres. Some other Regional Engineering Colleges at Bhopal, Srinagar, Calicut, Jaipur, and developed technical institutions and University Departments also undertake consultancy services.

Production-cum-training workshops

3.80. It has been suggested in a memorandum to the Committee that production-cum-training workshops in institutions should be **established**. Asked whether this aspect had been considered in the past, the Additional Secretary, Department of Education replied that in polytechnics at Allahabad, Lucknow and Bombay such production-cum-training workshops had been set up. The Secretary, University Grants Commission stated that in Banaras Hindu University production-cum-training workshop had been set up and that

they were doing a lot of work for the Diesel Locomotive Workshop in Varanasi.

3.81. The Department of Education have in a note stated that "the production centres and repair workshops are beneficial to students in polytechnics than in engineering colleges. As an engineer|technologist is required to perform Design|Research work in his profession in later life his training in design and consultancy work of higher level is considered essential. In so far as polytechnics are concerned their products go to industry as middle-level technicians and they need thorough training in workshop for maintenance and repair work. Some of the polytechnics like Allahabad polytechnic are running production-cum-training centres very successfully competing with local market. The Ministry have sanctioned special central assistance for establishing production-cum-training centres at 14 Polytechnics during the year 1976-77. These centres are being established."

3.82. The Committee are distressed to note that non-availability of funds for contingencies for providing raw materials, lubricants, power etc., for the workshops has adversely affected the workshop practice classes. They were informed that funds therefor have to be provided by the State Governments and very often funds for these purposes are not given, as bulk of the funds in the meagre provision made in the State Plans go towards salaries of staff etc. The Committee note the latest instructions that engineering institutions should take up consultancy work, entrepreneurship practice for students, repair and maintenance work, etc. so as to generate resources. The Committee understand that all the five IPTs and some Regional Engineering Colleges and developed technical institutions/University Departments provide consultancy service to the industry. The Committee have elsewhere in this report emphasised the importance of undertaking consultancy work by engineering institutions so as to keep the faculty members alive to the needs of industry. They stress that all the leading technical institutions should undertake consultancy services with a view to fully utilising the expertise available in the technical institutions and augmenting the resources of the institutions. Such activities would also help to inculcate a feeling of confidence among students.

3.83. The Committee note that in the Banaras Hindu University, production-cum-training workshop has been set up and that the workshop is undertaking some work from the Diesel Locomotive Workshop, Varanasi. The Ministry have expressed the view that

the production-cum-training workshops were beneficial to students in polytechnics than in engineering colleges. The Ministry have sanctioned special Central assistance for establishing such centres at 14 polytechnics during 1976-77. The Committee desire that the working of the production-cum-training workshop at Banaras Hindu University, Varanasi may be studied and evaluated with a view to determining whether similar facilities would be useful if established in other engineering institutions. They feel that such centres would not only afford facilities for the much-needed practical training for the undergraduate students but also generate revenues for the institutions.

Workshop Practice

3.84. It has been stated in a memorandum to the Committee that generally workshop classes are taken by Junior teachers with the help of technicians. Senior teachers do not get themselves involved. Exercises set are stereo-typed and repeated for decades. Unless senior teachers are put in workshop training and exercises are set with more imagination and sense of purpose practical training may not improve.

3.85. In the Report of the Steering Group and Task Force on Education (1973), it has been observed that the scheme of laboratory experiment and workshop practice in engineering institutions does not serve the purpose of imparting training to the students and these departments are not planned to simulate the conditions in the world of work. Asked about views of the Government, the Additional Secretary, Department of Education stated:—

“We do see that there is considerable scope for improvement. The question of funds is very relevant. If experimentation workshop facilities are to be improved, we must supply them the consumable raw materials. Funds are quite often not adequate.

3.86. In a subsequent written reply the Department of Education have stated that it could not be said that the laboratory experiment and workshop practice in the engineering institutions do not serve the purpose of imparting training to the students. They serve the purpose quite well even though it might be correct to an extent to say that this is not possible to simulate the conditions of the world of work entirely in the institutions. The attempt in the institutions is to provide instructions to the extent possible to the realities of any given situation which the student might face later on in his working life. It is with this in view that courses in the institutions are organised providing for a considerable exposure to all field situa-

tion. For example, the students are taken on educational tours during the course of studies when they visit various industrial and other field organisations of interest. Specific educational visits are also organised periodically during the course of studies to nearby industry/field organisation.

3.87. The Committee desired to be furnished with the details of the workshop practice given to undergraduate engineering students in Federal Republic of Germany and U.S.A. The Department of Education in a note (November, 1977) have stated that following system is adopted for giving workshop practice to undergraduate engineering students in Federal Republic of Germany and U.S.A.:—

(i) *Federal Republic of Germany*

No workshop practice is given in the university. Students do workshop practice in industry.

Of course each Faculty has got its own workshop for building up experimental set ups for research etc. But they are not meant for training students. Industries where the students are sent for training have training workshops where students do work shop practice. The University prescribes the nature of problems, the type of work etc. to be done by the students in each subject. But the work itself is done in the industry. When the students has completed the prescribed training in the industry, the industry certifies that the candidate has satisfactorily completed the work prescribed by the University. The University is free to test the candidates' competence in its own workshops.

(ii) *United States of America*

The present curricula for undergraduate engineers in USA does not include any of the traditional shop course work. Students who do get any workshop practice do so as part of the laboratory work associated with particular subject matter.

During the period of industrial development in the States i.e., during 1910 to 1940, the engineers there were expected to be craftsmen to a certain extent. However, during the 1960's, the credit hours (In American system of Education 2-3 hours of lab instn. is equal to one credit hour and one lecture hour (theory) is equal to one credit hour) for the bachelor's degree were reduced from 148 to 135 and as a consequence shop was one of the components of the curriculum that was sacrificed. Subsequent reduction in total hours have occurred so that now one semester consists of 124—129 credit hours only.

Laboratory work varies with the curriculum ranging from 11 to 14 credit hours equivalent, distributed over the 4 years. This work, while involving actual work with equipment and instruments, would not be workshop practice. However, where it is relevant to learning objectives some workshop theory is injected into lab. discussions. But it is not possible to estimate how much, since there is not formal requirement for it.

3.88. The Committee need hardly emphasise the importance of laboratory experiments and workshop practice in engineering colleges. It was admitted during evidence that there was considerable scope for improvement in this regard but as funds were lacking, adequate equipment and consumable raw material could not be provided.

3.89. The Committee would further like that senior teachers should also take up workshop classes so that the deficiency in equipment is made up by better and mature guidance. The senior teachers should prepare workshop assignments, in consultation with the industry so as to ensure that the assignments are challenging and relevant to the industry and the students develop capacity to tackle the various problems in the world of engineering after completing the course.

3.90. The Committee suggest that the Ministry should lay down suitable guidelines in this regard.

3.91. The Committee have dealt with question of paucity of funds for the purpose in paragraphs 3.82 and 3.83 of the report.

3.92. The Committee suggest that the detailed study of the workshop practice including time spent, nature of problems etc. assigned to undergraduate engineers in USA, USSR, Federal Republic of Germany and Japan should be made with a view to adopting useful aspects in India.

C. Practical Training

3.93. The Central Government have in the National Policy on Education approved by the Parliament in 1968 laid down that practical training in industry should form an integral part of technical education.

3.94. Asked about the action taken in this regard the Ministry have stated in a written reply that even before the Apprenticeship

Act came into force in 1969, the Central Government had been running a scheme of practical training in industry for graduates and diploma holders. With the passing of the Apprenticeship (Amendment) Training Act, 1973, more places of training are being located.

3.95. Further, practical training has also been provided during the vacations etc. Under the sandwich courses programme, in-plant training is organised during the course of institutional studies.

3.96. Each Indian Institute of Technology has got a Training and Placement Cell which arranges practical training for the students from 3rd year onwards. The Training and Placement section makes arrangements for vacation training of the students of the Institutes and placement of its graduates.

3.97. In the Regional Engineering Colleges, the workshop and practical training are part of the undergraduate studies. There is a Professor of Training and Placement at each College who makes arrangements for the placement of students in various industrial establishments for vacation training as well as long term training. He is responsible for maintaining link with the industry and secures seats in the various establishments. The training is normally offered during the vacations.

3.98. The Department of Education have further furnished the time allotted in the undergraduate engineering course for practical training in industry in respect of two institutions viz. Delhi College of Engineering, Delhi and PSG College of Engineering, Coimbatore. In the Delhi College of Engineering one full semester in the fourth year is allotted for practical training and in the PSG College of Engineering, 5 weeks in each of the 3rd, 4th and 5th year of the course are allotted for imparting in-plant training.

3.99. The Ministry have stated in a written reply that a Joint Committee of the All India Council for Technical Education and University Grants Commission is reviewing the whole system of engineering education. One of the study Groups appointed by this Joint Committee to study the duration and admission qualifications to the first degree course in engineering recommended in May 1976 that the duration of the under-graduate course in engineering should be four years after the 10+2 system of schooling. The Study Group also recommended that after under-graduate course, one year industrial training should be made compulsory. The Joint Committee at its meeting held on 5 May, 1976 while generally endorsing the recommendation of the Study Group to make one year industrial training compulsory after the successful completion of the first

degree programme in engineering college/institutes felt that this question be further examined and the whole mechanism for its implementation be carefully worked out. While it may be possible to obtain necessary training facilities for the engineering graduates and diploma holders in view of the amended Apprenticeship Act, the question of well supervised training programmes for all the graduates and diploma holders needs careful study. The Joint Committee strongly felt that unless the training programme is well organised it would not produce the desired result.

3.100. A number of non-officials have represented to the Committee that the present practical training is inadequate.

3.101. In a memorandum to the Committee it has been stated:—

“The practical training is generally combined with the annual leave of the students and is looked upon as a necessary evil both by the students and the industry. Instead a concentrated training for a period of 6 months/one year towards the end of the course where the candidates are asked to undertake regular work of the industry’s choice, is preferable.”

3.102. In another memorandum to the Committee it has been stated:—

“The present system of practical training given to the engineering graduates is far from satisfactory. The vocational training is often unsupervised and leads to nothing but familiarities with the industrial scene.”

3.103. It has been suggested by another non-official in his memorandum to the Committee:—

“Practical training should be integrated with the engineering curriculum and it may be made essential with the engineering industries, and various national laboratories to take the responsibility of training the engineers in their organisations for a prescribed period.”

3.104. In a memorandum to the Committee it has been suggested that in every organisation, the trainee should be attached to a particular individual and the trainees be paid stipend and the trainer, honoraria. Both should submit a report before they are paid stipend and honoraria for the last two months. This would ensure proper planning of training.

3.105. It was stated by a non-official during his evidence before the committee:—

“It is quite true that most of the engineers we produce have had no practical experience whatsoever. We have to change the structure of our engineering education to meet this. No doubt most of the engineering colleges have some programme of giving practical training to the students at the industry. But this remains only on paper. The student goes to an industry for two months, during vacation because the latter cannot refuse to have him. But the students are generally left alone there. There is no planned training programme for them in the industry.”

3.106. In another memorandum to the Committee it has been stated that the industries by and large have not yet realised their role or their social obligations regarding practical training of engineering graduates. Many of the engineering graduates when sent for industrial training simply waste their time, being sight-seers and watching the various industrial operations from a safe distance. On the other hand, the industries complain that these students are not trained for the specific tasks and as such their presence interferes with production.

3.107. Asked about the views of the Ministry in this regard, the Additional Secretary, Department of Education, stated during evidence that “both sides have some truth.”

3.108. During their tour to Western region, the Committee learnt from the representative of the State Government that the facilities offered by industries for practical training were not satisfactory. Students were left to the whims and fancies of the industries.

3.109. During their tour to the Regional Engineering College, Kurukshetra, the Committee were informed that the system of practical training as arranged was not very effective since the students were not generally allowed to work on the machines in the industry.

3.110. Asked whether the present practical training given to undergraduates was considered adequate, the Additional Secretary, Department of Education stated during evidence:—

“.....we can't deny the need for increasing the content of industrial training at the under-graduate level itself.

The problem is in regard to its implementation. I want to give some idea of the dimension of this problem. Vacational training starts from the third year onwards. We have to pay some stipend to students and honorarium to supervisors if this training has to be meaningful. The cost comes to Rs. 5 crores a year and Rs. 25 crores in a plan period. We have 60,000 under-graduate students in three year classes and about a lakh of diploma holders. How to provide this Rs. 25 crores when our total plan allocation itself is Rs. 156 crores? We have therefore to consider how exactly this problem has to be tackled.... In view of the stupendous dimension of the problem, this requires very deep study as to how exactly such a programme can be implemented."

Incentives to Industries:

3.111. It has been suggested to the Committee in a Memorandum that industries should be asked to establish training centres for giving training to students. Industry should also be given incentives by way of tax concessions etc. for giving practical training to students.

3.112. Asked whether this matter has been examined in the past, the Additional Secretary Department of Education stated that All India Council considered this matter in May, 1976. The witness read out the following extracts from the council's proceeding:

"The Council noted that under section 80 (g) of the Income Tax Act an amount equal to 50 per cent of the aggregate sum paid by the assessee as donation to a university established by law or any other educational institution recognised by Government.... shall be deducted in computing the total income of the assessee."

"The Council recommended that this provision should be brought to the notice of the industry so that they may provide assistance to technical institutions. The Council also recommended that the question of further exemption from payment of income-tax to contribution for technical education be examined."

Practical Training in U.S.S.R.

3.113. In a paper on Strengthening the links between the Higher Technical Education and the Industry in Training Engineers in the

USSR presented at the UNESCO Seminar held in New Delhi in April, 1976, it has been mentioned:

“As a measure to make young engineers better prepared for their practical work, the curricula of the technological institutes provide for the practical training at the industrial enterprises in the form of a system of practical training which are broken down by the years of studies in the following orders:—

The first practical course is technological and its purpose is to acquaint the students with the real conditions of production. Students usually work on the floor, at the machine-tools. Practical courses are organised at the advanced enterprises where production is carried out on a mass scale, serial and represents a full cycle in the manufacture of a given product.

The second practical course is also a technological one and its purpose is to acquaint the students with the technology of production of those machines and instruments which the future engineer will have to design after his graduation. A student works in one of the shops and in designing bureaus. This course is organised at the stage of technological and designing training of students.

The third course is an operational one during which the student works as assistant or counterpart of the head in charge of testing or at the repair bases, studying in the process of practical work the operational features of “his” machine and instruments. This practical course is a concluding element of the specialised designing training of students.

And the concluding practical course is called a pre-diploma course which is organised at the place of his future work where he while being initiated into the work of an engineer prepares materials for his diploma thesis.

It is important to note that all the practical courses are compulsory within the framework of the curriculum and they are also organised in such a way as not to deprive the students of the possibility of rest during their summer and winter vacations.

The industrial training of students takes up about 15 per cent of the total training time. The industrial training of students includes a wide set of measures whose purpose is to impart the ability to use theoretical knowledge in conditions of production and they provide a practical foundation for studying the applied disciplines provided for by the syllabus.

The responsibility for the efficiency and quality of this or other industrial practical course rests with the respective institute."

3.114. In another paper on the USSR Higher Technical Establishments Curriculum for Technical Engineering Specialities presented at the same Seminar, it has been mentioned:—

"According to the adopted schedule theoretical studies take 141 weeks. The total period of practice is 25 weeks. During the practice period students complement the acquired knowledge by an indepth study of a production technology, equipment, machinery, automated systems, organisation of labour or economics.

The higher technical education aims at training high grade specialists to be employed in various sectors of national economy based on modern scientific and technological achievements, specialists capable of combining masterfully theory with practice and ensuring technical progress of the nation.

Practical Training in Federal Republic of Germany

3.115. The Department of Education have in a note (November, 1977) stated that the practical training given to engineering students in Federal Republic of Germany is as follows:

"In Federal Republic of Germany the degree courses in Engineering (Dipl. Ingenieur) are normally offered by Technical Universities. The minimum duration of the course is 8 semesters (4 years) but vary from University to University, e.g. the Technical University of Berlin prescribes a minimum of 9 semesters for Engineering degree course (Dipl. Eng.) in Landscape Planning, Environmental Technology, Building and Transport Technology etc. The minimum duration prescribed by the University of Berlin for Industrial Engineering is 10 semesters. The minimum entrance qualifications is German Abitur or B.Sc. from Indian Universities.

For almost all Engineering degree courses, practical training, varying from 4 months to 8 months, depending upon the subjects is prescribed. In many cases part of the training is to be taken before the candidate joins the course and the remaining part during the course. The requirements vary from subject to subject and University to University. For some specialised professors, training is to be continued also after the course."

3.116. In the report on Training of Engineers, Technologists and Technicians in Developing countries prepared by the Secretariat of Committee on Science & Technology in Developing countries of the International Council of Scientific Unions and circulated in the UNESCO Seminar held in New Delhi in April 1976 it has been observed:—

- (i) It is probable that the engineers and technologists of the developing countries may be well educated but not sufficiently trained.
- (ii) The training given to them, although excellent in academic content, was severely lacking in relevance to problems of national development.
- (iii) All students in engineering degree course may be required to spend alternate years of their formal education in industry. This would give them a feel for the problems faced by industry and would encourage them to seek solutions in the academic world.

Apprenticeship training

3.117. In a written note the Department of Education have stated that the 'Programme of Apprenticeship Training' was known as practical Training Stipend Scheme before 1969. This Scheme was started by the Government of India during 1949-50 to provide industrial training to selected fresh Graduate Engineers and Diploma holders to condition them for gainful employment.

3.118. The Engineering Graduates and Diploma holders were required to undergo training for 12 months in industry and were paid a stipend of Rs. 250/- per month and Rs. 150/- per month respectively by the Ministry of Education & Social Welfare. Training places were offered by the industry on voluntary basis and the training establishments were free to contribute towards the value of stipend, if they desired.

3.119. From the academic year 1975-76, this programme came under the purview of Apprentices (Amendment) Act, 1973, which makes statutory provision for the training of engineering graduates and diploma holders.

3.120. The duration of training under the Act is one year. During training, graduate engineers and diploma holders are paid stipend at the rate of Rs. 280/- and Rs. 180/- per month respectively. The cost of stipend is shared equally by the Central Government and the employers to the extent of the above rates. Beyond this, the employer alone has to bear the expenses. In the case of management trainees, stipend is paid in full by the training establishments.

3.121. The Ministry have further stated that in order to achieve the target that no engineering graduate or technician apprentice (diploma holder) eligible for training and desirous to undergo training should be denied the opportunity for training under Apprenticeship Scheme because of lack of knowledge about the scheme or for other reasons, certain additional measures have been taken such as:—

- (i) Fliers containing brief information about the Apprenticeship Scheme have been printed and distributed among final students in all engineering colleges and polytechnics in the country;
- (ii) All candidates on the live registers of Employment Exchanges are asked to send their applications for training if they are eligible and desirous of undergoing training;
- (iii) Eligible candidates willing to undergo training are being interviewed at several Centres in each State and panels prepared for posting them for training; and
- (iv) Education Minister has recently addressed all Chief Ministers emphasising the need to utilise the training places to the maximum.

3.122. As on 31 October, 1976, 12,889 seats for engineering graduates were created out of which 11,267 seats have been utilised by the engineering graduates.

3.123. It has been stated in a memorandum to the Committee that adequate attention is not paid by the industry to the apprentice trainees as it is not obligatory on them to employ the apprentice trainees. Therefore, legislation may be passed to compel industry to employ a certain number of trainees in the industry so as to provide competitive motivation to the trainees for better performance.

Asked about the views of the Government on this suggestion, the Additional Secretary, Department of Education stated:—

“The Act makes adequate provision to take care of the training that is provided. Now it is for the apprenticeship boards and other organisations to ensure what is envisaged is done. Section 11 is quite clear about the responsibility of the employers.”

3.124. Regarding employment opportunities of the apprentice trainees, the witness stated that the matter was under consideration.

3.125. The Committee note that Government of India have in the National Policy on Education approved by Parliament in 1968 laid down that practical training in industry should form an integral part of technical education. The Committee have been informed that at present practical training to graduate engineers is arranged at two stages i.e. during studentship and after graduateship. At the first stage the training in Industry is given to students from third year onwards during vacation. At the second stage one year's practical training is offered to graduates under the Apprenticeship Act. Since practical training under Apprenticeship Act which is given after successful completion of the degree course is not compulsory for all students, it can hardly be treated as an integral part of technical education as envisaged in the National Policy on Education.

3.126. The Committee were informed that the recommendation of the Study Group appointed by the Joint Committee of All India Council for Technical Education and the University Grants Commission that once year's industrial training should be compulsory after the undergraduate course, is under further examination with a view to working out mechanism for its implementation. The Committee would like Government to ensure that the modalities for the implementation of this recommendation are worked on soon.

3.127. The Committee note that in some of the advanced countries practical training to engineering graduates is given as part of the curricula. The practical training is also guided by teachers of the institutions and their performance is evaluated. In USSR practical training is given in industry in such a detailed way as to produce specialists capable of combining masterfully theory with practice. In West Germany also practical training is given during the study of course as part of the Curricula. In many cases, part of the training is to be taken before the candidate joins the course and for some specialised professions, training is to be continued also after the course.

3.128. The Committee note that in India the practical training being given to the students is combined with their annual vacations and is not very satisfactorily organised and planned. The students are generally left alone in the industry without any guidance and supervision. Many of the students spend their time as sightseers and watching the various industrial operation from a "safe distance". The Industry on the other hand feel that these students are not trained for any specific task and as such their presence interferes with the production. During evidence the Additional Secretary, Department of Education admitted that there was need for increasing the context of industrial training at the under-graduate level itself. But the problem was the cost, involved in its implementation. According to him if the training has to be meaningful stipend has to be paid to the students and honorarium to the supervisors. The cost would come to about Rs. 5 crores per annum and about Rs. 25 crores during a plan period which would be difficult to provide from the total plan allocation of Rs. 156 crores for technical education. The Committee emphasise the need for imparting meaningful practical training at under-graduate level and making it an integral part of the Curricula.

3.129. The Committee consider that if practical training to engineers at under-graduate level is to be meaningful, and has to serve any purpose, it is essential that there is a proper planning and organisation of the training programme and the work done during the training period is evaluated. The Committee feel that the industry also owes an obligation in the training of under-graduates and it should involve itself fully in the training programme of the graduate engineers. The Committee suggest that the training programme should be prepared in close consultation with the industry. The Committee understand that 50 per cent of the amount donated by an industry to the Universities/Institutions qualifies for exemption from Income tax etc.....The Committee suggest that the question of giving further incentives/concessions to the industry to incur expenditure on training facilities to engineering students may be examined by Government.

3.130. The Committee suggest that the system of practical training given to students in under-graduate and post-graduate engineering courses in technically advanced countries like USA, UK, Germany USSR and Japan may be studied in detail with a view to adopting useful aspects of the same in India.

3.131. The Committee note that as on 31 October, 1976 out of 12,889 seats created for Graduate Apprentices, under the Apprenticeship Act 11,267 seats were utilised. The Committee emphasise that

wider publicity of the training facilities and incentives available under the Act should be given particularly among the fresh graduates coming out of colleges and unemployed engineers registered with employment exchanges.

3.132. A view has been expressed that adequate attention is not paid by the industry to engineer-trainees and that in order to provide motivation of trainees, it should be obligatory for the industry to absorb a certain percentage of them on successful completion of training.

3.133. The Committee were informed that under the Act, the Apprenticeship Board and other authorities have to ensure proper training. The Committee desire that the authorities concerned with supervising the trainees should exercise necessary checks to ensure that the industry pays serious attention to the programme. The Committee understand that the question of providing employment opportunities to apprentice engineers is also under consideration. The Committee would like to be informed of the decision taken in the matter and progress made in implementing it.

D. Centres of Excellence

3.134. It has been stated in the Annual Report of the University Grants Commission for the year 1973-74 that the UGC has recognised some centres in Indian Universities as Centres of excellence for advanced study in some subjects with a view to strengthening post-graduate studies and research, and to encourage the pursuit of excellence and team-work and to accelerate the realisation of international standards in these subjects. Some of the centres identified for science subjects are:—

University		Department recognised as Centre of Advanced Study
1	2	3
1.	Annamalai	1. Marine Biology
2.	Bombay	1. Mathematics 2. Chemical Technology
3.	Calcutta	1. Mathematics 2. Radiophysics & Electronics
4.	Delhi	1. Physics 2. Chemistry

1	2	3
		3. Botany
		4. Zoology
5.	Indian Institute of Science	1. Bio-chemistry
6.	Madras	1. Physics
		2. Botany
		3. Mathematics
7.	Osmania	1. Astronomy
8.	Punjab	1. Geology
		2. Mathematics
9.	Saugar	1. Geology.

3.135. Asked whether any such centres of excellence in respect of various disciplines have been identified in IITs and other engineering colleges, the Additional Secretary, Department of Education stated during evidence:—

“Actually, in the UGC itself, they have identified such centres. This matter was considered by the Post-graduate Board. Our view is that IIT as such are centres of excellence but they have still not gone in for specialised courses in advanced study and research. But certain areas have been identified where there would be special emphasis in a particular IIT.”

3.136. In a subsequent note, the Department of Education have stated that the Board of Post-graduate Engineering Studies and Research of the All India Council for Technical Education at its meeting held in August, 1974 considered the issue of establishment of centres of Advanced Studies and decided that Centres of Inter-disciplinary Studies should be established instead of Centres of Advanced Studies. The All India Council for Technical Education accepted this view of the Post-graduate Board. Therefore, no centre of excellence has been identified in any of the engineering colleges.

3.137. A Committee under the Chairmanship of Dr. Y. Nayudamma, Director General, CSIR accepted inter-disciplinary centres of studies in the following areas:—

1	2
I.I.T., Kanpur	1. Material Science.
	2. Lasers and Laser Systems.
I.I.T., Kharagpur	1. Cryogenic Engineering.
	2. Processing, Preservation and transportation of Food

1	2
I.I.T., Delhi	1. Energy Studies. 2. Information Systems.
I.I.T., Madras	1. Ocean Engineering. 2. Transportation Engineering.
I.I.T., Bombay	1. Resources Engineering. 2. Environmental Science.

31.138. The Committee note that the University Grants Commission has recognised some Centres in the Indian Universities as centres of excellence for advanced studies with a view to strengthening the postgraduate studies and research. The Committee were informed that the Indian Institutes of Technology which are by themselves centres of excellence have not yet gone in for specialised courses in advanced studies and research. The Board of Postgraduate Engineering Studies and Research of the All India Council for Technical Education in August, 1974 considered the matter of establishment of centres of Advanced Studies and decided that Centres of Inter-disciplinary studies should be established instead of Centres of Advanced Studies. The All India Council for Technical Education accepted this view and therefore no centre of excellence has been identified in any of the engineering colleges. Accordingly, certain Inter-disciplinary centres of studies in five Indian Institutes of Technology have been identified. The Committee feel that the Indian Institutes of Technology which have been in existence for more than two decades to serve as centres of excellences should also have facilities for specialised courses for advanced studies and research, The Committee desire that early steps should be taken to introduce advanced studies and research in the special areas identified for each IIT.

Project Work

3.139. In a paper on the USSR Higher Technical Establishments Curriculum for Technical Engineering Specialities presented at the Unesco Seminar held in New Delhi in April, 1976, it has been stated:

"In the curricula, 15 weeks are allotted for the diploma project which is prepared under the supervision of an instructor. During this period the students are free from any other training assignments. The diploma project is aimed at the systematization, consolidation and expansion of the students' knowledge. In the diploma project the student studies in a profound manner a production branch corresponding to his specialisation, and works out a concrete technological process. He solves the problems of choice

an designing of equipment, automation and mechanisation of processes, substantiates the chosen engineering solution, makes the necessary technical and economic estimates, etc. Wherever necessary, experimental and research work is also carried out."

3.140. It was suggested in a memorandum to the Committee that "live project" work should be introduced as a part of the curricula in engineering courses.

3.141. Asked whether such "live project" works are assigned to undergraduate students as part of the curricula, the Additional Secretary, Department of Education, stated during evidence thus:—

"We accept the utility of such projects. In fact a number of courses are there. We have got one semester for diploma project. Problems selected for diploma projects are as far as possible live problems."

3.142. The Review Committee on IIT, Madras (1971) recommended that at M. Tech. level it will be advisable to choose live problems from industry. It also suggested the following problems of immediate interest which could be tackled at the Institute:

1. Low cost housing both for urban and rural areas.
2. Treatment of Brackish water for purposes of drinking and other uses by the Community.
3. Design and construction of silos for proper storage of grains and other food material.

3.143. Asked about the action taken in this regard by IIT, Madras, the Additional Secretary, Department of Education, stated:

"...these problems are being taken care of by the concerned faculties which choose subjects for candidates who offer themselves for M. Tech. courses apart from that they have a diploma course for one year and such problems are being selected for candidates joining that course also. A candidate is required to select some problems for his study and care is being taken to see that a particular student may be given a particular problem in which he has the interest... The faculty is in touch with other organisation which are concerned with these matters like the National Building Organisation, Structural and Engineering Laboratory, State PDW, etc."

3.144. The Department of Education have in a subsequent note stated that under-graduate students are allotted project work at the

final year which engages about 6.15 hours a week. The project themes are generally selected in consultation with the industries and mostly pertain to aspects of design, fabrication, testing, investigation data collection, analysis etc.

3.145. At the post-graduate level, the project work also constitute an integral part of the curriculum having a net time input of 25 per cent. The projects at the post-graduate level are more sophisticated in nature and are chosen from areas relating to contemporary problems of the industry.

3.146. The industry assist the students both by way of guidance and facilities. Experts from industry are included in the Board of Examiners who evaluate the project work, which normally carried the weightage of one theory paper.

3.147. The Committee note that the Review Committee on the Indian Institute of Technology, Madras has recommended that at M. Tech. level, it would be advisable to choose live problems from industry. The Review Committee also suggested certain problems of immediate interest which could be tackled in the institute. The utility of taking up these live projects at M. Tech. and post-graduate diploma level was also recognised by the representative of Department of Education during evidence.

3.148. The Committee also note that both the Under-graduate and Post-graduate students are being assigned project work. The projects at the under-graduate level are selected in consultation with the industry and mostly relate to design, fabrication, investigation etc. while at the post-graduate level the projects are more sophisticated in nature and are chosen from areas relating to contemporary problems of the industry.

3.149. The Committee would like that a review be undertaken to ascertain whether all engineering institutes running post-graduate courses have identified the problems of live interest that can be undertaken by them and whether such problems are being assigned to the students at post-graduate level. The Committee need hardly point out that improvements may be made in the light of experience so as to enhance the utility and relevance of these live assignments.

Sandwich Courses

3.150. The Department of Education in a written reply stated that in the Fourth Five Year Plan the Central Government laid greater emphasis on the improvement of quality of technical education imparted in degree and diploma institutions. To this end, a number

of schemes were launched by the Central Government. One of the schemes was related to the introduction of sandwich courses in selected institutions of the country on an experimental basis.

3.151. The main objective of the sandwich courses is to cross fertilise theoretical education at institutions with actual practical experience in industry, in design, production and construction work. Industrial training is integrated into the total process of engineering degree course to complement the curricular offerings of engineering colleges.

3.152. The essential features of this sandwich programme have been stated by the Ministry as under:—

- (a) The duration of industrial training should be at least 12 months divided into convenient stages, but there should be a long spell of at least six months. To cover this industrial training adequately, the duration of the degree courses should not be less than 5½ years (after Higher Secondary) or 4½ years (after intermediate in Science).
- (b) The programme of industrial training should be formulated in close consultation with industry and it should include, in addition to other elements, specific training in design, development, production or construction, appropriate to the subject fields of degree and diploma courses. Close coordination should be established between technology theory as taught at the institutions and technology as practised in industry.
- (c) The responsibility for supervising practical training should be primarily that of the cooperation industry but the faculty of the institutions too must be closely involved. For this purpose and wherever necessary, each institution may have additional faculty posts at the level of the Readers/Assistant Professors.
- (d) The Central Government provided financial assistance at the rate of Rs. 250/- p.m. for each sandwich degree course student for one full year industrial training. This amount was utilised by the institutions for giving a stipend of Rs. 150/- p.m. for the degree course student for the actual period of their practical training in industry. The rest Rs. 100/- p.m. was utilised by the institutions concerned, on expenditure on the appointment of additional staff wherever necessary and for other items of expenditure like T.A. & D.A. consumable materials for project work in industry etc.

3.153. After the amendment of the Apprenticeship Act (1961) during the year 1973, the programme was transferred to the Regional Boards of Apprenticeship Training. The Institutions concerned obtain training places from the industrial establishments for their students.

3.154. The value of the stipend has been revised to Rs. 180 p.m. from 1976-77. The overhead expenditure is to be paid by the State Government concerned.

3.155. At present 10 engineering institutions offer sandwich courses at under-graduate level.

3.156. Asked whether sandwich courses would be introduced in other colleges, the Additional Secretary, Department of Education stated during evidence:

“While the desirability of extending the experiment to other colleges is fully established, the problem is that we have not been given funds though on our part we did formulate a programme.”

3.157. As regards the pattern of financing this programme, the witness stated during evidence that for the first five years cent per cent grants were paid by the Central Government but after that period, the State Governments would have to take over the programme. Asked when the five year period was over and whether the State Governments have taken over the programme, the witness stated “at the end of the Fourth Plan, the Five year period was over. It is unfortunate that though they have been taken over, some of the State Governments have discontinued the courses. But now it is going to come up in another form under the Apprentices Act.”

3.158. In this connection the Committee also drew the attention of the witness to the minutes of the meeting of the All India Council for Technical Education held in May, 1974 which read as follows:—

“.... the Council was informed that with the discontinuance of Central Assistance for payment of stipends to students under the sandwich pattern, certain State Governments were considering the discontinuance of the Sandwich programme even though it was admitted that the programmes had made an impact. The Council recommended that the sandwich programme of education is important and necessary; and the stipends for students undergoing

sandwich courses should be paid by the State Governments during the Fifth Plan period from the provision made in the State sector.”

Industry-oriented Post Graduate Courses and Practice laboratories

3.159. The Department of Education have stated in a written reply that nine Regional Engineering Colleges have started industry-oriented post-graduate Courses. In three Regional Engineering Colleges Problem-Oriented Research Laboratories have been established.

3.160. It has been further stated by the Department of Education that the industry-oriented post-graduate courses and problem oriented research laboratories in the Regional Engineering Colleges were established with UNDP/UNESCO assistance. This assistance has ceased since 1975. These courses are now being assisted under the normal budget of the Regional Engineering Colleges as a whole. According to the Department of Education the introduction of new industry-oriented courses and their development will, however, depend upon the decision of the Board of Postgraduate Engineering Studies of the AICTE which is concerned with the development of postgraduate courses in our country.

3.161. Besides these 9 Regional Engineering Colleges two other institutions, viz., College of Engineering, Trivandrum and Thapar Institute of Engineering & Technology, Patiala are also conducting industry-oriented post-graduate courses.

3.162. The College of Engineering, Trivandrum has organised a post-graduate Diploma course in Coastal Engineering as an Industry-oriented course, conducted in collaboration with the Public Works Department, Ports and Harbours. The same college has also a Post-graduate course in microwave engineering which is conducted in collaboration with the Indian Space Research Organisation. Future programme of this Institute includes courses in space science and technology which is proposed to be conducted in collaboration with Vikram Sarabhai Space Centre. Courses in fibre re-inforced plastic, vacuum Technology, cryogenics are also contemplated in collaboration with Keltron, Vikram Sarabhai Space Centre etc.

3.163. The Thapar Institute of Engineering and Technology, Patiala has also a course in civil structural Engineering which is tailored to the needs of the Public Works and Public Health Departments. The Institute also proposes to introduce a Post-graduate Course in Energetics which will cater to the needs of the Punjab State Electricity Board.

3.164. The Committee note that sandwich courses were introduced during the Fourth Plan in 10 engineering institutions, at undergraduate level. The main objective of the scheme was to cross fertilize theoretical education at the institutions with actual practical experience in industry in design, production and construction work. The essential feature of the course is that industrial training is integrated into the total process of engineering degree course to complement the curricular offerings of engineering colleges. The programme of industrial training is formulated in close consultation with the industry so that close coordination is established between theory of technology as taught at the institutions and technology as practised in industry. The Faculty Members are closely involved in the supervision of the practical training given by the industry. For the first five years the programme was financed from the grants paid by the Central Government on cent per cent basis. After five years, the State Governments were to take over the programme. The Committee are concerned to note that after the expiry of five years period at the end of Fourth Plan some of the State Governments have discontinued the courses. The Committee were informed that this programme is now going to be taken up in another form under the Apprenticeship Act. The Committee consider it very unfortunate that the sandwich courses which were introduced for improving the quality of technical education at undergraduate level have been discontinued in some States because of the withdrawal of the Central Assistance. The Committee desire that the State Governments concerned may be persuaded to revive this useful programme.

3.165. The Committee note that as a part of the Fifth Plan programme in technical education, industry oriented post-graduate courses have been started in nine Regional Engineering Colleges. This programme was started with assistance from UNDP and UNESCO but this assistance has ceased since 1975. These courses are now being assisted as part of the normal budget of the Regional Engineering Colleges. The Committee were informed that the introduction of new industry oriented courses would depend upon the decision of the Board of Postgraduate Engineering Studies of the All India Council for Technical Education. The Committee are anxious that these industry oriented postgraduate courses and problem oriented research laboratories already provided in some Regional Engineering Colleges should not be allowed to suffer because of lack of funds. The Committee would like that a periodical evaluation of these courses should be carried out and improvements should be made on the basis of experience gained.

3.166. The Committee note that two other colleges viz., College of Engineering, Trivandrum and Thapar Institute of Engineering

and Technology, Patiala are also conducting industry oriented post-graduate courses. The Committee hope that the Board of Post-graduate Engineering Studies of All India Council for Technical Education will seriously consider the question of introducing new industry oriented post-graduate courses in other institutes also as per a programme to be drawn up in that behalf, care being taken to see that leading disciplines/various regions are appropriately covered.

Book Banks

3.167. During their visit to Regional Engineering College, Kurkshetra, the Committee learnt that about 100 important journals could not be purchased due to shortage of funds. The annual grant to library was Rs. 55,000 but the actual requirements was Rs. one lakh.

3.168. During the course of evidence, the Committee enquired whether all technical institutions have Book Banks so that students who have limited means can avail themselves of these book banks. The Additional Secretary, Department of Education. stated:—

“All Regional Colleges and IITs have book banks and we have made a special request to State Governments to extend this programme. The University Grants Commission also has a scheme...this is one of the items included in the 20-point programme. So most of the States are doing whatever is necessary to provide book banks in the various institutions.”

3.169. Asked about the financial assistance given to institutions, the witness stated that a recurring grant of about Rs. 5 lakhs for IITs and Rs. 20,000 to Rs. 30,000 for Regional Engineering Colleges is given for books and journals. As regards grants to IITs for books and journals the Dept. of Education gave the following information:

(Amount in Rs.)

	1974-75	1975-76	1976-77
I.I.T., Kharagpur	11,45,000	15,10,000	18,39,000
I.I.T., Madras .	4,64,591	13,35,702	10,06,851
I.I.T., Bombay	6,16,661	11,71,821	10,94,541
I.I.T., Kanpur	11,59,000	13,53,000	17,50,000
I I.T., Delhi .	10,48,000	9,24,000	14,33,000

3.170. Asked how it was proposed to reduce the disparity between the IITs and the Regional Engineering Colleges, the Additional Secretary, Dept. of Education stated:

“This is a matter which certainly needs to be looked into because the Regional Engineering Colleges are a joint venture. So far they are mainly confined to under-graduate programmes and their research programmes and post-graduate courses are developing and their expenditure on books and journals will depend upon the academic programmes which are undertaken. The recurring expenditure is to be shared between the Centre and the States. As such for whatever extra we want to give the States must be prepared to provide the matching share.”

3.171. As regards the book facilities available in University Colleges, the Secretary, University Grants Commission stated that they are much better than the Regional Engineering Colleges and that the engineering departments run by the Universities are fairly well provided for.

Text Books

3.172. According to the Third Plan document one of the important problems identified while chalking out Plan programmes was adequate supply of Text Books on technical subjects at reasonable prices the method of their production in the country and availability of foreign publications to the increasing number of students. Asked about the present position of the availability of text-books in engineering subjects, the Additional Secretary, Department of Education stated during evidence “...by and large the position is satisfactory, but the whole matter is somewhat complicated because we have to make arrangements for printing and publication of foreign text-books here....”

3.173. The Department of Education have subsequently stated in a note that the University Grants Commission has a general scheme for production of text-books at the under-graduate and post-graduate levels and for making them available to students at reasonable prices. All the subjects taught in the engineering courses are covered under the scope of this scheme. So far, the Commission has approved assistance for production publication of 43 titles in engineering and technological subjects.

3.174. However, as (i) a good number of foreign books have yet to be depended upon, (ii) imported books are beyond the resources of most Indian students and (iii) the production of standard indigenous work would take some time, the Government of India have entered into collaboration arrangements with the Governments of the U.K., the U.S.A. and the U.S.S.R. in 1960, 1961 and 1965 respectively to make available standard university level books originating in these countries, to Indian students at low prices.

3.175. Under the U.K. scheme and the Joint Indo-Soviet Text Book programme, low priced editions of selected titles are reproduced in the U.K. and the Soviet Union, and marketed in India through normal commercial channels. Under the Joint Indo-American Standard Works Programmes, the books are reprinted in India by Indian publishers with a subsidy from the PL 480 funds and sold at about one-fifth of the U.S. retail price.

3.176. The books brought out under all these three programmes are approved by the Government of India in consultation with the expert agencies such as the U.G.C. etc. The titles are normally evaluated from the point of view of their suitability and usefulness to the students. As a general rule where equally good books by Indian authors are available, foreign publications under these programmes are not recommended. Efforts are also made to ensure that only latest editions of the approved titles are published under these programmes. About 640 British, 1460 American and 230 Soviet books have been brought out under these programmes. As far as Engineering and Technological students are concerned apart from standard text books of late a good number of teaching material at the college level has also been brought out by the Curriculum Development Centres in the IITs and the Roorkee University and at the Polytechnic level by the Technical Teachers Training Institutes.

Text Books in Hindi and Regional languages

3.177. The All India Council for Technical Education in their meeting held in April 1972 recommended that a glossary of English terms along with their equivalents in Hindi and regional languages suitable for technical students be prepared in consultation with the Central Institute of English, Hyderabad. The Committee asked about the follow up action taken in this regard and also the arrangements made to make available the text books in Hindi and regional

languages, the Additional Secretary, Department of Education stated thus:—

“This matter was discussed by the All India Council for Technical Education and it was decided that English may continue to be the medium of instruction in the Engineering Colleges, Polytechnics and that if any State wish to make a change, it should not do so without the consent of the Council. Subsequently they have said that the change in the medium of instruction should be brought about only after adequate preparations had been made for supply of text-books, instructional materials and teachers. This is the view taken only recently.

“As the All India Council, did not encourage any change of medium, no efforts were made for the preparation of text-books and other material in languages other than English, now there is a change in the attitude of the Council and we hope to pursue this matter to see that books and other teaching material are made available in Hindi and regional languages.”

3.178. The Committee note that one of the important problems identified in the Third Plan programmes for technical education was adequate supply of text-books on technical subjects at reasonable prices, the method of their production, the availability of foreign publications to the increasing number of students. The Committee have been informed that by and large the present position regarding availability of text-books on engineering subjects was satisfactory, but there were some difficulties in making arrangements for printing and publication of foreign text-books.

3.179. The Committee have been informed that the Government of India had entered into collaboration agreements with the U.K., U.S.A. and U.S.S.R. for bringing out text books in all subjects at low prices. Under the U.K. Scheme and the Joint Indo-Soviet text book programme, low priced editions of selected titles are reproduced in the U.K. and the Soviet Union and marketed in India. Under the Joint Indo-American standard Works Programme, the books are reprinted in India by Indian Publishers with a subsidy from PL 480 funds and sold at about one-fifth of the U.S. retail price. Apart from this, the curriculum Development Centres in IITs and Roorkee University had brought out teaching material at college level. The Committee would like Government to ensure that standard text-books are available to the students at cheap prices. It is also im-

portant that quality text-books in engineering disciplines are printed and published in the country itself. The Committee would like the Government to give serious attention to this problem and take concerted measures to encourage production of quality text books written in the country on technical subjects largely taught in IITs/Engineering Colleges.

3.180. The Committee note that all IITs and Regional Engineering Colleges have established book-banks and that State Governments have been requested to provide book-banks in other engineering colleges also. A scheme in this regard is also being implemented by the University Grants Commission. The Committee desire that concerted efforts should be made to set up book-banks in all such engineering institutions which do not have book-banks so that the students of engineering courses are not denied of adequate book facilities.

3.181. The Committee are unhappy over the inadequate allotment of the funds to the Regional Engineering Colleges for the purchase of books and journals. While the IITs received recurring grant of Rs. 10 to 20 lakhs a year, Regional Engineering Colleges are provided just Rs. 20 thousand to 30 thousand per year. The Committee understand from the Secretary, University Grants Commission that even the Engineering Departments of University Colleges were better equipped with books than the Regional Engineering Colleges. The Committee feel that the question of providing adequate funds to the Regional Engineering Colleges should be considered seriously by the Central Government and State Governments who share the recurring expenditure on a matching basis.

3.182. The All India Council for Technical Education recommended in April, 1972 that a glossary of English terms along with their equivalents in Hindi and Regional languages should be prepared. The Committee understand that the All India Council later on decided that English may continue to be the medium of instruction in engineering colleges and hence no efforts were made for the preparation of text books and other material in languages other than English. As the Council has now changed their attitude, the Committee were assured that the matter would be pursued and steps would be taken to make available books and other teaching material in Hindi and Regional languages. The Committee desire that earnest efforts should at least now be made to translate text-books and other teaching materials as per a well thought out programme to be drawn up in consultation with all those concerned.

CHAPTER IV

CONTINUING EDUCATION

A. Facilities for Continuing Education . .

4.1. In a number of memoranda to the Committee it has been emphasised that continuing education of all engineers is an important requirement in an age where obsolescence of technical skill and knowledge is rapid.

4.2. A leading engineering college in their memorandum to the Committee has stated:—

“Continuing education provided to engineers in profession has been a signal contribution to the profession. Extension of these activities will be fulfilling a great social and professional responsibility besides raising the level of technical services. Apathy, indifference and even interference by some of the benefiting industries is very distressing and indicates the need for enlightenment among industrial managers and administrators both in the public and private sectors.”

4.3. Regarding the facilities available for continuing education, the Ministry of Education and Social Welfare have stated in a note that the All India Council for Technical Education has considered from time to time the issue of providing facilities for continuing education and refresher courses to those working in the industry. Part-time degree courses have been organised for those who have taken up for various reasons their diploma and are desirous of acquiring a Degree. These courses are being organised at 14 Engineering| Technical Institution|Universities such as Jadavpur University, Aligarh Muslim University etc.

4.4. Asked about the number of seats available in these courses, the Additional Secretary, Department of Education stated during evidence that 900 seats for the degree courses and 200 seats at Diploma level are available. Asked whether these courses are organis-

ed in IITs also, the witness stated:—

“We have not organised these courses in IITs or in Regional Engineering Colleges. The general philosophy is that in the IITs the expansion should be, as far as possible, vertical and in other colleges, it may be horizontal. Secondly, since all the expertise has been assembled in the various IITs, it would be more useful to have certain specialised short courses there rather than having expansion of the regular and normal courses.”

4.5. In the report of the Task Force and Steering Group on Education (1973) it has been stated that a lacuna in our educational planning is the absence of multiple points of entry in the system to enable the large number of professionals already in the field to re-equip themselves professionally. The existing system provides only for a single entry point either at the first degree or at the diploma level. To accelerate the process of technological development, our concern should also be for the large number of professionals who need further education and development. This demands flexibility in the technical education system to provide for multiple points of entry for all those who wish to upgrade and diversify their skills, knowledge and competences. Asked about the action taken in this regard, the Additional Secretary, Department of Education stated during evidence thus:—

“We have on the basis of this suggestion of the Task Force, considered a number of items.

We thought we could provide to technicians, in their leisure time, facilities to undertake part-time diploma, degree and postgraduate courses and research facilities. We have also organised short term refresher courses to improve the competence of those who are already in employment.”

4.6. The Department of Education, have in a subsequent written reply stated that the Report of the Task Force and Steering Group on Education (1973) was drafted by the Planning Commission in connection with the formulation of Fifth Five Year Plan and all the recommendations contained therein have not been accepted by the Government of India. The question of multi-point entry in technical education is being considered by the Joint Committee of the All India Council for Technical Education and University Grants Commission. However, on the recommendations of the All India Council, part-time courses at degree and diploma levels are being conducted at several centres in the country for serving personal in industry and institutions.

4.7. Apart from these courses, institutions like Madras Institute of Technology, Madras, Bombay University, Nagpur University are admitting science graduates to 3-year degree course in engineering and technology. Several degree colleges are offering admissions to diploma holders in engineering and technology by allowing them some rebate in the duration of the course.

4.8. Facilities for post-graduate work are also offered to serving personnel in institutions and industry at all institutions conducting post-graduate courses. Thus a system of multi-point entry already exists and no difficulty has been felt in conducting the courses for employed personnel.

Short-term|Refresher Courses

4.9. The Ministry of Education and Social Welfare have stated that in order to help the technical personnel already employed to update their knowledge short-term courses|Refresher courses are also conducted by I.I.Ts and some engineering colleges including the Regional Engineering Colleges.

4.10. Asked whether any review of the utility and scope of the short-term courses and the amount spent on them has been made in consultation with the industry, the Additional Secretary, Department of Education stated:—

“.....the IITs are conducting these part-time courses mainly because they have the necessary expertise. No other institutions would be able to conduct such a course. Therefore, this is a part of the programme undertaken by the IITs. Regional Engineering Colleges have also started conducting some part-time post-graduate courses which are essentially undertaken whenever a demand is made. Compared to the IITs, the Regional Engineering Colleges are still in their formative stages. They have so far been able to organise only two courses... No review has been undertaken of this programme so far.”

4.11. A mention has been made elsewhere in this Report that in pursuance of the recommendations of the All India Council for Technical Education made at its meeting in April 1972, a Joint Committee of the Council and the University Grants Commission was set up in 1974 under the chairmanship of Chairman, University

Grants Commission to review the whole system of engineering education at first degree level. One of the Study Groups appointed by this Joint Committee is studying the various aspects of Continuing Education (Structure to overcome technical obsolescence—Upgrading Competence—Establishing articulate communication links with Industry—in providing possibilities to persons working in one area to get involved in another area of activity etc.). It has been stated by the Ministry that the study by the Joint Committee would be completed by 1980.

Correspondence Courses

4.12. The Education Commission (1964—66) recommended that an immediate beginning should be made to develop a wide range of technical courses through correspondence. It was also suggested in some memoranda to the Committee that correspondence courses in technical education should be started and that these courses be supplemented by practice in laboratories and design offices.

4.13. Asked whether correspondence courses in technical education has been started, the Additional Secretary, Department of Education stated:—

“This programme has not been undertaken because even the capacity that we have has not been fully utilised. Rather, if we are going to lay greater emphasis on practical training, one has to be very careful as to how correspondence course can help because there, the practical input will be still small.”

4.14. The Committee note that certain facilities for Continuing Education in the form of short-term and refresher courses are being afforded by Indian Institutes of Technology and some other engineering institutions for employed persons. Fourteen engineering institutions also conduct part-time courses in engineering for Diploma holders working in the industries in order to help them in acquiring degree qualifications. The Committee attach the utmost importance to the short-term and refresher courses which are aimed at updating the knowledge and skills of engineers working in various industries. In view of the rapid advancement of science and technology, it is necessary that engineers working in various industrial establishments should be afforded adequate opportunities to enable them to update their professional skills. This objective can be served by a well established system of continuing education. The

Committee feel that facilities which are at present existing in IITs and in a few other engineering institutions may be extended suitably to more institutions, in the light of experience gained in this behalf.

4.15. The Committee understand that one of the Study Groups of the Joint Committee of All India Council for Technical Education and University Grants Commission set up in 1974, is studying the various aspects of continuing education. The study by the Joint Committee is expected to be completed by 1980. The Committee hope that the Study Group and the Joint Committee will go into all aspects of short-term, refresher and part-time courses, as also multi-point entry system and suggest measures for effecting improvement. The Committee would like this study to be completed well before the launching of the Sixth Five Year Plan so that concrete measures may be taken in pursuance thereof to improve the facilities.

B. Examination held by Professional Bodies

4.16. The Ministry have stated that institutions such as Institution of Engineers, the Institute of Tele-communication Engineers have provision for awarding their Associate Membership Diploma to those candidates who, after certain years of practical experience, have been able to pass the examinations conducted by them. These Associate Membership Examinations are of the University Degree standard and have been so recognised by the Government of India for purposes of employment.

4.17. In a memorandum to the Committee it has been stated that the examinations held by these professional bodies do not include evaluation of practical work and hence it is not appropriate to recognise these examinations as equivalent to a degree. In another memorandum to the Committee it has been stated that the examinations held by these professional bodies are not of high standard.

4.18. During evidence the Committee enquired whether evaluation of practical work has been introduced in the examinations conducted by professional bodies. The Additional Secretary, Department of Education stated:

“Actually there is no practical examination, but unless a candidate has the prescribed experience, he would not be able to take the examination.....”

4.19. It was suggested in a memorandum to the Committee that the examinations conducted by professional bodies should be recognised by all engineering colleges including IITs for admission to post-graduate courses. Asked whether any guidelines have been issued to the universities and institutions with regard to admitting students holding qualifications from professional bodies, in the post-graduate courses, the Ministry have stated in a written reply that no guidelines have been issued in this regard, but certain universities like Roorkee University and Mysore University have been permitting such candidates to pursue higher studies.

4.20. Asked about the reasons for not following a uniform policy in this regard, the Additional Secretary, Department of Education stated during evidence that "it seems the contents of these courses are not what the universities want it to be." Regarding the conditions for admitting these students, the Secretary, U.G.C. stated that these students have to pass a test for admission to post-graduate courses. Asked about the opinion of the Government regarding admitting students qualified from professional bodies, the Additional Secretary, Department of Education stated that Government have not made any assessment in this regard.

4.21. The Committee note that the membership/graduateship examination conducted by certain professional bodies have been recognised by Government as equivalent to a university degree. The Committee, however, find that no review has been made of the system of examination, curricula etc. by Government so far, although these examinations have been conducted by these bodies for a long time. The Committee would like Government to conduct a thorough review of these examinations with a view to assessing the standards of examination and bringing about improvements where necessary.

4.22. The Committee understand that the examinations conducted by the professional bodies have not been recognised by engineering colleges for admission to Post-graduate courses, except by Mysore and Roorkee Universities which have been permitting such candidates to pursue higher studies. The Committee would like the Ministry to assess the position in the light of experience gathered by the Mysore and Roorkee Universities so that the facilities for postgraduate admission could be got extended by other Universities/Institutions.

CHAPTER V

TEACHERS

A. Qualifications for recruitment to Faculty Position

5.1. In his address at the meeting of the All India Council for Technical Education held in April, 1972, the Minister for Education emphasized the importance of adequate industrial experience for the teachers in the Technical Institutes and desired that the Universities, Engineering Colleges etc., should lay down a minimum industrial experience as an essential requirement for all teaching posts.

5.2. It has been suggested in a Memorandum to the Committee that only those having 3 years industrial experience should be selected to Faculty positions.

5.3. In another memorandum to the Committee, it has been suggested that:

“It is desirable that teachers not only have some industrial experience but also for each subsequent promotion in the hierarchy of the teaching profession, certain period of time in industry be encouraged.”

5.4. The Ministry have stated in a written reply that the following qualifications have been prescribed for teaching posts in engineering institutions.

Engineering Colleges

Professor:

First Class Master's Degree|Doctorate Degree in appropriate field with minimum 7 to 10 years' distinguished experience in teaching|research in institution of University standard at postgraduate level. Specialised knowledge in one more specified fields with experience in guiding research. Professional|Scientific work of outstanding merit would be preferred.

Assistant Professor:

First Class Master's Degree|Doctorate Degree in appropriate field with minimum of five years' experience in teaching|

research in Institution of University standard. Specialised knowledge in one or more specified field/subject with outstanding teaching|research experience and Doctorate Degree or published work of equal standard would be preferred.

Lecturer:

First class Master's degree in appropriate field, with two years industrial|research experience in any Institution of University standard. Doctorate or Degree published work of equal standard desirable.

Polytechnics

Principal:

- (i) First Class Bachelor's Degree in Engineering or Technology or equivalent.
- (ii) 10 to 12 years' of industrial experience in production or design or maintenance and|or teaching experience.
- (iii) Qualities of leadership and organisational ability.

Head of Deptt:

- (i) First Class Bachelor's Degree in Engineering and Technology or equivalent.
- (ii) 8 years' industrial experience in Production or design or maintenance and|or teaching experience.
- (iii) Qualities of leadership and organisational ability desirable.

Lecturer:

- (i) First Class Bachelor's Degree in Engineering or Technology or equivalent.
- (ii) 5 years' industrial experience in Production, design or maintenance and|or teaching experience.

5.5. In very rare cases the candidates possessing exceptionally good industrial experience, where significant contributions were made in the development of technology, the educational qualifications may be relaxed.

5.6. Asked when and on what bases these qualifications were fixed, the Ministry have in a written note stated that the All India

Council for Technical Education at its meeting held on 17th May, 1974 recommended that the revised University Grants Commission scales announced by the Central Government for teachers in Universities and colleges should be made applicable to teachers in engineering colleges and polytechnics. The Council, however, felt that before implementing the decision on the revised pay scales of teachers in engineering colleges and polytechnics, the details of qualifications, experience and other requirements prescribed for various categories of teaching posts in technical institutions should be examined *vis-a-vis* those recommended by the University Grants Commission for teachers in Universities and college for whom the revised pay scales are applicable. The Council authorised its Chairman to obtain the views of the State Governments and appoint a Committee to examine all these questions and take a decision on the revised scales of pay of teachers in engineering colleges and polytechnics on the recommendations of this Committee.

5.7. In pursuance of this recommendation, the Union Education Minister in his capacity as the Chairman of the All India Council for Technical Education, appointed a special Committee under the Chairmanship of Dr. B. D. Nag Chaudhuri, Vice-Chancellor, Jawaharal Nehru University in 1974.

5.8. The Committee submitted its report in 1975 and based on its report, Government of India issued orders in September, 1975 prescribing qualifications for the faculty members in engineering colleges.

5.9. During evidence, the Committee pointed out that qualifications prescribed for lecturers was "First Class Masters Degree in appropriate field with two years industrial/research experience" in which case the mere industrial or research experience would serve the purpose for recruitment. Asked why industrial experience has not been made obligatory, the Additional Secretary, Department of Education stated:—

"Actually this is in general terms. Suppose the post is specifically in research field, when the post is actually advertised, it should be written with two years' research experience etc. when it is otherwise, it should be advertised First Class Master's Degree and industrial experience. . . . It is prescribed in general terms for each category or individual post."

5.10. Asked why the qualification of industrial experience has not been prescribed in the case of other faculty positions like Assistant Professors, etc. the witness stated:—

“...For the post of Assistant Professors, there is an open advertisement every time. But generally it is the lecturers who apply for these posts. For them this qualification has already been prescribed.”

5.11. Asked to state the number of teachers with industrial experience recruited during the last 3 years, the Department of Education have in a note furnished the following information:—

S. No.	Name of the Region	Total No. of teachers recruited during the last 3 years	No. of teachers with industrial experience recruited during the last 3 years
1	WESTERN	587	142
2	NORTHERN	632	102
3	EASTERN	378	109
4	SOUTHERN	438	52
		2035	405

5.12. The Department of Education have further stated:—

“Industrial experience for teachers has been specifically mentioned only in the revised qualifications prescribed at the time of implementation of the revised UGC scale of pay in 1974, on the recommendations of the Nag Chaudhry Committee. It was only because of the lack of industrial experience among the majority of the recruits for the teaching posts in the institutions provision has been made under the Quality Improvement Programme for three months industrial training for each teacher.”

Appointment of faculty members on tenure basis:

5.13. The Department of Education have in a note stated that the following system is adopted in USSR for appointment of teachers in engineering institutions:

- (i) The selection of teachers is made by a selection committee on the basis of merit. The posts are advertised and the desirous candidates apply against these advertisements. During the selection, credit is given to the educational qualifications and to the social work done by the candi-

date. The term of appointment is 5 years. The lowest in the rank of teaching staff is Assistant Lecturer and minimum qualification is a diploma course in the concerned branch of engineering which is of 5 years' duration. After 5 years the post is again advertised and the present incumbent is also considered. If found suitable, he continues. On the initial appointment a report on the work of the teacher is given after first semester by the experienced and senior teachers who listen to his lectures and his defects are told, discussed and rectified.

After two-three years, the Assistant Lecturer is provided with the facility for doing research work leading to the degree of Ph. D. This can be done either in his own institute or outside.

- (ii) The next post is of a Senior Lecturer and the Minimum qualification for this is either a Ph. D. or a diploma with 10 years' teaching experience. The next post in the hierarchy is of a Reader and the minimum qualification for this post is Ph. D. with 10 years' experience. After every 5 years a refresher course of 5-6 months is arranged for all teachers for updating their knowledge. For this purpose teachers from smaller institutions are sent to bigger institutions and from bigger institutions to other specialised institutions. After the refresher course speciality tests are given.
- (iii) Every institute has contact with industry for solving their problems. Specific projects are assigned by the industry to the institutions and for this purpose the teachers who are assigned the job are paid fixed honorarium. The department/institute keeps a watch on the regular progress of work so that no slackness comes in the project. The teachers also keep going to the industry for consultations. In solving such projects research scholars of the institute are also associated. Teachers from engineering institutions also occasionally go to industry for giving lectures.
- (iv) At the time of selection of staff after every 5 years, the directors and chief engineers from industrial establishments are also considered for the appointment to the teaching post. In their cases it may not be necessary that they have prior teaching experience. Teachers with experience and good qualifications from bigger institutes

are also sent to smaller institutes for a period of about 2 to 3 weeks for conducting specialised seminars and to guide teachers of smaller institutes. The students of engineering colleges also go to factories for practicals during their course of study.

5.14. It was suggested in a memorandum to the Committee that "the teaching staff should be on 5 or 10 year tenures to keep them on their toes and to allow some mobility." Asked about the views of the Government on this suggestion, the Additional Secretary, Department of Education stated during evidence thus:—

"I understand that this has been considered and the view is that in our conditions it may not be possible. In the Indian Institute of Science, Bangalore we have this practice but there have been extension after extension of the same person."

5.15. The Department of Education have in a subsequent note stated that besides the Indian Institute of Science, Bangalore, the Regional Engineering College, Surathakal (Karnataka); the Indian Institute of Technology, Madras, and the Birla Institute of Technology, Pilani, have made certain appointments of teachers on contract basis.

5.16. The Committee note that at present qualifications prescribed for recruitment to the post of lecturers in engineering colleges are First Class Masters' degree in appropriate field with two years industrial/research experience. While in the case of polytechnics, industrial experience has been prescribed even for senior posts, principal and Head of the Department, such an experience has not been prescribed specifically for senior posts of Professors and Assistant Professors in Engineering Colleges. The Committee note that out of the 2035 teachers recruited during the last 3 years, only 405 had industrial experience. The Committee feel that under the qualifications prescribed for recruitment to the post of Lecturers in engineering colleges, it should be laid down as to what posts would attract industrial experience or research experience so that the candidates having industrial background are recruited for certain posts and their teaching has a practical bias.

5.17. The Committee are unable to appreciate why in the qualifications for senior Faculty positions like Professor, Assistant Professor, no industrial experience has been prescribed. They were

informed that for the post of Assistant Professor generally the lecturers for whom industrial experience has been prescribed, apply. The Committee are not satisfied with the clarifications for they feel that quite often persons are also taken in the higher grades of Assistant Professors/Professors, directly. The Rules should clearly lay down that industrial experience for a certain minimum period of five years or more is an essential condition for a candidate to be considered for appointment as an Assistant Professor/Professor. The Committee attach importance to this matter as in a developing country like India it is of the utmost importance that teachers in the technical institutions are fully conversant with the problems of the industry so that they devise the curricula and training programmes in such a manner as to equip the students with skills and knowledge which would be pertinent and relevant to the challenges which await them in industry.

5.18. The Committee understand that in several countries it is obligatory for the teachers to refresh their knowledge of industry and for this purpose they are given facilities for being seconded to an industrial unit of excellence relevant to their discipline. The Committee recommend that the position may be reviewed so as to make it obligatory for Professors/Assistant Professors/Lecturers etc. to undergo refresher courses and update their experience of industry first hand. In fact it would be a good idea if it was made incumbent for the teachers in technical institutions to refresh their knowledge of industry before they can be considered for promotion to the next higher post.

5.19. The Committee understand that in USSR teaching appointments in establishments of higher learning are made for a period of five years only after which the appointments are reviewed. After every 5 years a refresher course of 4-6 months is arranged for all teachers for updating their knowledge. The Committee have elsewhere in the Report emphasised the importance of providing first-hand experience in industry to the teachers through refresher and vocational courses. The Committee would like Government to consider whether apart from making the appointments of teachers particularly senior teachers in Institutes of Technology, on tenure basis, it may be laid down that they would be considered for another term only after successfully completing vocational refresher training in the related industry and putting it to constructive and effective use in the teaching programme for the students.

5.20. The Committee understand that in the Indian Institute of Science, Bangalore; Indian Institute of Technology, Madras; Birla Institute of Technology & Science, Pilani and Regional Engineering College, Suruthkal teachers are also appointed on tenure basis.

The Committee suggest that the system followed in these institutions in this regard may be carefully studied with a view to examining the feasibility of introducing it in other institutions.

5.21. The Committee have a feeling that appointment of senior teachers on tenure basis may serve the two fold purpose of ensuring that the teachers give off their best and that only those who have aptitude for the work stay on and that exchange of competent persons between industry and teaching institutions is encouraged.

Pay scale of Teachers

5.22. In a number of memoranda to the Committee it has been suggested that the pay scales of teachers should be attractive. In his memorandum to the Committee a Vice-Chancellor of a University has stated:—

“It is not easy to build a cadre of highly qualified teachers in higher technical institutes. One of the reasons is the scales of pay existing as at present. Industry is inherently attractive to many competent engineers. Unless the salary difference between the teachers and the professionals working in the industry is minimised, it will be difficult to retain competent teachers at engineering and technological institutions.”

5.23. During evidence before the Committee a non-official suggested that “the reward system must be related to the qualifications and productivity”.

5.24. In a written note the Ministry have stated that the Nag Chaudhuri Committee which studied the qualifications for faculty members in engineering colleges, in 1975 also recommended the following UGC pay scales for teachers:—

- | | | |
|-------------------------|-------|---------------------------------------|
| 1. Professors | . . . | Rs. 1500—60—1800—100—2000—125/2—2500. |
| 2. Assistant Professors | . . . | Rs. 1200—50—1300—60—1900 |
| 3. Lecturers | . . . | Rs. 700—40—1100—50—1600 |

5.25. The Department of Education have stated that the instructions of Government regarding implementation of the UGC pay scales were issued in September, 1975. Regarding the actual progress

made in implementing the revised pay scales, the Additional Secretary, Department of Education stated during evidence that IITs had implemented the UGC pay scales for teachers.

-5.26. The Department of Education have in a note in October, 1977 stated that the following State-wise position with regard to the acceptance of the revised U.G.C. pay scales for teachers in Engineering institutions was as follows:—

Name of the State/Union Territory	Remarks
1. Andhra Pradesh	Agreed to implement the UGC pay scales.
2. Assam	UGC pay scales in Regional Engineering College, Silchar have been implemented. Regarding other Engineering Colleges the matter is under consideration of the State Government.
3. Bihar	Implemented the UGC pay scales in all Engineering Colleges except Birla Institute of Technology, Mesra, Ranchi.
4. Gujarat	The matter is under consideration of the State Government.
5. Haryana	Implemented the UGC pay scales in Regional Engineering College, Kurukshetra. The implementation regarding Technological Institute of Textiles, Bhiwani is under consideration.
6. Jammu & Kashmir	UGC pay scales not yet implemented. The matter is being pursued.
7. Karnataka	Agreed to implement the UGC pay scales, only in the Regional Engineering College, Bangalore.
8. Kerala	Not yet agreed to implement the UGC pay scales.
9. Madhya Pradesh	The State Government has not yet accepted the UGC pay scales for Engineering Colleges.
10. Maharashtra	The State Government has agreed in principle to implement the UGC pay scales in Engineering Colleges in the State.
11. Orissa	Implemented the UGC pay scales.
12. Punjab	Department of Engineering of Punjab University has implemented the UGC pay scales. However, the UGC pay scales not implemented in other Engineering Colleges in the State.
13. Rajasthan	UGC scales have been implemented in all the Engineering Colleges. The information in respect of Birla Institute of Technology & Science, Pilani not available.
14. Tamil Nadu	The Government have agreed to implement the revised UGC pay scales in Engineering Colleges in the State.

Name of the State/Union Territory	Remarks
15. Tripura	Accepted the UGC pay scales.
16. West Bengal	UGC pay scales implemented in the case of Engg. Colleges. Regarding four Technological Institute the matter is under consideration of the State Government.
17. Chandigarh	Not yet implemented.
18. Delhi	UGC pay scales implemented.
19. Goa	Implemented the UGC pay scales in Engineering Colleges.

5.27. The Department of Education in a separate note had stated that All India Council for Technical Education in their meeting held in May, 1976 observed that most of the State Governments had not yet implemented the revised pay scales for engineering colleges teachers. The Council observed that "no educational system can give its best unless the institutions can attract, retain the best available teachers and to motivate them adequately. The teacher thus occupies the pivotal position in the educational system". The Council, therefore, reiterated its earlier recommendation that the pay scales as recommended by the University Grants Commission be implemented immediately.

5.28. The Committee note that IITs have implemented the pay scales for teachers as recommended by the University Grants Commission. The Committee also note that so far only 4 States/Union Territories (Rajasthan, Orissa, Delhi and Goa) have implemented the UGC pay scales and 6 States (Assam, Bihar, Haryana, Karnataka Punjab and West Bengal) have partly implemented. Four other States (Andhra Pradesh, Maharashtra, Tamil Nadu and Tripura) have agreed to implement these pay scales. The remaining States are considering the implementation of the UGC pay scales.

5.29. The Committee need hardly emphasise that teaching positions should carry adequate emoluments to attract the best talented persons to teaching profession. The Committee urge the Government of India to make all efforts to persuade the State Governments to implement the revised pay scales for Faculty members in the engineering colleges.

5.30. The Committee feel that with the revision of scales of pay which compare not unfavourably with those prevailing in the industry and other services, it should be possible to attract and retain the services of really competent teachers who are deeply and truly interested in the work of imparting professional education. It may be advisable to take advantage of this revision of scale of pay to link

it up with the system of tenure appointment as recommended in the earlier part of the Report.

Staff-structure

5.31. Asked whether any review of the staff structure in engineering institutions has been made, the Ministry have in a written reply stated that the All India Council for Technical Education at its meeting held on 23 September, 1969 had appointed an Expert Committee to consider the staff structure in the engineering institutions, under the Chairmanship of Prof. P. J. Madan, now Vice-Chancellor of M. S. University of Baroda. The Committee submitted its report in 1972. The All India Council for Technical Education in their meeting held in April, 1972 approved the broad principles laid down by the Committee. The important recommendations of the Committee are as follows:—

- (i) The Committee was of the view that the existing pattern provided for several categories of staff, viz., Professors, Assistant Professors, Lecturers, Assistant Lecturers, etc. The Committee recommended that the lowest formation in the teaching staff should be lecturers.
- (ii) The Committee recommended the following norms for deciding teaching staff structure in future:—
 - (a) Ratio of Senior Teachers to Junior Teachers should be 1:2:4 for Professors, Assistant Professors and Lecturers.
 - (b) Teaching load—Generally the curriculum provides for a total of 900 to 1000 contact hours in a year of 30—32 weeks. This load should be shared by different categories of staff (per week) in the manner given below:—

Principal	4 hours.
Head of Deptt.	10 hours.
Professors	12 hours.
Asstt. Professors	14 hours.
Lecturers	16 hours.

- (c) Grouping of students:—

Lecture class 60

Tutorials, Practicals drawing, Laboratory etc. 20 for I to III years and 15 for IV to V years.

- (d) Leave Reserves/Training Reserves 10% of the sanctioned strength

5.32. The Department of Education have stated that the recommendations of the All India Council were intimated to the State Governments through the Regional Committees to enable them to work out appropriate staff structure for the various institutions in the region.

5.33. When the All India Council for Technical Education approved the recommendations made by the expert committee for revising the staff structure in the technical institutions, the Council recommended that this was an important scheme which should be implemented during the Fifth Plan. While considering the funding arrangement for technical education, the Council had also recommended that the scheme of revision of staff structure should be included in the category of Quality Improvement Programmes. According to the present pattern of funding of schemes, recurring expenditure on such faculty development programmes are primarily the responsibility of the State Governments concerned and hence the resources for these programmes have to be included in the State plans. However, due to difficult financial position, it has not been possible for the States to implement this recommendation of the Council.

5.34. During evidence, the Committee enquired about the progress made in implementing the recommendation of expert committee on staff structure. The Additional Secretary, Department of Education stated:—

“While the staff structures have been worked out, implementation in many States is not satisfactory. The problem of funds comes.....It is in regard to this very matter that we keep on pursuing the matter with the States. But as soon as we start a dialogue, they say ‘we have no funds; why don’t you give us funds?’ This is not very helpful. According to the present pattern of assistance, there is at present no scheme at the centre under which financial assistance could be provided for the scheme. The expenditure on this scheme, therefore, can be met from the State plan. The Central assistance will be available for the plan as a whole.”

“Another important point. If we make an analysis of the expenditure incurred on technical education, particularly colleges etc., the proportion of staff salaries etc. is already very high and if the staffing structure is further modified, the additional expenditure, even if it is incurred, will erode the resources for other important items, raw

materials practical training experiments etc. This is really a difficult position”.

Teacher-pupil ratio

5.35. The Ministry have stated in a written reply that the average teacher-pupil ratio (for both under-graduate and post-graduate courses) is 1:7 in IITs and 1:10 in Regional Engineering Colleges and University Colleges.

5.36. During evidence the Committee enquired whether any guidelines have been issued regarding the optimum teacher-pupil ratio. The Additional Secretary Department of Education replied that the Visitor's Orders issued in September, 1974 to IITs stipulate 1:8 at undergraduate level and 1:4 at post-graduate level and for other colleges the guidelines issued stipulate 1:10 at undergraduate level and 1:5 at post-graduate level. The witness added that they were trying to achieve the ratios stipulated.

Shortage of Teachers

5.37. The Ministry stated (July, 1975) that in the context of formulation of faculty development programme during the Fourth Plan, a survey of the sanctioned staff strength and vacancies was made in 1969.

5.38. The overall shortage in engineering colleges at that time was 15.8 per cent. The shortage of staff at different levels was as follows:—

Institutes	Professors	Assitt./ Associate Profs.	Lecturers	Asstt. Associate Lecturers
(i) Engineering Colleges	18.3%	22.6%	14.0%	9.8%
(ii) Regional Engineering Colleges	38.3%	22.6%	12.7%	8.3%
(iii) Indian Institutes of Technology	34.8%	16.8%	13.2%	24.6%

5.39. On the basis of this survey specific faculty development programmes for teachers to acquire higher qualifications like M. Tech. and Ph. D. and short term programmes for industrial training were formulated. These programmes were launched in 1970 and since then 4029 college teachers have been trained under various faculty development programmes.

5.40. The Ministry stated that as part of the review of the Quality improvement Programme which was being undertaken, a survey of the position of teachers in engineering colleges would be also made. The Department of Education in a note (October 1977) have further stated that an expert committee to critically review the Quality Improvement Programme and its impact on faculty has been set up. This committee which met once in New Delhi suggested to undertake a Sample Survey of the problem. A proforma devised by them has been issued to all Heads of Institutions (Regional Engineering Colleges and other Engineering Colleges) calling for the requisite information.

The latest position regarding the sanctioned staff (teaching) strength and vacancies in IITs is as below:

Name of IIT	Sanctioned Strength	No. of vacancies
IIT Kharagpur	482	78
IIT Kanpur	406	136
IIT Delhi	304	59
IIT Bombay	361	68
IIT Madras	379	50

5.41. The Committee note that the survey of the sanctioned staff strength and vacancies made in 1969 revealed that there was acute shortage of "professors" in Regional Engineering Colleges and IITs, shortage being 38.3 per cent and 34.8 per cent respectively. The Committee are informed that an expert Committee has been appointed to review the Quality Improvement Programme and that as part of the review of the Quality Improvement Programme, a survey of the position of the teachers has been undertaken by the review Committee. The Committee desire that the review should be completed expeditiously.

5.42. The Committee find that an Expert Committee appointed by the All India Council for Technical Education in April, 1972 to consider staff structure recommended a ratio of 1:2:4 for professors, assistant professors and lecturers. The Visitors orders issued in September, 1974 stipulated teacher-pupil ratio of 1:8 at undergraduate level and 1:4 at post-graduate level for IITs. For other colleges the guidelines stipulated the ratio of 1:10 at under-graduate level and 1:5 at post graduate level.

5.43. The Committee are not happy that the Central Government have not kept track of the staff position even in the Indian Institutes of Technology and Regional Engineering Colleges apart from other recognised engineering institutions. The Committee recommend that Government should devise an institutional arrangement by which the position is reviewed once every year so that necessary follow-up action can be taken to see that the vacancies particularly in disciplines which are of greater relevance to the existing state of industrial development are filled up.

5.44. The Committee also suggest that a comprehensive review in depth may be made in the fourth year of the each plan period, so as to assess the actual position and take timely measures to see that deficiencies do not continue into the next Plan period.

Teaching of junior classes by senior Faculty Members

5.45. The Committee set up to review the working of IIT Madras in its report (1971) stated that it is important for the senior members of the Faculty to participate in the undergraduate teaching as it is necessary to provide adequate inspiration to the young students for acquiring scholarship and to provide correct orientation and philosophy of the course content.

5.46. Asked about the action taken on this recommendation, the Additional Secretary, Department of Education stated during evidence that the Visitor's orders issued in September, 1974 on the basis of the Review Committee Reports *inter-alia* state "a senior faculty member should be encouraged to handle Junior Classes".

5.47. In a written reply the Ministry have stated that the progress of the implementation of this decision has been quite satisfactory in all the IITs.

5.48. The quantum of post-graduate (including Masters, Doctoral and Post-doctoral) work at the Regional Engineering Colleges is comparatively less than that of in the IITs. The Senior teachers therefore are in a position always to devote adequate time to the under-graduate classes also. Faculty members both in the IITs and the Regional Engineering Colleges devote most of the time in their respective institutions. They are allowed to go to other institutions and participate in discussions in their fields of specialisation or take on projects of interest to them, without prejudice to their normal teaching/research programme in the concerned institution.

5.49. The Committee note that orders of the Visitor issued to IITs in September, 1974 require that senior Faculty members should be encouraged to handle 'Junior Classes'. The Committee were informed that the implementation of the decision has been quite satisfactory in all IITs. In Regional Engineering Colleges the post-graduate and research work was comparatively less heavy than in IITs and senior teachers were in a position to devote adequate time to the under-graduate classes also.

5.50. The Committee desire that heads of institutions should make sure that senior Faculty members not only take classes of undergraduates, but also take active and sustained interest in teaching and practical work at the under-graduate level so as to provide proper orientation to the course and inspire the students to achieve excellence in their respective subjects.

Evaluation of Teachers' Performance

5.51. It has been stated in a memorandum to the Committee that many teachers do not (i) engage in research (ii) take up industrial consultancy and (iii) keep themselves upto date with modern developments. At present, promotions become automatic because of pressures applied by teachers' organisations. These aspects have caused deficiencies in education. Asked about the views of the Government in this regard, the Additional Secretary Department of Education stated during evidence:

“As regards recruitment of teachers, the general practice except in the case of engineering colleges etc. run directly by the State Governments is that there is no automatic promotion. In these colleges, because they have organised services, the State Public Service Commissions come into the picture and there is a regular system of promotion. In other institutions faculty position, by and large, is advertised and the respective merits of the applicants are considered before appointments are made. Our view is that in highly specialised fields such as technical education, there should not be automatic promotions.”

5.52. Asked whether the State Governments also followed this method, the witness stated:—

“...that is why we are encouraging more and more engineering colleges should be run by autonomous boards rather than by the State Government directly.”

5.53. The Department of Education have in a subsequent note stated that different Institutions/Universities have varied methods for evaluating the performance of the faculty members of the Institutions. Generally the performance of the students, research and consultancy work done by the particular staff member along with his involvement in the institutional (primarily) academic activities including the maintenance of laboratories and workshops and handling of lecture classes, etc. are taken into consideration. The All India Council for Technical Education in May, 1976 recommended that a review of the Quality Improvement Programme should be made. A detailed picture of the methods of evaluation in vogue in various Institutions/Universities would be available when the review of the Quality Improvement Programme is carried out by this Committee.

5.54. It has been represented to the Committee that in some engineering colleges promotions to higher posts are made as a matter of routine without categorically evaluating the performance of the teachers. It was admitted by the Department of Education that in the highly specialised fields such as technical education, there should not be automatic promotions.

5.55. The Committee were informed that the performance of the students, research and consultancy work done by the particular staff member along with his involvement in the institutional academic activities including the maintenance of laboratories and workshops and handling of lecture classes etc. are taken into consideration while evaluating the performance of a teacher. The All India Council for Technical Education in May, 1976 recommended that a review of the Quality Improvement Programme should be made. A detailed picture of the methods of evaluation in vogue in various institutions/universities would be available when the review of the Quality Improvement Programme is carried out by the Review Committee.

5.56. The Committee need hardly stress that the review should be completed at the earliest. The Committee, however, desire that in the meantime, board guidelines regarding the system of promotions to be followed by the various Engineering Colleges/Institutions may be evolved. The system for evaluation should, besides the performance in teaching, take into account the research work and consultancy work done by the teachers. The guidelines may be reviewed after the report of the Review Committee of the Quality Improvement Programme is received.

Exchange of Teaching Staff among IITs.

5.57. The Reviewing Committee of the I.I.T, Kanpur (1973) recommended that staff exchange programme amongst Indian Institutes of Technology and Indian Institute of Science, Bangalore and also with other technical institutions in the country should work out and implemented.

5.58. Asked to state the action taken on this recommendation, the Department of Education have stated in a written note that this recommendation along with recommendations of other Reviewing Committees of the IITs was considered by the Visitor and orders issued in September, 1974. The visitors orders contained *inter-alia* the direction:

“The IIT within the funds available under the ‘Quality Improvement Programme’ should draw a programme of exchange of their faculty with other technical institutions and provide opportunities in IITs for training of faculty from other technical institutions/technical Departments.”

5.59. The Department of Education had further stated that the modalities for implementing this have been prepared and the same have to be approved by the Boards of Governors of IITs. During evidence, the Additional Secretary, Department of Education informed the Committee that “the recommendations have been approved by all Boards of Governors except that of Kanpur IIT which is likely to meet shortly. But even there, without waiting for formal approval, they are going ahead with the programme. They are deputing one of their senior professors to go and work in the Indian Institute of Science”.

5.60. Asked about the reasons for delay in implementing the Visitor’s Orders which were passed in September, 1974, the witness stated:—

“All these institutes are autonomous bodies governed by their Memorandum of Association. Necessary changes have to be made in them in order to enable the exchange programme. Otherwise, if a teacher is deputed to some other organisation that service may not be counted for various purposes giving rise to complications. I agree that two years should not have been taken. The Visitor’s order is in general terms and one has to spell out precise conditions; all the same it should not have taken two years.”

5.61. The Department of Education has in a subsequent note furnished the following Institution-wise position regarding implementation of the faculty exchange programme.

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|---------------|--|
| IIT Kharagpur | . One Prof. of the Institute is working at the IIT Delhi. |
| IIT Madras | . One Lecturer of the Department of Mechanics of the Institute has been deputed to IIT Bombay. |
| IIT Bombay | . The Institute has deputed two Professors one each to IIT Delhi and Madras and in exchange have availed of the services of three faculty members one from IIT Delhi and two from IIT Madras. |
| IIT Delhi | . A regular scheme has been formulated for this programme and three exchange visits of one year duration have already been effected within the IITs and one short visit has taken place from IITs Bangalore. |
| IIT Kanpur | . The Exchange programme of the Institute with other Institutes of Technology and Institute of Science, Bangalore is facing difficulties due to
(i) Housing shortage;
(ii) Difficulty in schooling for children. |

5.62. More interaction will be developed in future in areas of inter disciplinary research mutual interest.

5.63. The Committee note that the Review Committee on IIT Kanpur recommended as early as 1973 that staff exchange programme amongst Indian Institutes of Technology and Indian Institute of Science and also with other technical institutions should be worked out and implemented. The orders of the Visitor directing the IITs to draw up a programme for exchange of faculty members with other technical Institutions were issued in September, 1974.

5.64. The Committee are disappointed to find that the progress made in implementing the Faculty Exchange Programme amongst IITs and Indian Institute of Science is very slow. In the case of IIT, Kanpur the recommendation has not been implemented at all on the plea that there is shortage of accommodation, and difficulties in schooling for children.

5.65. The Committee desire that there should be more earnest consideration of the idea underlying the exchange programme and the IITs should arrange for inter-change with a view to enriching the experience of the Faculty members and adding to the knowledge and experience of the students. The Committee would like to be informed within six months of the mechanisms and details of the scheme worked out and the progress made in implementing it.

5.66. The Committee would also suggest that in the light of experience gathered such inter-changes may also be extended as between Regional Engineering Colleges, between IITs and Regional Engineering Colleges and between Regional Engineering Colleges and State Government Engineering Colleges with a view to providing deeper and more varied knowledge to students.

B. Quality Improvement Programme

5.77. The Ministry of Education & Social Welfare have stated in a note that as part of the measures to improve the tone of technical education, Government of India launched the Quality Improvement programme in 1970. The Quality Improvement Programme as approved by the Ministry has two broad programmes viz. Faculty Development Programme and Curriculum Development Centres which have been established in all the IITs and the Roorkee University.

5.78. Under the Faculty Development Programme the following two types of programmes are being organised:—

(i) Long Term Programme:

To stimulate creative research activity in the institutions as also to improve the quality of teaching, it is necessary that the teachers themselves should have adequate post-graduate and research experience. With this end in view, provision is made under the Quality Improvement Programme to depute teachers from the engineering colleges to selected centres for working towards a Master's degree or a doctoral degree as the case may be. The period of deputation in the former case is two years, while in the latter case it is 3 years. During the period of deputation, teachers are paid their normal salaries by their sponsoring institutions and in addition are granted a stipend of Rs. 300/- p.m. in case of Master's degree candidates and Rs. 400/- p.m. in case of doctoral candidates. Admissions under this programme were started in 1973 and upto 31st March 1977, 526 teachers for M. Teach. Courses and 506 for Ph. D. programmes were enrolled.

(ii) Short-term Programme

(i) Under the Programme of Faculty Development, there is also provision for providing industrial/field training for teachers of the institutions for a period upto 3 months in the areas of specialisation relevant to them. Each teacher deputed for industrial training is paid, in addition to his normal salary, the travelling cost to proceed to the training centre and also a pocket allowance of Rs. 300/- p.m.

(ii) A number of short term refresher courses are also organised at each of the Quality Improvement Programme Centres so as to update the knowledge of teachers. From 1971 to 1977, 1135 short-term refresher courses were conducted and 23122 teachers participated. The Ministry have further stated that "a good number of these programmes are practical oriented."

5.79. The expenditure incurred since the inception of the Quality Improvement Programme till 1976-77 is indicated below:—

Year	Expenditure (Rs in lakhs)
1970-71	29.66
1971-72	58.34
1972-73	61.15
1973-74	63.37
1974-75	75.55
1975-76	78.16
1976-77	76.80
TOTAL	443.03

5.80. The Ministry have also stated that a good number of teachers have now undergone this programme and are, therefore, in a position to influence the thinking in the institutions and among the teaching community. The All India Council has recommended at its meeting held in May, 1976 that a review of the impact made by the programme on the teachers may be made. Under this review an assessment of the programme on the improvement of standards would also be made.

5.81. The Department of Education have in a note in October, 1977 stated that an expert Committee to review the Quality Improvement Programme and its impact on the Faculty has been set up. This Committee held its first meeting in August 1977.

5.82. The All India Council recommended in April, 1972 that a high level professional unit should be set up in the Central Ministry of Education for the overall execution, co-ordination and direction of all the Quality Improvement Programme.

5.83. Asked whether such a unit has been set up in the Ministry, the Additional Secretary, Department of Education stated:

“...the Indian Society for Technical Education (ISTE) is conducting this programme on behalf of the Government. This is a high professional body. We are now considering the question whether the stage has not been reached when Government should directly take over this work.”

5.84. Asked to state the specific action taken on this recommendation of the All India Council, to set up the high level professional unit in the Ministry, the witness stated:—

“That has not been considered, we have started examining it now.”

5.85. Regarding the details of the society to whom the work of organising the Quality Improvement Programmes had been entrusted, the witness stated:—

“This is an Association of Principals of Technical Institutions which has converted itself into this society. It is a registered society with a constitution.”

5.86. Explaining how the recommendation of the All India Council was not considered the witness stated:—

“The Society was entrusted with this task before this recommendation was made. As I have already said, it is unfortunate that this recommendation was not considered. I confess this is a slip on our part....”

5.87. Asked to state the full details of the functions of the ISTE, the Department of Education have in a note stated that on the analogy of the Association of Principals of Technical Institutions in the United Kingdom, the Association of Principals of Technical Institutions (APTI) (India) was founded in the year 1941. With the rapid expansion of technical education facilities as also activities, the need for a wider range of initiatives and programmes was felt and it was decided that the efforts in this direction needed wider participation of not merely the syllabus of the institutions but the whole faculty and even more, all those interested in the promotion of technical education in the country on sound lines. With this in view the APTI (India) at its general body meeting in 1968 resolved to establish a new organisation, comprising all interested in technical education including administrators and teachers. This organisation, the Indian Society for Technical Edu-

cation in which the earlier APTI was merged is registered under the Societies Registration Act.

5.88. The aims and objectives of the Indian Society for Technical Education fall under five broad categories:—

- (1) Advisory role at the national level
- (2) Information and dissemination
- (3) Institutional services
- (4) Teacher Services
- (5) Activities under the Quality Improvement Programme of the Ministry of Education.

5.89. The constitution of the Indian Society for Technical Education provides for an Executive Council consisting of the President, the immediate past President, Honorary Treasurer, members elected from among the total membership with the Council membership for each 300 members or part thereof, 2 members nominated by the Council to represent special interests and the Secretary. As a mark of recognition of the useful role played by the ISTE, the organisation has representation on the All India Council for Technical Education, its various Boards and the Regional Committee.

Total Number of summer/winter and/or other schools conducted by ISTE for Engg. Colleges and Polytechnics teachers since 1972 and the amount given by Government to the Society for organising these courses are:

Year	Engg. Programmes	Polytechnic Programmes	Amount given
1972	28	38	16,92,200
1973	32	31	20,00,000
1974	30	23	14,50,000
1975	25	22	17,00,000
1976	23	22	17,00,000
TOTAL	138	136	85,42,200

5.90. It has been suggested in a memorandum to the Committee that the Quality Improvement Programme would be effective if instead of individual teachers, all the teachers in one department or a group of teachers from one department are sent for training. If one individual teacher is given training, it will not be possible for him to introduce change in the training of students. If training is given to all the teachers in one department or a group of teachers in one department, the changes in the training of students can be brought about effectively.

5.91. Asked about the views of the Government on this suggestion, the Ministry have in written reply stated that at present under the Quality Improvement Programme individual teachers are being selected for training. When the matter came up for consideration before the All India Council for Technical Education, it was observed that the authorities concerned are not in a position to depute a large number of teachers for the various Quality Improvement Programmes without upsetting the work at the sponsoring institutions, since the number of teachers available in the department is just adequate and the institutions are not in a position to spare many teachers at the same time. On the other hand, it might be true that sponsoring a number of teachers from the same department might result in a better impact of the experience of training when these teachers return to the institutions. However, this matter will be taken into consideration by the committee, being appointed to review the Quality Improvement Programme.

Summer Schools

5.92. The Ministry have stated that under the Quality Improvement Programme, a scheme of Summer/Winter Schools Programme is being organised since 1970 by the Indian Society for Technical Education. The aims of the Summer Schools Programme are given below:—

- (i) Updating the knowledge and skills of teachers.
- (ii) Providing an opportunity for teachers of engineering colleges for improving their organisational and pedagogical skills.
- (iii) Providing an opportunity for interaction and mutual exchange of ideas between teachers.
- (iv) Providing an opportunity for teachers to familiarise themselves with modern engineering practice including the latest technological methods adopted by industry.

(v) Opening up before teachers new vistas in technology at the frontiers of knowledge and the challenges and opportunities, these provide to the dedicated and hard working.

5.93. On an average about 60 programmes of 2 to 4 weeks duration are conducted every year. About half the number is intended for the Faculty of the college and the other half for the Faculty of the polytechnics. So far 6200 teachers have been trained under this programme.

5.94. Regarding the contents of summer institutes programmes it has been stated in a memorandum to the Committee that:—

“Summer institutes too often stress on advanced research topics and hence of marginal value to teachers of first degree engineering colleges. Preferably there should be summer institutes on how better to teach undergraduate subjects, exchange opinion etc.”

5.95. In another memorandum to the Committee it has been suggested that summer school programmes would be effective if real life problems of industry are discussed.

5.96. A leading engineering institution has stated in their memorandum to the Committee thus:—

“It should be obligatory on the part of every teacher in the country to attend short courses organised by the higher institutions during summer and winter vacations in a phased manner according to their field of interest. Experience shows that although some teachers have attended many short-term programmes, there are others who have not taken part in any programme whatsoever.

There should also be an assessment of the performance of the teachers in short courses to ensure their sustained interest in such programmes.”

5.97. It has been stated that the Standing Committee of the Indian Society for Technical Education has highlighted two major difficulties pointed out by the participants of the summer schools programmes:—

- (i) inadequacy of equipment and teaching aids like slide projectors, etc. and
- (ii) the inflexibility of the syllabus of instruction and difficulties in taking prompt action to update the same.

5.98. Asked about the action taken in this regard, the Additional Secretary, Department of Education stated during evidence that the Standing Committee of the ISTE highlighted these problems in December, 1974. The matter was considered by the All India Council for Technical Education at their meeting held in May, 1976. The problems have been brought to the notice of the State Governments who have to take action. He added "the general consensus among the teachers as well as administrators in charge of educational institutions is that summer and winter school programmes should be extended so as to give all teachers a reasonable chance of attending at least one programme."

5.99. Regarding the action taken by Universities, the Secretary, U.G.C. stated:—

".....the syllabus has to be revised by universities and they do take time to do so; the Directors of Public Instructions and others come into the picture and it takes time..... if engineering Colleges become antonomous Colleges they can frame their own syllabus.....one or two teachers who come from these courses know the new things; but if the syllabus has to change it is not those two teachers who could do it. That is why we recommended that some of the good engineering colleges should be declared as auto-nomous colleges, then they may not have to wait for months and years."

Teaching Methodology

5.100. Asked whether any review of the present teaching processes|methodology in the engineering institutions, particularly in IITs, Regional Engineering Colleges, has been made, the Department of Education have in a note stated that no review of the present teaching processes|methodology in the engineering institutions, including IITs has been made. However, it has been considered that if the standard of professional education is to be maintained at a satisfactory level taking into account the developments in the professional field and related areas, the need for revision of curriculum and consequently the methods of instructions, teaching material etc. also is important. It is in view of this only that the curriculum development centres have been set up. During the course of their working, curriculum development centres not only are charged with the responsibility of revising the curriculum, but also with the responsibility of suggesting improvements in the preparation of instructional material both for the teachers and students as also the methodology of teaching etc.

5.101. The Committee enquired whether Personalised Self-Instruction or Team Scheme method of teaching|learning has been tried out in any IITs. Regional Engineering Colleges etc. The Department of Education have in a note stated that Personalised self-instruction or team scheme method of teaching|learning as such had not been tried out in any Regional Engineering College, IIT etc. However, the importance of the faculty working as a team to devise the curriculum and draw the teaching programme taking into account the learning process of the students has been kept in view, particularly in the institutions like the IITs and the Regional Engineering Colleges and some of the better known engineering colleges. This sort of collective effort including the students reaction and encouraging the students to learn in stages the various topics prescribed has been thought of. Since this scheme is a new innovation and also pre-supposes an element of the teachers themselves being not only competent in their subject disciplines but also in this specialised method of teaching, it takes some time before the scheme could be successfully and effectively launched in an acceptable fashion in our institutions.

Industrial Training for Teachers

5.102. The Ministry have stated that under the Programme of Faculty Development, there is also provision for providing industrial|field training for teachers of the institutions for a period upto 3 months in the areas of their specification.

5.103. During their visit to Regional Engineering College, Kurukshetra, the Committee understood that:—

“Last year 20 teachers were sent for summer school training for one month. It was felt that it would be advantageous if the teachers could be sent for three to six months training to leading industrial establishments to brush up their knowledge about the latest technological developments,”

5.104. The Ministry have stated that the progress of the programme of training of teachers in industry was reported to the All India Council at its meeting held in May, 1974. It was observed that “the implementation of the programme was not satisfactory. According to the existing arrangements, the selection of teachers and their placement was made by the Directorates of Technical Education and Regional Offices for training in industry for a period of three months. Neither the teachers nor the Directorates of Technical Education in the States responded to this programme in any significant manner. It was suggested that the programme be re-

organised and converted into a programme of industrial residences for a period of one to two semesters. The details of the programme be worked out after the proposal to increase the duration of the training has been accepted."

Regarding the action taken by the Government on this observation of the Council, the Ministry have stated in a note that the All India Council for Technical Education at its meeting held in May, 1976, taking into account that the State Governments have not been able to relieve the teachers for training for longer periods and also the fact that the teachers themselves are reluctant to go for such long term programmes and further considering that funds available for the purpose were limited, recommended that the programme of training of teachers in industry during vacations be continued as at present and that all the teachers who need training be covered in the next five years, wherever necessary, the training being provided under the Apprenticeship Act.

5.105. The Department of Education have in a note stated that the following systems are adopted regarding updating of the knowledge of faculty members in engineering institutions in Federal Republic of Germany and Japan.

In Federal Republic of Germany

The Professors in technical universities update their knowledge on their own by involving themselves in active research work. The Professors who have large industrial experience always remain in touch with the industries and solve a lot of industrial problems in their Faculties. The younger teachers update their knowledge by working under senior and experienced Professors and by helping them in their research work. The senior Professors invariably encourage their young teachers to do independent research work. The young teachers can acquire new qualifications by doing research and by attending classes of their choice in their own universities while working under senior Professors.

In Japan

The Ministry of Education, Government of Japan, offers some fellowships under which teachers of private colleges or universities can be attached to faculties in the national Universities for a period of about a year. This system is

basically meant to provide opportunities for teachers from smaller colleges to upgrdate their knowledge. The industries in Japan themselves sometimes send their engineers to Universities as also their research and development divisions try to keep in touch with University Faculty members to get new ideas as well as guidance in some of their problem. There is an informal system in Japan through which industry take help of the Academic Community. It should be mentioned that sometimes the engineering students are attached to industries for a period of few months to a year before they graduate.

5.106. The Committee are surprised that the entire Quality Improvement Programme including summer schools which involve considerable expenditure is being conducted by the Indian Society for Technical Education, a private organisation of teachers. The expenditure on this programme has increased from Rs. 29.26 lakhs in 1970-71 to Rs. 76.80 lakhs in 1976-77 and the total expenditure on this programme till March 1977 was Rs. 443.03 lakhs. The total amount given to the Indian Society for Technical Education alone for organising these courses from 1972 to 1976 is Rs. 85,42,000. The All India Council for Technical Education as early as April, 1972 had recommended that a high level professional unit should be set up in the Ministry of Education for the overall execution, coordination and direction of the Quality Improvement Programme. But the recommendation of the All India Council was not considered due to a serious omission on the part of the Department of Education. The Committee regret to observe that this is a sad reflection on the working of the Ministry. The Committee would like the Government to investigate why no follow up action on this recommendation was taken and fix responsibility therefor. It should also be ensured that in future conclusive follow up action is taken promptly on the recommendations of the All India Council for Technical Education.

5.107. The Committee desire that immediate steps should be taken to set up a high level professional unit in the Department of Education for overall execution of the Quality Improvement Programme.

5.108. The Committee have been informed (October 1977) that an expert committee was set up to review the impact of the Quality Improvement Programme, in pursuance of the recommendations of the All India Council for Technical Education made in May, 1976

and it held its first meeting in August 1977. The Committee desire that this review should be completed expeditiously. They hope that this review committee would cover all aspects of this programme and its utility. It should be particularly examined how far the present programmes both long term and short-term are really useful and what improvements and modifications are necessary. The Committee are anxious that the short-term courses especially summer and winter courses should really be effective and that teachers should take up these courses seriously and not merely treat them in a casual manner. Further, there should be a regular system of deputing teachers for these courses to enable all teachers to avail themselves of the benefits of these courses, if found useful.

5.109. The Committee note that no review of the present teaching methodology has been made. They suggest that the modern methodology of teaching, communication skill, multi-disciplinary approach in teaching, etc. prevailing in technically advanced countries like USA, UK, Germany, USSR and Japan may be studied with a view to suitably adopting useful aspects of the same in India.

5.110. The Committee suggest that while reviewing the summer school programmes, the review committee should also look into all the aspects including teaching methodology, communication skills, discussions on live problems etc. as part of the summer school programme.

5.111. The Committee note that at present under the Faculty Development Programme, teachers in engineering institutions are sent to industry for practical training for a period upto 3 months. At their meeting held in May, 1974, the All India Council for Technical Education recommended that the Programme be reorganised into a programme of industrial residences for a period of one to two semesters. However, the All India Council at its meeting held in May, 1976 recommended that the programme of vocational training as at present, be continued in view of the fact that (i) State Governments have not been able to relieve teachers for longer periods, (ii) teachers themselves are reluctant to go for such long term of programmes and (iii) the availability of funds for the purpose is limited.

5.112. The Committee consider that the industrial training for teachers would be useful in giving them first hand experience of latest technological development and practical and technical problems faced by the industry requiring new skills, expertise to be developed in different disciplines.

5.113. During their visit to the Regional Engineering College, Kurukshetra it was suggested to the Committee that it would be advantageous if teachers could be sent to the industry for three to six months. The Committee urge the Government to review the usefulness of the present industrial programme for teachers and take appropriate steps to ensure that the industrial training given to teachers is made more and more meaningful, relevant and purposive.

C. Exchange of teachers between institutions and industry

5.114. In the Review Report of the IIT Delhi (1972) it has been recommended that "a programme for the exchange of teachers of the Institute and experts engaged in design, research and construction projects within the country, should be drawn up and implemented."

5.115. In a number of memoranda to the Committee it has been suggested that there should be a regular exchange of practising engineers in industry and faculty members in engineering institutions.

In a memorandum to the Committee it has been stated:—

".....teachers must be given adequate industrial orientation and they should be sent to industry from time to time for short span of time for exchange with experienced men from Industry who have academic interest and who can be helpful in healthy inter-action between the Industry and the academic Institutions—vital for proper blending of education and training of the students."

5.116. In another memorandum, it has been stated:—

".....It may be necessary to draw up schemes by which there could be a more meaningful and continued inter-action between the institutes and industries. One of the means by which this may be achieved is by drawing the experience and expertise of practising managers to teach the students during their academic sessions in the institutes. Also, perhaps, a percentage of the total teaching staff in the institutes may have to be reserved for the practising managers."

5.117. In a paper on "Strengthening the Links between the Higher Education and the Industry in Training Engineers in the USSR" presented at the UNESCO Seminar held in New Delhi in April, 1976, it has been stated:—

"The existing statutes in USSR provide that establishments of higher learning may appoint prominent specialists work-

ing in industry as professors and award them in accordance with the existing procedures the academic title of professor and thus accord them the same rights as are enjoyed by persons who already work in the system of education.

The employment of prominent specialists in industry in the system of education allows to introduce a significant element of modernisation into the teaching process, a spirit of realism and helps the field of education to respond better to the demands of practice."

5.118. During their visit to Western Region, the Committee held discussions with the representatives of the State Governments. It was stressed during the discussions that:—

"Technical persons from the industry should be seconded to the engineering institutes. There should also be a system of regular exchange between the teachers in the engineering institutes and the technical men in the industry."

5.119. Asked about the action taken on the recommendation of the Review Committee on IIT Delhi regarding organising exchange of teachers in engineering institutions and practising engineers in industry, the Additional Secretary, Department of Education stated during evidence:—

"In 1974 on this recommendation no decision was taken by the Visitor but recently the Council welcomed the proposal for new programmes and suggested that the Secretariat might formulate a pilot project.

".....If I may digress a little, many years ago it was suggested that there should be an exchange between the universities and the Government. Unfortunately that exchange has remained only one-way traffic. Whosoever came from the universities has stuck up in Government. So, one will have to work with great care any programme with private industry. It might be easier with the public sector but with the private industry I am not sure whether real meaningful programme could be worked out without going into the minutest details.

.....just now my attention has been drawn to the fact that as far as public sector units are concerned they are going to make a beginning. This has already been discussed with a number of public undertakings. In the light of

these discussions a pilot project will be prepared and we will put it before the Council.”

5.120. Regarding the position in Universities, the Secretary, University Grants Commission stated during evidence thus:—

“The universities have a scheme called National Associate Scheme where selected teachers during the course of a year, cover a period of five years go and spend three months or so in different research laboratories whether in the university system or outside. We have extended this scheme. Previously our teachers from the engineering faculty could do it but now people from industry could come and spend a period of three to four months. We support this scheme in a small way. What you were referring to was a formal exchange. Here we have initiated a scheme whereby you go and spend and also they come and spend three to four months in the laboratories.

Secondly, with the new pay-scales the old problem of university people going and stuck up in the Government will not be there because there is no major monetary gain. Secondly, they feel they have got much more mental and creative feeling in the university and as such they will prefer to come back to the university. They are coming back. We have now a Visiting Professor scheme whereby people from industry can come and work in Universities for a year or so.”

5.121. When pointed out that in USSR and West Germany there was close collaboration between the industry and the institutions and that free exchanges were taking place, the Additional Secretary, Department of Education stated:—

“.....nobody can dispute the usefulness of such a scheme but in both these countries there is much more mobility of personnel than in our country.....”

He added:—

“... what I said was that we have been slow in implementing it. There have been difficulties. Every country is developing its own administrative culture depending on a variety of factors. You referred to the case of USSR and West Germany. A few more names could be added to

them. For instance, in Canada unless someone has worked at four or five places, he is not considered to be experienced enough for a senior assignment. In a country like ours nobody thinks of leaving organisation easily. One of the factors is immobility. I was mainly referring to the administrative culture that has developed here....”

5.122. The Committee note that the Review Committee on IIT, Delhi had recommended as early as 1972 that a programme for the exchange of teachers employed in the Institute and experts engaged in industry should be drawn up and implemented. However, no decision on this aspect was taken at the time of issue of the orders of the Visitor in 1974 on the report of the Review Committee on the working of IITs. The Committee have been informed that the All India Council for Technical Education in their recent meeting had suggested that the Secretariat might formulate a pilot project in this regard. The Committee are unhappy at the delay in reaching a decision on this important recommendation of the Review Committee on IIT Delhi.

5.123. While the Committee can understand that there might be some administrative difficulties in implementing the scheme of exchange of teachers and experts, they feel that considering the usefulness of the scheme, these difficulties could have been sorted out particularly in case of exchange programme with public undertakings. They note that such schemes are in operation in other advanced countries like West Germany, USSR etc. The Committee desire that the pilot project, suggested by the All India Council of Technical Education should be prepared and implemented without further delay. Based on the experience of the working of the pilot scheme, it may be extended further by making suitable improvements, where necessary. The Committee would like to be informed about the progress made in this regard.

5.124. The Committee find that in case of universities, a scheme of visiting professors from the industry has been introduced. The Committee desire that this scheme may be studied carefully for adoption in Indian Institutes of Technology and Regional Engineering Colleges.

CHAPTER VI

LINKAGE BETWEEN INSTITUTIONS AND INDUSTRY

A. Linkages between Institution & Industry

6.1. The Ministry have stated in a written reply that one of the main programmes in technical education taken up during Fifth Five Year Plan was establishing linkage between technical institutions and industry. The All India Council for Technical Education at their meeting held in May, 1974 considered this matter and suggested that the following measures may be taken up by the engineering institutions to develop fruitful relationship and close collaboration and interlinking between technical education and industry.

- (i) Organisation of cooperative programmes like apprentice-training, sandwich courses and practice school.
- (ii) Periodic review in consultation with the University, as necessary, of the design and orientation of courses to ensure that they meet the operational and design requirements of industry.
- (iii) Organisation of short-term and other courses for benefit of people in industry in the areas to meet their specific needs.
- (iv) Assignment to the students of projects related to the live problems of industry, to be identified by mutual consultation between the institution and the industry.
- (v) Provision of facilities, as may be feasible, for further, if necessary, non-formal education for personnel already in industry.
- (vi) Organising special seminars, symposia etc. with participants drawn both from industry and institutions.
- (vii) Organising "Open Days" to give industry an opportunity to have a look at the activities and problems of the institutions.

6.2. A copy of Department of Education letter No. F. 1-13/74-T. 2 dated 20 September, 1974 containing the recommendations of the Council and the instructions of the Government in this regard is given at Appendix V.

6.3. In a note, the Ministry of Education and Social Welfare have stated that the IITs and Regional Engineering Colleges have taken the following measures to develop linkage with industry:

- (a) Many of the faculty members of the IITs are well associated with the industrial problems and have established good contacts with the industries in the regions. About 3500 industrial consultancy projects were undertaken by these institutes during the last four years. Consultancy projects undertaken have been concerned with systematic investigation of raw materials, and development of new processes and products, conditions and the understanding of scientific principles behind technological operations.
- (b) The Regional Engineering Colleges have established close links with the industries. Nine colleges are offering industry oriented Postgraduate courses (Sandwich Courses). These courses are being offered in close collaboration with the industry. Guest professors are invited from industry to deliver lectures on certain topics. Some of the industrial projects are taken as a basic work and allotted to postgraduate students as project works. Many postgraduate students work on their thesis at the industry itself, the latter providing all facilities for conducting the experiments. These Colleges are also doing consultancy work on various industrial projects.

6.4. In a memorandum to the Committee the following measures *inter alia* have been suggested for establishing close linkage between institutions and industry:

“The institutions and industry must get together to strengthen practical training, to improve guidance given to students and to plan a fruitful industrial exposure. Simultaneously, industry could use this young manpower for solution of small specific problems.

“The institutes have much to offer to industry in terms of consultancy services for solution of specific problems. Such work is beneficial both to industry which finds a solution to its specific problems and to the institutes. The institutes and their staff benefit by a recognition for rendering a much needed national service, by an enrichment of the experience and a sense of involvement in an active professional capacity.”

6.5. In the Report of the Seminar on Cooperative Education held at the Birla Institute of Technology & Science, (BITS), Pilani in

January, 1977, the following details of the Practice Schools organised by the Institute have been given:—

“The practice school as a part of the educational programme was started by BITS in 1973 and has become popular with students in all disciplines including engineering, science, management pharmacy, economics and English, the various areas in which BITS awards degrees. This programme envisages batches of students and teachers drawn from different disciplines to physically reside for a period of six months in industry, R and D organisations, Banks etc. and continue the educational process of the students in the real life setting by using real life problems as a vehicle for education. The host organisation where BITS practice schools have been located are 17 in number.”

Industrial Liaison Boards

6.6. The Ministry have stated in a written reply (Oct. 77) that the most concerted effort to involve industry in the planning and conduct of courses, research and development of the Institutions is the formation of Industrial Liaison Boards in the following 13 States and 3 Union Territories:

1. Andhra Pradesh
2. Assam
3. Bihar
4. Gujarat
5. Haryana (decided to constitute the Industrial Liaison Board).
6. Karnataka
7. Maharashtra
8. Punjab (decided to constitute an Industrial Liaison Committee on the pattern of Gujarat Industrial Liaison Board)
9. Rajasthan
10. Orissa
11. Tamil Nadu
12. Uttar Pradesh
13. West Bengal.

Union Territories:

1. Chandigarh
2. Pondicherry

3. Goa, Daman and Diu.

Constitution of Board

6.7. The Constitution of the Liaison Boards does not follow a uniform pattern in all the States, but majority of the States have the following constitutions:

1. Chief Minister or Minister of Education.—*Chairman*.
2. Secretary, Technical Education.
3. Secretary, Industry.
4. Five Members from Industry and Commerce nominated by State Governments.
5. Representative of Employee's Association.
6. Director, Board of Apprenticeship Training.
7. Regional Officer, Ministry of Education and Social Welfare.
8. Vice-Chancellor of a University in the State nominated by the State Government.
9. Four persons from engineering and technological institutions in the State.
10. One representative from Departments of Government like PWD, Transport etc.
11. Director, Technical Education.

Functions of the Board

The functions of these Boards are enumerated below:

- (i) To formulate and recommend training programmes in industry for students, fresh graduates and diploma holders and teachers of technical institutions.
- (ii) To formulate Sandwich or Cooperative Courses in collaboration with Industries.
- (iii) To solicit and recommend problems from Industry on research, design development and production and to assign them to suitable technical institutions.
- (iv) To evolve and recommend exchange of personnel between industries and technical institutions.
- (v) To evolve and recommend liaison between industry and the institutions for consultancy practice of technical teachers.
- (vi) To arrange and recommend refresher courses for serving technical personnel on some modern subjects in collaboration with technical institutions.
- (vii) To advise for the admission of students to part time cour-

ses and solicit cooperation of Industry in providing necessary facilities, and concessions to their personnel pursuing part time courses at degree or diploma level.

- (viii) To solicit and recommend coordination of the Industry in sparing of qualified staff for participation in the educational programmes of institutions such as visiting teachers, discussion leaders, examiners etc.
- (ix) To appoint standing committees, panels, study groups and sub-committees of various branches of studies as required from time to time and to carry on the recommendations and decisions of these committees.

6.8. Other States where these Boards have not yet come into being, have been advised by the Government to constitute them. Some of the States like Kerala have not constituted these Boards as they feel that their functions could as well be carried out by the Boards of Technical Education. The question of constitution of these Boards is, however, being followed up with those State Governments who are yet to constitute them.

6.9. The Industrial Liaison Boards, so far constituted have started functioning only recently and as such a review of their working will be made in due course to assess the impact.

6.10. The Committee note that the All India Council for Technical Education has recommended a number of steps for establishing meaningful linkage between engineering institutions and industry like organising sandwich courses, periodical review of curricula in consultation with the industry, organising short-term courses for employed personnel, undertaking consultancy services, assigning live problems to students as project work etc. The Committee need hardly stress the importance of close linkage between the engineering institutions and industry as it not only would enable the engineering institutions to produce the technical personnel required by the industry but would also help the industry in resolving technical problems and challenges facing them. In short, it would help in developing a need-based and job-oriented system of education in technical institutions. The Committee are, however, anxious that these measures for establishing close linkage should be implemented by the various engineering institutions and the Industry in actual practice. For this purpose both the engineering institutions and industry would have to make concerted efforts and ensure that the linkage between them which would be of immense mutual benefit, is not only maintained but continuously strengthened. The Committee would like that the Department of Education should play

an effective role in this matter and closely watch the implementation of these programmes and resolve difficulties, if any.

6.11. The Committee understand that the Birla Institute of Technology and Science, Pilani has achieved some success in establishing linkage with industry by organising practice stations in industry and research laboratories etc. where the students continue their educational process in the real life setting by using real life problems. Such practice stations would not only make the students aware of the world of work but would develop in them willingness to work with their own hands rather than aspiring for white collar jobs. The Committee would like the Department of Education to carefully study and evaluate the working of these practice stations and if found suitable commend it for adoption by other engineering institutions, with such improvements as are considered necessary in the light of the experience.

6.12. The Committee note, that in 13 States and 3 Union Territories, Industrial Liaison Boards have been constituted and these have been entrusted with a wide variety of functions like formulation of training programmes in industry for students, recommending exchange of personnel between industries and technical institutions, etc., which would go a long way in fostering inter action between engineering institutions and industry. The Committee desire that setting up of Industrial Liaison Boards in other States/Union Territories may be vigorously pursued. The Committee further suggest that the working of these Boards may be periodically reviewed with a view to effecting improvements in their functioning.

B. Industrial Consultancy Centres

6.13. On the basis of the recommendations of the All India Council for Technical Education made in their meeting in 1974, the Ministry of Education and Social Welfare recommended in September, 1974 that well established technical institutions like Indian Institutes of Technology, Engineering Colleges or Postgraduate Departments and the University Departments where facilities and expertise are available for undertaking research, design and calibration work should set up consultancy centres. These Centres are to be headed by full time staff members on full time or part-time basis for promotion of work. These Centres are to work as links between industry and technical institutions, to enable the existing expertise and capacity in terms of man and machinery, to be effectively used for the growth and development of industry based on indigenous know-how competence etc. on the one hand and the competence

of the institution on the other. The Centres are to be self-supporting. However, in the initial stage of one or two years if there is any additional expenditure on this account the same is to be met from the overall budget/plan provision of the Institutes/States Governments.

6.14. Most of the State Governments have finalised their rules for consultancy. In majority of the institutions, the fees derived from consultancy practice are distributed among the institutions and the staff members approximately in the ratio of 40:60. At the last meeting of the Council of IITs held on 17 April, 1976, the Council has given certain guidelines for consultancy practice which are given below:—

- (i) "The Council felt that in the formative stages of consultancy service, the rules should be flexible to help expand the activity. It was felt that consultancy services should be encouraged, so as to bring the institutes closer to industry, to train the students to solve actual problems facing industry and to augment the resources of the Institutes to enable them to take up mission oriented research. At the same time care should be taken to see that the main functions for which the Institutes have been established, viz. teaching and research, do not suffer. The Council was of the view that income from consultancy services should not be taken into account as revenue for purposes of calculating the grant, but such earnings should be used for developing the departments which would, in turn, improve the quality of consultancy service. However, in case of income from routine testings and for use of computers by outside agencies the same may be treated as revenue.
- (ii) The Council further desired that the Institutes should establish closer links with professional consulting engineers and also take steps to promote exchange of personnel between the industry and IITs. The Council recommended that the students who have an aptitude and could be useful should also be involved in the consultancy work.
- (iii) The Council resolved that the Institutes should frame proper guidelines for governing consultancy services of the IITs on the basis of above observation.

6.15. In a written reply, the Department of Education have stated that all the five Institutes of Technology are extending consultancy

services. Their earnings during each of the last four years are as follows:—

	Rs in lakhs			
	1973-74	1974-75	1975-76	1976-77
IIT Kharag pur	1.47	0.88	N A	8.00
IIT Kanpur	2.44	1.53	2.96	4.31
IIT Bombay	3.42	3.54	8.68	11.21
IIT Madras	4.03*	5.30	8.38	12.94
IIT Delhi	1.00	2.00	5.06	5.70

*Consultancy and Testing

6.16. The Committee have been informed that the Regional Engineering Colleges Kurukshetra, Nagar and Allahabad have set up consultancy centres. The Regional Engineering Colleges at Srinagar, Calicut and Jaipur have engaged themselves in active consultancy with many establishments. Regarding the engineering colleges under the State Governments the State Government of Tamil Nadu have sent the recommendations of the All India Council for Technical Education to all the technical education institutes for setting up of the industrial consultancy centres as and when considered necessary.

6.17. During evidence the Committee enquired about the reasons for low earnings from consultancy services by IIT Kharagpur and Kanpur. The Additional Secretary Department of Education stated thus:—

“ This is certainly one of the items to assess the performance of the IITs but I would submit that this may not be the main item the revenue aspect does indicate the volume of consultancy work. The only answer I can give you is that Kanpur has started this service only in 1975. In one year's time it has picked up considerably. Therefore, we hope that the performance will be improved still further in the years to come. The view that Kanpur is an industrial base is one-sided. It has mainly textile industry. This may be one of the reasons why we have not got enough consultancy work ”

6.18. The Committee also enquired whether students are involved in consultancy works, as recommended by the Council of IITs.

The witness stated that "in certain selective projects, students have been involved in IIT, Madras and Delhi."

Directory of facilities available for Consultancy Service.

6.19. The All India Council for Technical Education in their meeting held in April, 1972, recommended that:—

"The Secretariat should take steps for early compilation of a basic directory setting out, institution-wise, the expertise and capabilities which the different Institutes of Technology, the Engineering Colleges and polytechnics have so far provided, and what each can provide hereafter, in terms of consultancy functions for and liaison with industry. Likewise industry should compile another documentation on its own part setting out the problems and purposes for which different undertakings may need consultancy and liaison with the institute of technology and technical institutions. Based on these individual compilations, both from the side of industrial undertakings and the institutions, the Secretariat should compile, as early as possible, a comprehensive compendium of the information so collected. Copies of the documentation should be made available for bringing about better linkages between industry and the institutions of technology and technical education to Members of the Council, the State Governments and the Central Ministries, the various educational and technological institutions and industrial undertakings as well as others interested in the subject. The compendium can be refined and brought up to date as time goes on, but the initial compilation should be brought out without delay."

6.20. Asked about the action taken on the recommendation, the Additional Secretary, Department of Education stated during evidence that "R&D committees are taking up this work."

6.21. In a subsequent written reply, the Department of Education have stated that "all the technical institutions, Directors of Technical Education, Federation of Indian Chambers of Commerce and Industry and other similar organisations have been requested to furnish the required information for compilation of the basic directory. The matter is being pursued'. In November 1977, the Department of Education informed the Committee that "the Universities, Engineering Institutions, various industries (through Federation of

Indian Chamber of Commerce and Industry) have been approached to furnish requisite information. About 230 institutions and industries have replied so far. Information is being compiled and the remaining institutions reminded."

6.22. The Committee note that on the basis of the recommendations of the All India Council for Technical Education, the Department of Education issued instructions in September, 1974 to State Governments, IITs and Regional Engineering Colleges that Industrial Consultancy Centres should be set up in well established institutions such as Indian Institutes of Technology, engineering colleges and university departments where facilities and expertise are available for undertaking consultancy work. The Committee understand that at present consultancy services are being extended by all the five Indian Institutes of Technology and some Regional Engineering Colleges. The Committee consider that undertaking of consultancy work by the engineering institutions is very important to keep the faculty alive to the needs of the industry as also to create greater awareness among them of the industrial problems which would make them better teachers. Consultancy work would thus contribute greatly to the faculty development and in improving the effectiveness of teaching and the standard of technical education. The Committee recommend that consultancy centres may be set up in leading engineering colleges which have already established a name for themselves. The Committee would like the Department of Education to pursue the question of setting up consultancy Centres with the State Governments and engineering institutions concerned vigorously, where these have not been set up so far.

6.23. The Committee are concerned to note that while IIT Madras and IIT Bombay earned Rs. 12.94 lakhs and Rs. 11.21 lakhs respectively during 1976-77, the IIT Kanpur earned only Rs. 4.31 lakhs. The Committee desire that wider publicity may be given to the consultancy services available in these institutions so that the Industry is aware of the expertise available in the institutions and the extent to which the Institutions can help in the solution of the problems of the industry. The Committee urge the Ministry to keep a close watch over the consultancy services rendered by the IITs and Regional Engineering Colleges with a view to effecting improvements wherever necessary. The Committee also feel that while evaluating the performance of the IITs, and Regional Engineering Colleges, the quality and extent of consultancy services rendered by them may also be taken into consideration. . .

6.24. The Committee would like to sound a note of caution in developing the consultancy services. It may be ensured that the relationship between the industry and the institution may be one of mutual benefit and that students may be involved to the maximum extent possible; under no circumstance the consultancy service may be allowed to come to a point where teaching and instructional work suffers. Continuous vigilance may be exercised by the Management of the technical institutions and engineering colleges to see that the consultancy services are developed and expanded on the right lines from the beginning and that no malpractices are allowed to creep in.

6.25. The Committee are distressed to note that though the All India Council for Technical Education recommended as early as May, 1974 that the Secretariat of the Council (Ministry of Education & Social Welfare) should compile a basic directory setting out institution-wise the expertise and capabilities which the different engineering institutions have and what each institution can provide in terms of consultancy services to industry, the directory has not yet been prepared. The Council further recommended that the industry should compile another document on its own, setting out the problems and purposes for which different firms may need consultancy services from institutions.

6.26. It is well known that some of the engineering institutions have a team of highly qualified engineers and possess modern sophisticated equipment and other facilities. This expertise and the facilities are not being fully and effectively utilised as the industry is not fully aware of the expertise and equipment available in these institutions. Industry is also not sure about the extent to which the problems encountered by them can be solved by these institutions. It is therefore, necessary that the expertise and capabilities available in each institution may be identified and made known to the industry. The Committee consider that the two documents would be of immense help to the industries/institutions in identifying the problems where consultancy services may be developed for mutual benefit. The Committee urge the authorities to expedite the compilation of the two directories.

C. Researches in Engineering Institutions

6.27. The Task Force & Steering Group on Education recommended in 1973 that "it is necessary to identify such of the emerging important areas of science and technology in which technical education system could make significant contributions in the light of facilities and expertise available and/or that could be created." Asked about the action

taken in this regard the Additional Secretary. Department of Education stated during evidence thus:—

“The National Committee on Science and Technology set up a panel in December, 1975 to identify the areas and the panel identified the following areas for intensive and analytical studies in terms of immediate future of 1985 and the likely future in the year 2000 AD. These areas are: (1) energy generation and needs, (2) food, (3) transport, (4) communications, (5) urbanology and slum problems, (6) rural development, housing, management and education.....The IITs other technical institutions are associated with these panels. This is done by the Department of Science and Technology and our Ministry is associated with it as a nodal Ministry.”

6.28. In a written reply Government have stated that the Sub-Groups on these areas have been set up and they are expected to give their interim reports shortly offering ample qualitative analysis and indicating areas of intensive quantitative modelling in futurology research. The Department of Education in a note (October, 1977) stated that the recommendations made by the various technical sub-groups of the Futurology Panel have been placed before a Working Group which shall prepare an integrated document in the end of December, 1977. The interim reports will be available at the end of June, 1978.

6.29. During evidence, the Committee referred to the speech of the Minister of Education at the meeting of the All India Council of Technical Education in May, 1976 in which he said that our technical institutions should become agencies in the task of utilisation of scientific knowledge for the solution of simple problems which beset the common people of this country, and wanted to know the specific steps taken in this regard. The Additional Secretary of the Department of Education stated thus:

“...The general statement in regard to the utilisation of the services of technical education in solving the problems of the common man related, mainly to food, water, housing, etc. . . . it will be seen that the growth of technical education in this country during the last 20 or 25 years has been quantitative, it is only now that we are laying greater emphasis on qualitative aspects. We have, therefore, advised the technical institutions that while their emphasis should still remain on the educational aspects, they should as a part of their research and extra curricular

programmes undertake study of problems which would benefit the common man in respect of these three items."

6.30. Regarding the specific projects undertaken by the Institutions, he listed the following projects:—

- (1) Study of Ground Water resources.
- (2) Desalination of water.
- (3) Schemes on Slum Clearance.
- (4) Low income housing
- (5) Research on new construction material.

6.31. When asked about the specific instances in which these efforts of the institutions have been actually made use of in the field, the Additional Secretary, Department of Education stated that on the basis of research efforts of the IIT Kanpur, a low-cost housing project in the villages roundabout Kanpur was taken up. Pre-fab school buildings have also been constructed. On the basis of another project, production of cement from rice-husk has been taken up by a private firm. Asked whether commercial viability of these projects has been established so that these could be taken upon a mass scale, the witness stated that these are in the nature of pilot projects.

6.32. In a memorandum to the Committee, it has been stated:

"As far as research in IITs is concerned, most of the research is "West-oriented" and "subjects" of research do not have practical utility to the industry. There is need for promoting research in more applied subjects which have direct relevance to the growth of industry. As a matter of fact, greater selectivity of subjects should be exercised on the basis of problems of industry which should be identifiable in the terms of the concrete issues. Only then perhaps the fullest advantage of the research can be obtained."

6.33. In the orders of the Visitor issued by the Ministry on 5 September, 1974 to all the IITs it has been stated that:—

"Inter-disciplinary research should be the principal direction of growth in the IITs during the 5th Plan. The IIT should work closely with the CSIR, R & D Department of Ministry of Defence, Department of Space and Aeronautics, Department of Heavy Engineering, Ministry of Petroleum and Chemicals and other interests like Irriga-

tion and Power etc. to locate valuable inter-disciplinary programmes of importance for which these establishments would contribute both financially and in the shape of provision of experts and sponsorship of candidates. Within the overall fund available for the IIT during the 5th Plan periods at least 20 per cent should be earmarked for such programmes."

6.34. During evidence the Committee enquired how the research projects were chosen. The Additional Secretary, Department of Education stated:—

"Our submission is that by and large these research projects are based on Science & Technology Plan and they are relevant to the country's needs. The main point which I would like to emphasise is that these research projects are based on the Science and Technology Plan which has been approved by Government at the highest level. These are bound to have relevance to our present day needs As far as IITs are concerned the bulk of these projects would be on the applied side. It is not that there is no fundamental research at all."

He added:—

"I can give a very broad idea by saying that in each IIT about 20 to 35 per cent of research is of a fundamental nature. The rest 65 to 80 per cent is applied. The basic and fundamental research is mainly in pure science like Physics and Chemistry."

6.35. As regards inter-disciplinary research programmes, the Ministry have stated that all the IITs have taken up such research programmes. The IIT wise position is as follows:—

IIT DELHI:—

Several projects of inter-disciplinary research sponsored by the organisations like CSIR, R & D Department of the various Ministries have always been undertaken by the Institute from time to time. In 1975, Finance Committee of the Institute earmarked an amount of Rs. 22.1 lakhs for the IIT to initiate new activities in important projects of Science and Technology, especially inter-organisation in character.

The following inter-disciplinary research centres have been established at the Institute:—

- (a) Bio-Medical Engineering.
- (b) Bio-Chemical Engineering.
- (c) School of Radar Studies.
- (d) Industrial Tribology and maintenance Engineering.
- (e) School of Materials Science & Technology.
- (f) School of Systems and management Studies.
- (g) School of Bio-Sciences.

IIT BOMBAY

At the undergraduate level four courses of 30 lectures each are offered in the last four semesters as electives to all the undergraduate students in the Environmental Engineering and Systems engineering. Other inter-disciplinary areas taught in undergraduate programme are operations research and industrial engineering. In 1976 two broad based programme for M. Tech. degree in Material Science and Industrial Engineering|Operation research have been started. Action has also been initiated to start M. Tech. programme in Environment Science and systems and control engineering from July 1977. Emphasis is also laid for project work on live problems from Industry and involvement of sponsored candidates from public Sector Undertakings. The Senate of the Institute has appointed special Committees for each inter-disciplinary programmes for organisation of instructions, building up of new laboratory facilities and planning industrially oriented projects.

IIT KHARAGPUR

The Institute of Technology, Kharagpur has taken up several inter-disciplinary programmes|projects such as Radar Communication Centre, Rice Process Engineering Centre, Rural Development Centre and inter-IIT Collaborative programmes on Energy studies and Ocean Engineering etc.

IIT KANPUR

The Institute of Technology Kanpur has four inter-disciplinary programmes leading to Master's degree and Ph.D which are actively conducted in the areas of Nuclear Engineering, Computer Science, Industrial Management and Engineering Science and Materials Science. In all these centres effective interaction between basic

Science, Social Sciences and technological faculty have taken place. A number of students have been admitted in these inter-disciplinary programmes who are pursuing higher studies in these areas. As a result of their accomplishment the Materials Science has been developed into an advanced centre and the computer science has also been recommended to become the regional Computer Centre Catering to professional needs as well as to modern scientific teaching in the areas of computer system. Several other inter-disciplinary sections have been initiated in the areas of Bio-systems and Environmental Science.

IIT MADRAS

The Institute has several inter-disciplinary Centres like Bio-medical Engineering, Centre for Systems and Devices, Computer Centre, Energy Research Centre, Sophisticated Instrumentation Centre, Fibre Reinforced Plastic Centre etc. For this purpose faculty drawn from various disciplines are working on inter-disciplinary projects. For example Bio-medical Engineering has Physicists, Mathematicians, Electrical, Mechanical and Chemical Engineers working in it. Computer Centre has faculty from Electrical, Chemical and other disciplines.

Joint Research Centres

636. Asked whether any joint research centres have been set up by the industry and institutions, the Department of Education have in a note stated that the Department of Science and Technology has started Research and Development Centres where continuous development of industries in small scale sectors through provision of research and development facilities is contemplated. Department of Science & Technology has 17 such R&D Committees which include the Development Commissioner, Small Scale Industries, CSIR Laboratories and the Technical Institutions. The main functions of these Committees are to study and identify the problem of design, development and production posed by the small scale units and refer them to the appropriate institutions for expert advice. The Industrial Liaison Boards established in most of the States on the advice of the All India Council for Technical Education also permit this sort of industry/institution, link and in course of time it is hoped that the Research Centres with industrial participation will be active in the Institutions. It may, however, be mentioned that in certain technological areas where the organised industry is traditionally quite enlightened and experienced and has taken the initiative for

development, such Research Centres exist, for instance, Ahmedabad Textile Research Association, the South Indian Textile Research Association at Coimbatore, Selection Art Silk Mills Research Association (SASMIRA) Bombay have such research activities where a number of Institutions are associated with the industry. The National Institute of Foundry and Forge Technology is another example where for purposes of development many of the industries are assisting the Institution in its activities.

6.37. The Committee note that at present about 20 per cent to 35 per cent of the research work taken up in IITs is of a fundamental nature and that the rest 65 per cent to 80 per cent is applied nature. The fundamental and basic research is mainly in pure sciences like Physics and Chemistry. The Committee are not convinced that engineering institutions like IITs should devote as much as 20 per cent to 35 per cent of their resources for research in pure sciences. The Committee need hardly point out that researches in IITs and other engineering institutions should have greater relevance to the needs of the industry and development. Some of the engineering institutions have gathered team of highly qualified scientists and engineers and possess modern sophisticated equipment and other facilities. The Committee are anxious that the expertise and facilities available in these institutions should be fully utilised for research and solution of important live problems of the industry and the community.

6.38. The Committee note that the engineering institutions have taken up some projects like ground water resources, desalination of water, schemes on slum clearance, low income group housing and research on new construction material. They also note that the panel of the National Committee on Science and Technology has identified certain areas for intensive and analytical studies. The sub-groups on these areas with which IITs and other engineering institutions are also associated have submitted their reports. The recommendations made by these sub-groups are being considered by a working Group which shall prepare an integrated document by the end of December, 1977. The interim reports will be available by the end of January 1978. The Committee urge that the report of the Working Group should be expedited and conclusive action taken on the recommendations.

6.39. The Committee suggest that after these studies are completed special areas for research should be identified and allocated to the engineering institutions so that the available expertise and facilities are put to the best use. The Committee need hardly stress that de-

tiled estimates of the time and money required for each research project should be made and a periodical watch kept on the progress made.

6.40. The Committee note that one of the most significant approaches in recent years in the field of research and development relate to inter-disciplinary approach. This has been correctly identified in the orders issued by the Visitor in September, 1974 on the reports of the Review Committee on IITs. The IITs have taken up a number of inter-disciplinary research programmes particularly in Bio-Medical Engg., System Engineering, Environmental Engineering, Material Science, Bio-Sciences, Rural Development, Energy problems. etc. The Committee feel that such inter-disciplinary programmes of importance should also include the problems of the common man which are represented by the need for water for irrigation and drinking, shelter particularly for those in the low-income groups and agro-industrial technology which is relatively simple and can effectively contribute towards development.

6.41. In commending the inter-disciplinary approach the Committee have not only in view teams drawn from different Faculties working on a specific problem, but meaningful and well-coordinated research and development effort being undertaken by the IITs and engineering colleges in conjunction with the national research institutions, laboratories, industries etc. The Committee feel that this concept and approach have undoubted potential and relevance to our present conditions and it is therefore of the utmost importance that Government should bring about close and meaningful cooperation and coordination between the Institutions to take up problems of national importance e.g. agro-industries for rural development, mass housing, transport etc., and provide the necessary funds and facilities as per a time bound programme, monitor the progress in order to lend a helping hand to resolve difficulties and above all see that the results are commensurate with the effort and investment and are in fact pressed in use to accelerate the process of development.

6.42. The Committee note that the Department of Science and Technology had set up 17 R & D Committees which study and identify the problem of design, development and production posed by the Small Scale Units and refer them to the appropriate institutions for expert advice. The Committee also note that certain associations are taking up research activities with which the engineering institutions are associated. The Committee were informed that research centres with industrial participation would be established in engineering institutions in course of time. The Committee need hardly

emphasise that such research centres with industrial participation would be very beneficial both to the institutions and industry. The Committee suggest that the progress made in establishing such centres should be kept under close watch.

Researches in Solar Energy

6.43. The Ministry stated in a written reply (April 1977) that the Indian Institute of technology, Madras had taken up the following three major projects in the areas of utilisation of solar energy:—

1. Development of a three-ton Solar Air-conditioner.
2. Development of Vapour Absorption Refrigeration Systems working on Solar Energy.
3. Development of 10 KW Solar Power Station for Rural Communities.

(i) Development of a three ton solar airconditioner:

The project is sponsored by the Department of Science and Technology and is nearing completion. The solar airconditioner has been designed and fabricated. The testing is in progress (October 1977).

(ii) Development of Vapour absorption refrigeration systems working on Solar Energy:

The project is sponsored by the Department of Science and Technology through the ESNP division of Bharat Heavy Electricals Ltd., New Delhi. Under this project, the responsibilities are allocated as follows:—

Phase I—Complete design of the system and its components—
IIT Madras.

Phase II—Fabrication of the components BHEL, New Delhi.

Phase III—Assembly and testing—IIT Madras.

Phase II has just now been completed.

This is a joint project under the Indo-German Science and Technology Agreement. This Project is financed by the Department of Science and Technology with the ESNI division of the BHEL which is keeping close contact with the Ministry of Energy. Progress achieved so far includes the Thermodynamic analysis of the cycle to fix the working condition, system design and design of solar energy

collection and storage systems. The project is expected to be completed by early 1978.

The progress made in other solar research projects taken up at IIT, Madras is as follows (November 1977):

(i) *Intermittent Solar Refrigerator Ph. D. Project*

A small unit using the Ammonia Absorption Cycle has been designed and fabricated. The testing and analysis are in progress.

(ii) *Heat and Mass Transfer Analysis of a Solar Generator—Ph.D. Project*

Analysis has since been completed and experiments are in progress.

(iii) *Analysis of Solar Power Plant—M.S. Project*

Computer simulation and analysis of a Solar Thermal Power Plant have been initiated.

(iv) *Comparison of performance of a convention flat plate collector and a winston collector—M.S. Project.*

The Units have been fabricated and testings in progress.

(v) *Solar Cooker-Laboratory project*

A Solar cooker (popularly known as Solar Bucket) has been fabricated and tested. Improvements are planned.

On request from Tamilnadu Government, designs for a 500 litres Day Solar Still, for installation Krusede Islands (near Rameswaram) have been provided.

6.44. During evidence the Committee enquired whether any review of the researches on solar energy undertaken by IIT, Madras was made. The Additional Secretary, Department of Education stated:—

“This precise programme was started only in 1974 and as such, no review has been made. But the fact is that other national laboratories and the National Committee on Science and Technology have on the basis of their review, considered it desirable to give them more project in this field. This indicates that they are satisfied about the competence of the Institute to undertake high level work in this sphere. The National Committee on Science and Technology have given them projects in this field.”

6.45. The Committee note that Indian Institute of Technology, Madras has taken up a number of important programmes of research in Solar Energy. The Committee have been informed that the project regarding Solar Air-conditioning has been designed and fabricated and the testing is in progress. The one on Vapour Absorption Refrigeration system working on Solar Energy, is being processed and is expected to be completed by early 1978. Besides a number of other programmes including Solar Cooker-Laboratory project are at various stages of research. The Committee urge that the progress made in these research programmes should be regularly monitored so as to ensure their completion within the stipulated period.

6.46. The Committee need hardly point out that energy is an essential infra-structure and input for developmental processes. It is well-known that even amongst the developing countries the availability of energy in India is relatively low. It is, therefore, of the utmost importance that taking advantage of our equatorial geographical conditions and abundance of sun-shine, concerted efforts are made to have a break-through in solar energy. In this context the Committee would like to point out that priority should be given to projects like development of solar power stations for rural communities refrigeration systems of relevance to rural community so that solar energy can be made available in economically viable form and comparable rates in rural areas where the overwhelming majority of Indian people stay. The Committee feel that this is an area where it is of the utmost importance that there should be a well-coordinated and integrated effort by institutes of technology, research, industry etc. so as to achieve the requisite break-through at the earliest. The Committee attach great importance to these recommendations and would like to be informed of the precise action taken in pursuance thereof.

6.47. The Committee further desire that concerted action should be taken for commercial exploitation of the successful research projects expeditiously.

D.—Linkage between IITs and other Institutions and Research Laboratories

6.48. The All India Council for Technical Education at their meeting held in April, 1972 considered it necessary that an institutional mechanism should be evolved to promote collaboration among National laboratories, Institutes of Technology and Universities to undertake major research and development projects for the technological development of our country. The Council recommended

that to this end the National Committee on Science and Technology be requested to appoint a Committee of all the interests concerned.

6.49. Asked whether any guidelines have been issued regarding collaborative links to be established by IITs with other institutions and research laboratories, the Department of Education have stated in a note that the orders of the Visitor issued on 5 September, 1974 after considering the Review Committee Report on IITs, *inter-alia* provide:—

“Selective programmes of exchange of faculty between the IIT on the one hand and engineering departments, research laboratories of the CSIR, R&D establishments etc. on the other hand should be developed by the IIT. Similarly, inter-IIT exchange of faculty is to be encouraged on a larger scale.”

6.50. During evidence, the Committee were informed that a Standing Inter-Ministerial Committee headed by the Director-General, Council of Scientific and Industrial Research has been set up in 1974 for bringing about greater collaboration between IIT and C.S.I.R. laboratories so that facilities available in these organisations are more formally linked. In a note it has been stated by the Government that this is a permanent standing committee to monitor in the interest of greater utilisation of available resources between IITs and National Laboratories and to facilitate greater collaboration. No formal report is expected to be submitted by this Committee. This Committee has so far held only three meetings in September, 1974 February, 1975, and January 1977.

6.51. At their meeting held on 17 September, 1974 the Inter-Ministerial Committee set itself to the following specific objectives initially:—

- (i) To identify areas of cooperation with CSIR organisations, institutions controlled by UGC and IITs, identify possible inter-disciplinary fields and inter-institutional areas of research work to maximise utilisation of personnel, material and resources available.
- (ii) To establish close and firm linkage between IIT research complex and CSIR research complex.
- (iii) To formulate specific proposals and schemes for such a linkage as enumerated at (ii) above.
- (iv) To monitor the progress of the objectives stated above and after achieving these to set further objectives.

6.52. During evidence, the Additional Secretary, Department of Education stated that the following decisions were taken during the two meetings:—

- (a) In the areas of research work, the CSIR and other institutions can collaborate and identify where they can interact and have a national integrated approach in taking up the research work.
- (b) Development of technology for sale both within the country and abroad, should be fully exploited by making use of total facilities available both in the SCIR complex and IITs and universities.
- (c) An integrated regional instrumental complex and a similar computer complex should be brought about for making maximum utilisation of the repair facilities and computer facilities in each region.
- (d) Science museums should be set up at University, College and District level for dissemination of scientific work particularly to students in villages and towns to bring about the desired change in the outlook of persons to take up research work in future.
- (e) Popularisation of science programmes through T.V., Radio and other information media by contribution from IITs, CSIR institutions and cultural organisations.
- (f) Scheme for free mobility of personnel between the CSIR laboratories/organisations, IITs and Central Universities should be drawn up.
- (g) A common information centre to serve industries should be set up so that the industrial consultancy available to industry is more fully utilised.
- (h) Talented students and teachers should be exposed to research laboratories and IITs enabling them to spend a summer or a larger period to familiarise themselves with the tools and research methodologies to imbibe in them research consciousness.
- (i) IITs and CSIR laboratories should adopt nearby colleges or Higher Secondary Schools to enable students to acquire proper mentality and be aware of instruments which they otherwise cannot see.
- (j) Science teaching kits and teaching aids for colleges and schools should be manufactured by a joint programme.

Laboratory personnel should take up teaching assignments and participate in training programmes.

6.53. Regarding the progress made in implementing these decisions, the witness stated:—

- (1) The IIT's have collaborated with CSIR laboratories on cooperative research projects.
- (2) The projects undertaken by the IITs and the Universities have been intimated to CSIR so that proper integration can be thought of in taking up such projects.
- (3) The preparation of list of technologies developed for the sale, both in the country and abroad, is still in progress.
- (4) The National Physical Laboratory has been requested to assess the facilities for repair of scientific instruments.

6.54. The Committee note that the All India Council for Technical Education at its meeting held in April, 1972 recommended that a Committee should be set up to promote collaboration amongst National Laboratories, Institutes of Technology and Universities to undertake major research projects for the technological development of the country. The Committee are however distressed to note that the standing Inter-Ministerial Committee was set up only in 1974 after a lapse of two years. The Committee feel that such delays are totally unwarranted and should be avoided.

6.55. This inter-ministerial committee has set for itself the objectives of identifying areas of cooperation with CSIR organisations, IITs, and institutions controlled by the University Grants Commissions, establishing linkage and monitoring the progress of the objectives. The Committee note that this inter-ministerial committee has so far held only three meetings in September, 1974 February, 1975 and January 1977. The Committee emphasise that effective and meaningful cooperation should be established between IITs and laboratories of CSIR in the various fields, like research and exchange of faculty, in order to maximise utilisation of personnel, material and resources available. The Committee would like that this Inter-ministerial Committee should be more active and that it should meet at least once in six months.

5.56. The Inter-ministerial Committee has identified a number of areas where fruitful collaboration could be established between

engineering institutions and CSIR laboratories. The Committee urge the Government to take suitable follow up action on the actual progress made in these areas. The Committee would like to be informed in due course about the results achieved in this regard.

6.57. The Committee have earlier recommended that there should be a budget-bound and time-bound integrated programme of collaboration on assignments of relevance to development. The Committee would like this concept to be worked out in detail. The Committee would like to emphasise that what is required is result-oriented approach. The modalities of working of the Scheme should be such as to clearly define the roles and responsibilities of the collaborating institutions and it should be possible also to call them to account where necessary for producing results.

CHAPTER VII

A. Unemployment

7.1. The Ministry of Education have stated in a written note that the last survey of employment pattern of engineering graduates, diploma holders in the country was conducted by the Directorate General of Employment and Training, Ministry of Labour in the year 1968 and covered those alumini who passed during the years 1965 and 1966 from the engineering institutions other than University of Roorkee. (The survey regarding the University of Roorkee was earlier conducted by the Directorate in 1967).

7.2. The Ministry of Education have further stated that the Directorate General of Employment and Training do not have precise estimates in regard to unemployed engineers. The only information that is available in this regard relates to number of engineering graduates and diploma holders (all of them who are not necessarily unemployed) on the Live Registers of Employment Exchanges. The number of engineering graduates and diploma holders on the Live Registers of Employment Exchanges as on 31-12-1976 was 18,385 and 62,447 respectively.

7.3. Regarding the causes for unemployment amongst engineers, the Ministry of Education have stated that since 1951-52, the Department of Education in consultation with the Planning Commission and the State Governments, undertook a big programme of expansion of technical education at all levels, from one successful Plan to another. A target of 25,000 intake at degree level and 50,000 at diploma level was set for the Third Plan. The demand was estimated generally in relation to the projected economic growth rate. By 1968, a backlog of the stock of technical personnel was noticed in that a large number of engineering graduates and diploma-holders were stated to be unemployed. According to the estimate made at that time by Dr. K. L. Rao, Union Minister for Irrigation and Power, there were about 45,000 unemployed graduates and diploma holders. At that time it was also noted that successively for about 2-3 years there had been a big recession in the industry. Further no additional expansion or development of irrigational, power and other projects had been taken in hand on a big way. Also big projects like the steel plants, heavy electricals, machine build-

ing and so on, which used to absorb a large number of graduates and diploma holders, did not offer any such employment opportunities because they had reached the saturation point. In view of the uncertainty about the implementation of the Five Year Plans, as envisaged earlier it was felt that the admission rate of 25,000 students to degree courses and 50,000 to diploma courses proposed, would create a situation where a large number of unemployed would be added on. Consequently, it was decided that till the industrial and economic growth rate improved and the opportunities for employment also correspondingly showed a better growth the admission to the various courses in the technical institutions may be cut. The admissions were reduced from 25,000 to about 18,000 at degree level in 1968-69 and from 50,000 to about 27,000 for diploma level.

7.4. The All India Council for Technical Education at its meeting in April, 1972 recommended that in view of the anticipated demand for engineers for the Fifth Five Year Plan, admissions to technical institutions may be restored to their full capacity, namely 25,000 to the degree courses and 45,000 to 50,000 to diploma courses, in stages after ensuring adequate instructional facilities in institutions. The Council also emphasised that the admission requirements should not be lowered.

7.5. The Council also emphasised the need to review on a continuing basis the pattern of admissions to different subject-fields to ensure that there was no large excess or shortage of engineering manpower in each major field of engineering *vis-a-vis* the estimated demand. To this end, the Council recommended that the Secretariat should formulate specific proposals regarding the pattern of admissions to different subjects-fields in the light of the studies carried out by the Institute of Applied Manpower Research and other agencies, circulate it to all State Governments and technical institutions and coordinate the pattern of admissions in future years.

7.6. A statement showing the actual admissions to the graduate course in engineering during the years 1966-67 to 1976-77 is given below:—

Year	Actual Admissions
1	2
1966-67	24934
1967-68	24571
1968-69	18445
1969-70	17853

1	2
1970-71	17907
1971-72	18197
1972-73	19997
1973-74	21199
1974-75	21870
1975-76	22454
1976-77	22309

7.7. The Ministry have further stated that since the demand for engineering seats has now started picking up, they may have to increase the number of seats for certain selected courses in the Fifth and Sixth Plans but on the advice of All India Council it is proposed not to go beyond the overall admission capacity of 25,000 as a cautious approach, till the manpower requirements of technical personnel are assessed on scientific basis for the Sixth and subsequent Plans.

7.8. A leading engineering institution in its memorandum to the Committee has suggested that:—

“If the unemployed engineering graduates can be mobilised, trained and made use of for a major national programme of rural development based on small scale industries, with particular reference and emphasis on agro-based, cottage and village industries, then, apart from giving employment to these graduates, simultaneously we advance the cause of rural development and reconstruction on which the future of the nation depends.”

7.9. In a number of memoranda to the Committee it has been stated that an important reason for unemployment amongst engineers was large out-turn of sub-standard graduates. Asked about the views of the Government in this regard, the Additional Secretary, Department of Education stated during evidence that:—

“.....Even in arts, pure science and humanities there are certain universities and colleges which produce better graduates than the others. The same is the case with regard to technical education.....There has been no systematic survey or review to study the co-relation between the quality of teaching on the one hand, the quality of graduates turned out by various colleges and their employability on the other. While some graduates com-

ing out of certain colleges may be termed as substandard, on the whole, the average standard is not really as bad as that."

7.10. Asked about the measures taken by Government to solve the unemployment problems amongst engineers, the witness stated:—

".....As regards the formulation of schemes for dealing with unemployment we do not have a big role to play. Actually, this is the work of other agencies of Government....."

7.11. The Committee have been informed that the last survey of the employment pattern of engineering graduates and diploma holders in the country was conducted by the Directorate-General of Employment and Training in 1968. The Directorate-General of Employment and Training do not have precise estimates regarding unemployed engineers and the only information available in this regard pertains to the number of engineers on the Live Registers of Employment Exchanges. As on 31 December 1976, 18,385 graduate engineers had registered their names, but it is possible that many have got placement through their own effort while some unemployed graduate engineers might not have registered their names in the Employment Exchanges. It is a long time since the last survey of unemployed graduate engineers and diploma holders was undertaken.

7.12. The Committee suggest that a critical analysis may be made of the unemployed graduate engineers and diploma holders in order to identify the branches/disciplines of engineering where acute difficulty is being felt in finding placement. This may also give a clue whether the difficulty is experienced in respect of graduates/diploma holders turned out by a particular institution or in a particular State/region so that corrective remedial measures could be taken.

7.13. The Committee would also like to point out that in the light of the analysis it should be possible for the Government to co-relate admissions to technical institutions in accordance with the known requirements of the industry. This is of particular importance at the present juncture when efforts are being made to step up admissions to under graduate courses in engineering colleges to 25,000 which had come down to a level of 18,000 in 1969-70 from 25,000 in 1966-67

7.14. The Committee have elsewhere dealt with this question of co-relating admissions to technical manpower planning. The Committee note that admission to engineering colleges which declined

from about 25,000 in 1966-67 to about 18,000 in 1969-70 at under graduate level has been picking up and reached over 22,000 in 1976-77. According to the Department of Education the demand for engineering seats has started picking up and seats are to be increased in certain selected courses in the Fifth and Sixth Plans. But on the advice of the All India Council for Technical Education it has been proposed not to go beyond the limit of 25,000 till the manpower requirement of technical personnel is assessed on a scientific basis.

7.15. There is a feeling that one of the reasons for unemployment among the engineers is large turn out of sub-standard graduates. As engineering education is costly and heavy amounts are spent by the parents/guardians on the education of the engineering graduates, apart from the enormous expenditure incurred from public exchequer on this education, it is of prime importance that the quality of technical education is maintained at a high level. The Committee would like Government to go into this matter in depth and bring about perceptible improvements in the quality of education of those engineering colleges where it is lacking at present. Government should not hesitate to de-recognise such colleges which do not show marked improvement in the quality of technical education imparted by them as sub-standard technical education is not only frustrating to the students but results in national waste and discontentment.

7.16. It has been suggested to the Committee that unemployed engineering graduates could be mobilised, trained and made use of for a major national programme of rural development which may be based on small scale industries, agro-based, cottage and village based industries. As a very high priority is being accorded to the rapid development of rural areas, the Committee would like Government to prepare a meaningful programme for the setting up of small village and cottage industries in rural areas and provide adequate package of facilities by way of finance, power, water etc. for such industries so as to attract engineering graduates to involve themselves in this work. Such a programme not only solves the problem of unemployment among the engineering graduates and diploma holders but would also promote rapid development and establishment of the much desired agro-industrial base in the rural areas.

7.17. While the Committee are impressed with the merit of the suggestion, they would like to point out that if the graduates and diploma holders are to be involved extensively in the development programme in the rural areas, the curricula and training programme would have to be so modified as to provide the students with first--

hand experience of rural conditions and inculcate in them a feeling of involvement and dedication to take technology to the rural areas and help in the process of regeneration and development. In this context it is equally important that the young engineers and diploma holders are extended a package of facilities by way of adequate finance, power, water and other infrastructural facilities which are a pre-requisite for development of agro-industrial centres in the rural areas.

7.18. The Committee suggest that having regard to the importance of the subject and the avowed policy of the Government to devote greater resources for the development of the rural areas, the experiment of enthusing the young engineers, graduates and diploma holders may be tried out on a pilot scale by some of the leading Institutes of Technology and Regional Engineering Colleges and after it has shown results, it may be extended to other institutions.

B. Self Employment schemes

Self Employment Scheme and promoted by Motilal Nehru Regional Engineering College—Allahabad.

7.19. In a note the Department of Education have stated that the Motilal Nehru Regional Engineering College, Allahabad has established an industrial estate.

The objectives of this scheme are:—

- (i) To create self-employment opportunities for the unemployed engineering graduates.
- (ii) To provide all assistance under 'package programme' to the young engineers in terms of space and capital (fixed and working) arranged through the bank by the college.
- (iii) To continue providing assistance for developing items of manufacture in the college workshop under the guidance of faculty members.
- (iv) To provide testing facilities to the entrepreneurs.
- (v) To implement the above four objectives under the atmosphere, Teacher Taught Relationship'.

Industrial Entrepreneurship Programme

7.20. The College runs industrial entrepreneurship programme, standardised and financed by the Ministry of Industries, Government of India, for which the college has been considered as the big-

gest centre in the country and trains about 100 entrepreneurs per year. The College has already run 8 run programmes so far.

7.21. The Department of Education have further stated that the experiment of setting up Industrial Estate in the college has been found quite successful. It has served the following purposes in addition to the concepts and objectives:—

- (a) It has created an atmosphere among the students undergoing studies in the college showing them an opening of **self-employment**.
- (b) This has given confidence to young engineers to run industrial units and each entrepreneur with an average age group of 26 years, earns Rs. 2,500 to Rs. 3,000 per month.
- (c) Short term training and visit facilities are provided by the entrepreneurs to the students of the college. The supervision of the training is much better in the Industrial Estates as they are located near the college campus.
- (d) Help to the entrepreneurs is given by the college faculty who keep their knowledge up-to-date. This has helped in the import substitution also.

Review of the working of the Industrial Estate

7.22. The Board of Governors of the College constituted in January, 1975 a Committee under the Chairmanship of Shri O. N. Mishra, Member of the Board, to inquire into the affairs of the industrial Estate and submit its report to the Board. The following were the terms of reference to the Committee:

- (1) Review of the progress made by the Industrial Estate.
- (2) Irregularities, if any.
- (3) Consideration of all the terms of the loan and suggestions and recommendations with regard to the terms of payment of the loan.
- (4) Future arrangements and work of the Industrial area.

7.23. The Department of Education in a note informed the Committee in June 1977 that the Report of the Review Committee had been received recently and would be placed before the Board of Governors for consideration.

7.24. Asked about the details of the self-employment schemes promoted by other engineering institutions, the Ministry have stated in a written reply that certain promotional schemes have been in-

roduced by some of the institutions and Directorates of Technical Education. Kerala for instance, have conducted seminars to discuss the problems of unemployed graduates. The Directorate also conducted three programmes on entrepreneurial development and self-employment as part of the half-a-million Job Scheme formulated by the Ministry of Labour. The Directorate has also a Cell for Placement and Guidance to assist the prospective entrepreneurs of small scale industries.

7.25. The Birla Institute of Technology, Pilani has a Training and Placement Unit which conducts seminars on small scale industries. The Institute also offers Practice School Courses and a full Semester Course in entrepreneurship.

7.26. The Small Industries Services Institutes established in the various regions also offer courses in entrepreneurship.

7.27. Asked whether any study of the problems standing in the way of engineers in taking up self-employment schemes has been made, the Ministry have stated in a note that they have not undertaken any systematic study of the problem.

7.28. In a memorandum to the Committee, it has been stated that:—

“Entrepreneurship or self-employment is full of practical difficulties of various sorts and the raw engineering graduate could not be expected to have the competence, experience, patience, etc. to run from pillar to post and to go through all the formalities, procedural problems, delays and having to deal with so many agencies. The people who would be best-suited to go into self-employment or entrepreneurship are those who have got five or six years of industrial experience and not only knew what it takes to organise and run an industry, but also are of the enterprising and go getting type.”

7.29. In another memorandum to the Committee it has been suggested that it would be for better if larger institutions like the IITs, Regional Engineering Colleges and engineering universities have industrial complexes attached to their institutions in such a manner that the technical guidance and consultancy needed by the young entrepreneurs are provided by the institution concerned. The institutes can help the entrepreneur identify the produce for manufacture, help him in preparing feasibility report and also to obtain loan from the bank. Much of the uncertainty of the scheme will disap-

year if such help and regular consultancy over a period of 5 years is guaranteed to these young entrepreneurs. The failure rate among the entrepreneurs will definitely come down and the banks will not have to worry about the viability of the projects, they finance. The present suggestion is only the marriage of the concept of the industrial estates thought out by many State Governments with the technical competence and back up that an institution of learning can provide.

7.30. During evidence before the Committee, a Director of a leading engineering institution stated:—

“The IIT, Institute of Science and the Regional Engineering Colleges, with the industrial collaboration and the funds that come to them from the banks can organise six months’ programmes of entrepreneurship to tell them (students) what that involves and they can ask them to go into these. From the Government side something must be done. This involves project identification and market surveys. That is a major hurdle. We (institutions) do not have the facilities for the market surveys; nor do the Banks have that. We have to go to the agency who will do the market survey. That agency might demand Rs. 20,000 for doing this. We cannot afford to pay Rs. 20,000 for a market survey. We do not know whether the survey made and the conclusions drawn as a result thereof are realistic or not. It is only this poor fellow who goes into this thing will know it at the time of sale of the products. So, an integrated agency for funding, for marketing survey, for feasibility report, for marketing outlays in the small scale sector, is the crying need so that they do not have to go from place to place and get frustrated and disgusted.”

7.31. During their visit to Regional Engineering College, Kurukshetra in August, 1976 the Committee learnt that although banks were advancing loans for self-employment, the procedure was very complicated. It was suggested that there should be an assured market for the products. This would depend upon the growth of the industry and the reliance that larger industries should have on small industry. It was stressed that big industries should be required to obtain their requirements for various items of their products from small scale industries as in Japan.

7.32. During their tour to Eastern Region in September, 1976, the Committee held discussions with the representatives of the

State Governments. They were told that greater stress on self-employment schemes and motivation to engineers at the institutional level given, so that by the time they pass out they could be in a position to have an employment of their own, rather than finding a job in the industries. Major difficulties experienced by the engineers was lack of finance, for setting up their own units. Most of them being poor could not even arrange for margin money. More liberalised approach on the parts of Banks for techno-entrepreneurs was desirable.

7.33. Asked about the views of the Government regarding promotion of self-employment schemes by engineering institutions, the Additional Secretary, Department of Education stated:—

“One Regional Engineering College started it in collaboration with the State Industries Department of Allahabad. We welcome such arrangements, but in this regard much would depend upon the initiative of the college and also the response of the State Government and the local conditions. But you are aware that even when the government set up industrial estates in certain areas, they have not been very popular, perhaps because all aspects of the matter had not been considered. So, it may be difficult to recommend this as a general proposition but certainly where the State Industries Department can make a realistic survey of the local conditions and find that there is a demand for such estates, the technical institutes can go ahead.”

7.34. Regarding the difficulties coming in the way of young engineers in taking up entrepreneurship, the witness stated:—

“This subject has only a very limited bearing on our Ministry. We did ask the Industries Ministry whether they could furnish up-to-date information, but in the short time available, we could not get it, but we know generally that the small scale institutes are conducting certain courses which are helpful in self-employment programmes.

All these matters fall outside the scope of our Ministry, Land acquisition policies followed by the State Governments, the power situation etc. are matters dealt with by other Ministries, but whenever any such matter comes to our notice, we always refer it to the Ministry concerned. We

even make suggestions on the basis of our experience but otherwise it is outside our scope.”

7.35. The Committee then drew the attention of the witness to the following observations made by the Reviewing Committee on IIT, Madras in their report presented in 1971:—

“It must be regarded an important duty of the faculty in each department to recognise the students who have intentions of starting small industrial units and who have aptitude and ability for this, and to encourage them. Institution of awards for successful completion of projects of this nature would go a long way to encourage them.”

The witness replied:—

“That can be done by our guidance and counselling unit in IITs and other colleges. They can put the person in touch with the right agencies and also continue to take interest till results are achieved.”

7.36. In a memorandum to the Committee it has been suggested that engineering institutions should organise courses on entrepreneurship which should be a balanced blend of business courses, technical subjects and working experience. Such a programme should include:—

- (i) core courses involving motivation and stimulation to set up and achieve planned and realistic goals;
- (ii) factory visits and planned vocational industrial training; and
- (iii) project oriented training in small industries.

7.37. Also entrepreneurship development education can be included in the educational curriculum in two ways:—

- (a) Undergraduate level, to include:
 - (i) scope and need for entrepreneurship development;
 - (ii) fundamentals of market research and forecasting;
 - (iii) process planning and machinery requirement calculations;
 - (iv) plant layout and material handling;
 - (v) financial management, costing and cost control, cost accounting and auditing;

- (vi) economic analysis and break-even charts;
- (vii) financing and other agencies which help the small manufacturers;
- (viii) communication and procedural details in starting new industries.

(b) *Postgraduate level* to include an intensive course on specific projects which would be joint ventures of students, Faculty members, Scheduled Banks and Small Industries Development Corporation.

In every case, work experience through inplant training should be an integral requisite for any entrepreneurship development programme.

7.38. Asked whether courses on these are taught by engineering institutions, the Additional Secretary, Department of Education stated during evidence:—

“While at present some of these courses are being run by the Small Scale Industrial Training Institutes, no technical institutes is running such a course. Some of the items mentioned here do form part of the model syllabus which we have formulated.”

7.39. The Committee learn that because of the innumerable difficulties like shortage of credit facilities, raw materials, realistic market surveys, cumbersome procedures, marketing problems etc., young engineers are not taking up self-employment schemes. The Committee were informed that no systematic study of the problems coming in the way of engineers in taking up self-employment schemes has been undertaken by the Government. The Committee suggest that the Government may immediately arrange to have such an analysis made by an expert team having representative from Ministry, industry, institutions with a view to identifying the problems that are coming in the way of young engineers in taking up self-employment schemes and taking remedial measures. It is evident that self-employment schemes to be successful, should provide for a package programme including necessary assistance and guidance required in preparation of project report and market surveys, credit facilities, arrangement for technical knowhow, licensing, marketing etc.

7.40. The Committee consider that the training in entrepreneurship is essential if the young graduate engineers are to have the

skill and confidence to undertake self-employment schemes. The Committee recommend that the curricula may be suitably amplified to include essential aspects of entrepreneurship such as fundamentals of market research, forecasting of demands, economic analysis, process planning, machinery requirement calculation, plant layout, cost control, material management etc. It would be a good idea to involve in this training programme senior representatives of scheduled banks, Small Industries Development Corporations, Faculty members etc. so as to provide realistic and well informed grounding in these essentials. The Committee suggest that the approach indicated above may be tried out in some of the institutes of Technology and in the light of experience gathered in turning out genuine entrepreneurs, it may be improved and extended to other institutions in a phased manner, taking care to cover all regions/States.

7.41. The Committee note that Motilal Nehru Regional Engineering College, Allahabad has organised an industrial estate and has promoted self-employment schemes. The Committee also note that a Review Committee was appointed to enquire into the affairs of the Industrial Estate set up by the Motilal Nehru Regional Engineering College in 1975 and that the report of the committee has been received and would be placed before the Board of Governors of the Regional Engineering Colleges for consideration. The Committee expect that early action will be taken on the findings of the review committee. The establishment of the industrial estate by the college Prima facie provided the students the desired training facilities for self-employment although there might be scope for improving its working. The Committee have no doubt that necessary improvements would be made in the working of the industrial estate as a result of the report of the Review Committee.

7.42. The establishment of an industrial estate by a college on the face of it is an interesting development, but it remains to be seen how far and to what extent it has been possible to generate through this extension agency genuine engineering entrepreneurs. The Committee need hardly point out that based on evaluation of this experience, the Government may consider the feasibility and desirability of providing similar extension services by way of industrial estate etc. in other well-known institutions like the Indian Institutes of Technology, Regional Engineering Colleges etc. but they would like to stress that there should be continuous monitoring of this effort so as to effect timely improvements and ensure that the underlying objectives are being truly fulfilled.

VII

C. Brain Drain

7.43. The Department of Education have stated in a written reply that they have not undertaken any survey of Indian engineers who have gone abroad for seeking jobs. However, the Council of Scientific and Industrial Research (Department of Science & Technology) maintains a National Register for scientific and technical personnel of India who are or had been abroad for higher education, training, employment etc. This register was started in 1958. Registration, however, is voluntary. Consequently all Indian scientists, engineers etc. abroad are not enrolled in the Indians Abroad Register. The CSIR had informed the Department of Education that since the inception of the National Register, 7,868, Indian engineers have been enrolled in the National Register upto 31-8-1976. Out of these 3663 have reported their return to India.

7.44. The largest number of engineers enrolled are from U.S.A. (35.81 per cent) and U.K. (33.86 per cent) while a sizeable number are from Germany. About 46.6 per cent of the enrolled engineers have since reported their return to India.

7.45. About 4,200 Indian engineers enrolled in the Indian Abroad Section of the National Register are still abroad.

The Country-wise break-up is as follows:—

USA	1630
Canada	244
U.K.	1383
Germany	576
OEC	189
ANZ	36
Others	147
TOTAL	<u>4,205</u>

OEC=Other European Countries,

ANZ=Australia & New Zealand.

The number of stay-ons is the highest in U.S.A. followed by U.K. and Germany. About 59 per cent of the engineers enrolled from U.S.A., 52 per cent from U.K. and about 51 per cent from Germany have not yet reported their return.

7.46. The Department have further stated that 'Brain Drain' may be viewed as the result of various factors of 'Push' and 'Pull' in relation to professional, economic and financial opportunities and social conditions at home and abroad. In the Indian context, it is mainly related to employment opportunities to absorb the large number of Indian scientific and technical personnel at home and abroad. The Government of India have been taking, from time to time, various measures in this regard.

These are:—

- (i) A special section—"Indians Abroad" section—of the National Register is maintained for enrolment of Indian Scientists and Technologists abroad.
- (ii) Union Public Service Commission and some of the State Public Service Commissions treat Indian specialists whose particulars are in the Indian Abroad Section of the National Register, as 'Personal Contact' candidates for posts advertised by them.
- (iii) The Scientists Pool operated by CSIR provides temporary placement for well qualified Indian Scientific and technical personnel returning from abroad without an assured job.
- (iv) A 'Package Scheme' approved to attract Indian scientists, technologists and engineers working in production units abroad to come back and start their own industries in this country.
- (v) Creation of supernumerary posts in approved scientific institutions to which temporary appointments can be made from among the scientists working and studying abroad.
- (vi) CSIR have introduced a scheme for appointment of 'Research Associate' or 'Visiting Scientists' under which Indian scientists etc. visiting India for a short period can be offered such appointments in CSIR organisations.
- (vii) The University Grants Commission has introduced a scheme under which Indian Scholars abroad can be offered short-term appointment in Indian Universities during their

sabbatical leave.

- (viii) Scientists returning from abroad are allowed to import professional scientific instruments and equipment, whether new or used upto a value not exceeding Rs. 50,000/-.

7.47. In a memorandum to the Committee it has been stated that the following measures would curb the brain drain:—

- (i) No body should be granted pass-port for studying at undergraduate level or Master's level.
- (ii) Permission to carry on doctorate or post-doctorate research should be given only in fields where necessary facilities for research are not available in India.
- (iii) Bilateral agreement should be reached between India and foreign countries so that no engineering graduate without immigrant visa is allowed to stay in these foreign countries for more than 3 or 5 years without specific approval of Government of India.
- (iv) Engineering graduate going to foreign countries with immigrant-visa should be asked to pay to Indian Government Rupees Fifty thousand as compensation for cost-incurred on their education in India, before, they leave India.

7.48. In another memorandum to the Committee it has been suggested that bank guarantees from those going abroad to ensure the repatriation of foreign exchange to the limit of the cost of education, should be taken.

7.49. The Department of Education have stated in a note that broadly, the policy to allow foreign exchange for study abroad is decided having regard to the general foreign exchange situation of the country, the manpower requirement and the facilities available within the country and the need for higher training abroad. The Ministry of Finance is the Ministry concerned. However, for deciding the policy, particularly with reference to the levels of study and fields of study, the Ministriec|Department concerned and the Reserve Bank of India are consulted. Whenever necessary, the matter is considered at inter-departmental meetings with the participation of other agencies such as University Grants Commission. The final decision is taken by the Finance Minister.

7.50. Till 1957, there was no restriction on release of foreign exchange for higher studies abroad. Certain restrictions were imposed in that year because of the decline of foreign exchange reserves. On the recommendations of a committee appointed for the purpose, it was decided to release foreign exchange for degree courses in arts, science and technical subjects. A minimum percentage of 60 per cent of marks was also prescribed. Subsequently by 1970, this prescription was lowered to 55 per cent. In 1970, it was also decided, with the approval of the Cabinet that in all fields of studies in which first degree courses are not available in India, foreign exchange would be released without insisting on the student being a graduate. In 1975, following representations from various quarters about the inadequacy of maintenance allowance allowed to students, the matter was reconsidered and since it was felt that enhancement of the scale of allowance would result in considerable extra foreign exchange liability, and with a view to limiting the total out-go on students abroad at a reasonable level, the eligibility conditions were revised as follows:—

- (i) the candidate should have obtained 60 per cent marks in the relative prescribed minimum degree examination; and
- (ii) foreign exchange could be released only for post-graduate courses abroad.

7.51. However, the earlier exception made with regard to permission in those areas where no degree course was available in India, was continued.

7.52. The policy is implemented by the Reserve Bank of India which issues suitable instructions to its Regional Offices to enable them to screen the individual applications. Wherever clarifications are required, the Regional Offices write to the Central Office of the Reserve Bank which in turn approach the Government. A decision is then taken in consultation with the Ministry|Department concerned.

7.53. For all studies abroad, tuition fee in full as certified by the overseas institutions is released as foreign exchange in addition to approved maintenance allowance. From 1975 onwards, there has been a slight increase in the maintenance allowance also.

7.54. During evidence the Committee enquired whether universities nominate students for studies abroad. The Additional Secretary, Department of Education stated:—

‘We do try to insist on certain percentage of marks to be obtained by the candidates desirous of going abroad. In

actual practice, however, things may be happening in a different manner. It is well known that many obtain some scholarships through their personal efforts.'

7.55. Asked about the procedure followed for permitting teachers to pursue higher studies and research, the Secretary, University Grants Commission stated:—

“There are two types of things—one is they are sponsored under a regular programme and, if a teacher applies to the Reserve Bank and says that he wants to go abroad, the money question comes in. If he wants to go abroad for specialisation, the Reserve Bank sometimes refers the case to the Ministry of Education and the UGC who should recommend that. In other cases foreign exchange release is not done.”

7.56. Asked whether there was any proposal to recover the cost of training from those technical personnel who seek employment abroad, the Additional Secretary, Department of Education stated:—

“There is no proposal for recovery of expenses incurred on them. The nodal department for this is the Department of Science and Technology. It functions in close collaboration with other ministries and departments. The position is reviewed from time to time and whatever is possible is being done. The Department of Science and Technology has formulated a programme under which our scientists abroad can come and undertake specific projects here.”

7.57. A copy of Circular No. F. 9—80/75 SR.I dated 13th August, 1976 from the Department of Science and Technology, New Delhi addressed to all Indian Missions abroad, all Research Institutions|Public Sector undertakings in India, all Ministries|Departments of the Government of India giving the salient features of the scheme for utilisation of talented Indian Scientists and Technologists for development programmes in India is enclosed (Appendix VI).

7.58. The Department of Education have stated that the Institutes of Technology are not maintaining systematic follow up of career pattern of the alumni of the institutes. However certain information

regarding number of those who have gone abroad is available as per details given below:—

Year	Kharag- pur	Bombay	Madras	Kanpur	Delhi
1968	67	80	81	72	Precise informa- tion not available
1969	57	105	53	101	
1970	53	116	112	98	
1971	24	83	50	79	
1972	35	77	33	67	
1973	14	68	45	45	
1974	50	66	68	84	
TOTAL	300	595	442	546	

7.59. Asked why no systematic follow up of the career pattern of alumni of IITs is maintained, particularly of the top students, the Additional Secretary, Department of Education stated thus:—

“There is no systematic follow-up. The difficulty is that most of these candidates have been very uncooperative in the efforts made to collect these data. I understand that in Bengal an engineering college tried to make a systematic follow-up in this regard but it had to give up its efforts after a year or so. While there is no systematic follow-up yet we have tried to collect whatever information has been possible. I would submit that the information is not complete but it does give an indication—as far as the IITs are concerned as to the number of students going abroad....”

7.60. In their Eighty-eighth Report on Deputation of Indian experts and Officers Abroad, the Estimates Committee 1975-76 (Fifth Lok Sabha) observed as follows:—

“The Committee note that a large number of Indian experts| specialists are going away to foreign countries and this trend is on the increase. As has been pointed out by a study conducted by the United Nations Conference on Trade and Development, every medical doctor leaving India amounts to a loss of Rs. 3.3 lakhs and every scientist leaving India makes the country poorer by Rs. 1.73 lakhs. The Committee feel that in view of the heavy cost incurred by

the country on the education of these scientists and doctors etc., the country has a prior claim on the services of these persons.

“The Committee would like Government to make a detailed study to find out the reasons why scientists and doctors etc., are eager to go away to foreign countries and to take suitable measures in this regard. Government should also give wide publicity about the employment opportunities in the country, pay scales and other facilities etc., available so that these persons are able to seek employment in the country itself.

The Committee would like to stress that there are vast opportunities in the country which provide a challenge to the scientists and doctors etc., to put their talents to the service of the nation, particularly, for ameliorating the conditions in rural and backward areas. The Committee also feel that those who have been trained at public expense, should compensate at least for expenditure incurred on their training by serving in the country itself or by remitting an equivalent amount.”

7.61. In their action taken reply, the Department of Personnel and Administrative Reforms have stated that the reasons why many scientists and doctors etc., are eager to go away to foreign countries have been examined with reference to financial, educational and other factors. Measures have been taken to improve employment opportunities for scientists, engineers, medical personnel etc., by different organisation. As regards recovery of compensation for the expenditure incurred on training of those going abroad, the Department have stated that “possible specific measures to implement the recommendation are under examination.”

7.62. The Committee note that at present students are permitted to study abroad only at post-graduate level. However, in cases where no degree courses are available in the country study at degree course level is also permitted. The Committee, however, feel that since a number of institutions have got adequate facilities for post graduate courses, it may be examined whether the permission to study abroad at post graduate level may be confined to those courses for which adequate facilities or specialisation do not exist in the country. This would not only save foreign exchange but also reduce brain drain of qualified engineers trained at a considerable cost.

7.63. The Committee note that no systematic follow up of the career pattern of the alumni of the IITs is being maintained by the IITs. The Committee were, however, informed that 1883 students of the IITs, Kharagpur, Bombay, Madras and Kanpur have gone abroad. Regarding IIT Delhi it has been stated that no precise information was available. The Committee feel that it is important to maintain a close follow up of alumni of all engineering institutions particularly those turned out by IITs and Regional Engineering Colleges.

7.64. The Committee are concerned to note that a large number of Indian engineers have chosen to stay on in foreign countries. As per the National Register of Scientific and Technical Personnel as many as 4205 Indian Engineers are living abroad. Since registration in this National Register is voluntary, it is quite possible that many other engineers residing abroad might not have registered themselves. The Committee reiterate their earlier recommendation in their Eighty-eighth Report on Deputation of Indian Experts and Officers abroad that in view of the heavy cost incurred by the Country on the education of these specialists, the country has a prior claim on the services of these persons.

7.65. The Committee reiterate further that those who have been trained at public expense should compensate at least for the expenditure incurred on their training by serving in the country or by remitting an equivalent amount.

7.66. The Committee note that a number of steps are being taken by the Government to attract specialists working abroad to come back and work in the country. Also, a number of incentives like package schemes for specialists abroad for setting up industries in India, Research Associateship and short-term appointments, etc. are being offered. The Committee would like government to monitor the outcome of these measures and improve and amplify them as necessary in the light of experience so as to achieve the objective of attracting back the talented engineers and specialists whose knowledge and expertise are relevant to the present developmental needs of the country.

CHAPTER VIII

Financing Technical Education

8.1. The Department of Education have in a written reply stated that the total expenditure incurred by the Central and the State Governments on technical education during the various Plan Periods is as follows:—

(Rs in lakhs)

	Centre	State	Total
First Plan	1155.24	844.76	2000.00
Second Plan	2616.00	2284.00	4900.00
Third Plan	6880.00	5620.00	12500.00
Fourth Plan	6865.14	3734.86	10600.00

8.2. In the Draft Fifth Plan a sum of Rs. 164 crores was allotted for technical education. However, in the final Fifth Plan approved in October, 1976, only Rs. 156 crores have been provided.

8.3. During evidence the Committee enquired about the provision made in the Central and State sectors out of the revised outlay provided for technical education. The Additional Secretary, Department of Education stated that out of the final outlay of Rs. 156 crores, Rs. 92 crores have been provided in the Central Sector and the rest in the State Sector.

8.4. Asked how these cuts were imposed in the allocation for technical education, the witness stated:—

“.....Actually, even this Rs. 164 crores was a reduced amount. We started with a still higher figure but every-time we discuss with the Planning Commission, we come out as the losing party They have to take an overall view. Despite all over pleadings, our allocation for the Fifth Plan has been reduced in stages. Obviously, whenever we have argued, the point made is that

the Planning Commission has to take an overall view of the position, keeping in view the resources available. In the ultimate analysis, the allocation is approved by the NDC in which the Central Government and the Chief Ministers are represented. On our part, we can assure you that we have always tried to plead our case to the best of our ability.....”

He added:

“This amount is only Rs. 8 crores and in the overall plan it because of these cuts. I may give you one figure by way of illustration. The allocation for technical education is only 0.39 per cent of the total plan allocation. We always talk and I think rightly so—of linkage with industry: and for programmes of industry and mining the allocation is Rs. 10200 crores whereas for technical education the amount is Rs. 156 crores”.

8.5. Regarding the impact of the cuts imposed on the provision for technical education, the witness stated:—

“This amount is only Rs. 8 crores and in the overall plan it may be very difficult to identify the areas where exactly the effect would be felt. But what actually happens is that because of the reduction, we have to reduce in some cases an equipment and in some cases a refresher course and in some cases even simple things which are very necessary for practical training. I would say that as far as our Central institutions are concerned, we are better off than the States where the position is much worse with this phenomenon of diversion of funds that is hapening in this Plan. Whereas on paper we may well say that we run ten refresher courses in actual practice instead of deputing 30 teachers, probably we will be deputing 25 teachers. After all when a teacher is deputed you will have to pay him some allowance. But the quantum of practical training and in some cases, even theoretical training may be reduced”.

8.6. Subsequently, the Department of Education have furnished the following statement indicating the provision asked for by the

Ministry and finally agreed to by the Planning Commission:—

(Rs in lakhs)

Year	Asked for	Final allocation	Percentage reduction
1972-73	1750.19	1553.59	11.3%
1973-74	1896.95	1326.49	30.0%
1974-75	1438.15	935.00	34.8%
1975-76	1395.58	1050.00	24.7%
1976-77	2351.04	1678.10	28.6%
1977-78	3075.40	2259.50	26.5%

8.7. The Department of Education have further stated that for the Fourth Plan the Ministry asked for an allocation of Rs. 258.30 crores for technical education for both State and Central Sectors, but only Rs. 125.37 crores was allotted by the Planning Commission.

Expenditure in State Sector

8.8. In his inaugural address at the meeting of the All India Council for Technical Education held in May, 1976, the Minister for Education referring to the expenditure incurred in the State Sector stated:—

“.....During the Fourth Plan, a sum of almost Rs. 67 crores was allocated in the Central Sector, of which the actual expenditure was Rs. 65 crores. In the State Sector, on the other hand, out of Rs. 58.38 crores, only Rs. 41 crores were spent during the Fourth Plan Period as Plan outlay. If the Plan outlay in the current year, being the mid year of the Fifth Plan period is to be taken as a guide, the expenditure in the Central Sector will show some improvement against the Fourth Plan period, though I must confess that even this is not satisfactory. In the state sector, however, the expenditure is likely to be of the order of Rs. 50 crores. In other words, whereas in the Central Sector, we hope that the percentage of Plan

expenditure on technical education would be roughly of the same order as the total educational expenditure in the Fourth Plan period, in the State Sector as against the projected Fourth Plan. Outlay of 10.6 per cent the actual expenditure was 7.5 per cent. I am afraid it is going to be less than 6 per cent of the total expenditure in State Sector in the Fifth Plan period.

This is a very serious matter, because it is likely to affect adversely not only our own economic development but also our capacity to promote meaningful collaboration with the other developing nations of the world. I hope the State Governments are conscious of the risks that they are taking by allowing expenditure on technical education to go down in this manner....”

8.9. During evidence, the Committee drawing attention to the above statement of the Minister of Education, desired to know the details of the diversion of funds by the States. The Additional Secretary, Department of Education, stated thus:—

“One of the fields where there has been diversion of funds is technical education. The State Governments have diverted these funds to other fields. While on paper they have accepted the need for running these courses or organising these programmes, when it comes to actual practice, they have not been able to do so. The funds have been diverted to other fields.... The diversion is perhaps to the extent of 40 per cent.... This has been possible by the change of pattern of central assistance during the current Plan. Earlier it was based on matching grants”.

8.10. Regarding the steps taken to ensure that States provide funds for technical education as approved, the witness stated:—

“I would say that we are trying to do our best. In fact, this is one of the concern expressed by the Education Minister at the last meeting of the AICTE. He emphasised it in a very telling manner. Whereas in the Central Sector in the Fifth Plan, our percentage of expenditure would be more or less the same as in the Fourth Plan, in the State Sector it would be much less.

8.11. In the course of evidence, the Committee drew the attention of the witness to the following resolution of the All India Council for Technical Education made in their meeting held in May, 1976:—

“The Council noted that most of the States have not implemented the norms for recurring expenditure in engineering colleges and polytechnics as recommended by it earlier. The Council realising that the training expenses recommended by it are the minimum required for maintenance of standards in the technical institutions strongly recommended that the State Governments may be requested to implement the norms set by it within the Fifth Plan period”.

8.12 Asked about the action taken, the Addl. Secy., Deptt. of Education stated that “the norms have been prescribed and made available to the State Governments. None of the State Governments has disagreed with the norms, but the general implementation is, I must confess, very unsatisfactory”.

8.13. The Department of Education have in a subsequent note stated that the following norms of maintenance expenditure have been recommended by the All India Council at its meeting held on 17th May, 1974:—

Items	Engineering Colleges	Polytechnics
Staff Salary	Actual as per sanctioned posts	Actual as per sanctioned posts.
Library (Recurring)	Rs. 50,000 for an intake of 180 and Rs. 75,000/- for higher intakes	Rs. 15,000 for an intake of upto 120 and Rs. 20,000 for higher intake.
All other expenditure	Rs. 550/- per student per year for an intake of upto 180 & Rs. 500/- for higher intakes	Rs. 350/- per student per year for an intake of upto 120 & Rs. 300 for higher intake.

8.14. The Department have further stated that:—

“The recommendations of the All India Council for Technical Education were intimated to all the State Governments| Union Territories and other departments dealing with technical education, requesting them to meet the recurring expenditure on a net deficit basis under the provisions of the Grant-in-aid code with the norms as suggested. It is understood that none of the State Governments|

Union Territories have been able to introduce, the above norms of recurring expenditure, because of paucity of enough funds for technical education programmes.”

Sharing of expenditure on Technical Education by industry

8.15. In the Report of the Task Force and Steering Group on Education (1973) it has been recommended that “industry for whom the technical education system prepares its manpower resources, should have a greater share in financing not only the practical training in industry but also the institutional programmes.”

8.16. In a memorandum to the Committee it has been stated:—

“... If each industry would realise the national investment in the training of scientists, engineers and technicians that they recruit and whose productivity generates profit and would try to repay part of this national investment, I think the field of technical education would have more financial resources for improving the quality of education and for initiating various other worthwhile activities. It is high time that the industries—both in the public and private sectors—are forced to pay back to the nation a good percentage of what is invested on technical education and of which these industries are the beneficiaries. An education and R&D cess must be imposed on all the industries.

8.17. During evidence the Committee enquired about the views of the Government in this regard. The Additional Secretary, Department of Education stated:—

“In this respect we have formulated certain new programmes. We are now requesting the industries to adopt polytechnics. We are associating industry.”

8.18. Regarding levying of an education and R&D cess on industry, the witness stated:—

“The Department of Science & Technology is seriously considering this question, though a final decision has not yet been taken.”

8.19. The Committee note that a sum of Rs. 156 crores has been provided for technical education in the Fifth Five Year Plan which works out to about 0.39 per cent of the total plan outlay. It is

significant that allocation for industry and mining for which sectors, technical education provides an essential input in the form of technical personnel, is to the tune of Rs. 10,200 crores. The Committee further note that considerable reductions have been made by the Planning Commission in the allocation for technical education in the Annual Plans proposed by the Department of Education, the extent of reduction being 31.8 per cent in 1974-75, 24.7 per cent in 1975-76, 28.6 per cent in 1976-77, and 26.5 per cent in 1977-78. The Committee have been informed that on account of these reductions in the Annual Plan allocations, various schemes like acquisition of essential equipment, running of refresher courses, imparting practical training etc., have received a set back. While the Committee agree that the Planning Commission has to take an overall view of the resources in allocating funds for technical education, they would stress that adequate funds should be provided for technical education to meet the manpower requirements for the economic and industrial development of the country. It should also be ensured that there is sufficient provision for the implementation of schemes which would result in significantly improving the standard and quality of technical education and the out-turn of really competent technical personnel. At the same time, the Committee suggest that the Department of Education should ensure that utmost economy and austerity is exercised in the use of the allotted funds and all wasteful and ostentatious expenditure avoided.

8.20. The Committee would in particular, urge that a critical review may be carried out to identify the areas where economics could be effected in the expenditure incurred on the 5 IITs, and Regional Engineering Colleges without militating against the quality of instructions in disciplines which are relevant to the present day developmental requirements of the country.

8.21. The Committee are distressed to note that the allocations made in the State sector for technical education are not fully utilised but are diverted to other purposes. During the Fourth Plan, out of a provision of Rs. 58.38 crores in the State sector, only Rs. 41 crores were spent on technical education by the States. Similarly, it is apprehended that out of a sum of about Rs. 64 crores provided for technical education in the State sector during the Fifth Plan, the expenditure may amount to only about Rs. 50 crores. According to the representative of the Department of Education, the diversion of funds in the States is to the extent of about 40 per cent. It is evident that such a large scale diversion of funds in the State sector is bound to adversely effect the implementation of important schemes for the improvement of technical education. They would like Gov-

ernment to take suitable steps to persuade the State Governments, to see that the funds allocated for technical education are actually utilised for this purpose in the larger interest of the States and the country.

8.22. The Committee note that in 1974, the All India Council for Technical Education prescribed certain norms for maintenance expenditure on various items like staff salary, library etc. They have been informed that due to paucity of funds, the State Governments/Union Territories have not been able to adhere to these norms. The Committee are unable to appreciate the plea of paucity of funds as the funds available for technical education are not being fully utilised and are being diverted by the State Governments. The Committee would like the Central Government to impress upon the State Governments the desirability of implementing the norms for maintenance expenditure.

8.23. The Committee have elsewhere in the Report recommended that engineering institutions should take up consultancy work, repair and maintenance work etc., in larger measures so as to augment their resources for meeting recurring expenditure. The Committee have no doubt that with the expertise and equipment available in the technical institutions, sufficient amounts could be earned if these activities are taken up by them in right earnest and with a sense of dedication. The Committee hope that with the increase in these activities, the technical institutions would be able to generate adequate resources for meeting, inter alia, the recurring expenditure required for implementing the norms laid down by the All India Council for Technical Education.

8.24. The Committee note that the Task Force and Steering Group on Education had recommended in 1973 that "the industry for whom the technical education system prepares its manpower resources, should have a greater share in financing not only the practical training in industry but also the institutional programmes." The Committee note that the Department of Education have formulated certain new programmes and are requesting the industry to adopt polytechnics. They hope that these programmes will be soon implemented.

8.25. The Committee learn that the Department of Science and Technology is seriously considering the question of levying Research and Development Cess on industry. The Committee feel that the industry which is benefited by the technical personnel turned out

by the technical institutions, should at least share a part of expenditure on technical education so that additional financial resources are available for improving the quality of technical education and introducing other meaningful schemes which would result in higher productivity. The Committee hope that an early decision would be taken in regard to the imposition of a Research and Development Cess on industry.

CHAPTER IX

ORGANISATIONAL SET UP

A. All India Council for Technical Education

9.1. The All India Council for Technical Education was set up by a Government of India Resolution issued in November, 1945 as a result of the recommendation of the Central Advisory Board of Education that "to stimulate, coordinate and control the provision of educational facilities which industrial development in the post-war period as well as the existing industry will need, there must be an all India body in supreme charge". The Board recommended the establishment of a National Council for Technical Education which should control policy in technical education generally and deal with all technical institutions above the higher school stage except the Technological Departments of Universities. The Government of India felt that this recommendation raises issues, agreement on which is likely to be reached only after considerable discussion with the various authorities concerned. At the same time the development of technical or practical instruction at all stages is important not only in view of the accepted need for making Indian Education generally more realistic but also because it has an essential and urgent contribution to make towards other branches of post-war reconstruction which will demand a large increase in the available supply of Indian technologists and technicians. A necessary preliminary to any planned and balanced development of technical education is a survey by a single competent body of existing facilities, probable post-war requirements and present and prospective proposals for development in this important sphere of education. For the immediate task of survey and advice it was not necessary that the All India Council for Technical Education should be endowed with executive, administrative or controlling powers of any kind or that its establishment should be delayed until all the issues raised by the Central Advisory Board's recommendations have been settled. It was accordingly decided by Government that the All India Council for Technical Education should be set up immediately, composed in the way suggested by the Central Advisory Board but entrusted in the first instance with advisory functions only.

9.2. In the Constitution of AICTE, it was however stated that the decision to set up the Council immediately with advisory functions is without prejudice and at the same time without commitment to the full implementation of the Central Advisory Board.

9.3. The main functions assigned to the Council by the Government Resolution were as under:—

- (i) To survey the whole field of Technical Education.
- (ii) Consideration of immediate projects such as establishment of Higher Technical Institutions, establishment of Engineering Courses etc.
- (iii) Conduct of preliminary investigation with a view to ascertaining the conditions under which the authorities in control of the existing facilities would be prepared to cooperate on an all India scheme.

9.4. The Department of Education in a note has stated that the composition and functions of the Council have been reviewed from time to time and necessary amendments made in the Resolution to incorporate the required changes/additions. The Council consists of representatives of the Union and State Governments, Parliament associations in the fields of business, industry, labour and education and professional bodies. The Union Minister for Education is the Chairman of the All India Council for Technical Education. The total membership of the All India Council is 109 at present. An up-to-date copy of the Government Resolution as amended from time to time, setting forth its present Constitution and functions is given at Appendix VII.

9.5. The Bureau of Technical Education of the Department of Education functions as Secretariat of the All India Council for Technical Education, its Committees and its Boards of Studies.

9.6. During evidence the Committee enquired whether the question of entrusting this body with full executive, administrative and controlling powers as recommended by the Central Advisory Board on Education was considered since the setting up of the Council in 1945. The Additional Secretary Department of Education replied that:—

“.....the All India Council for Technical Education has passed a resolution that it does not want any statutory status. At its last meeting the Council took a decision that there is no special advantage in its being given statutory powers.”

9.7. Regarding the earlier consideration of the proposal, he stated:—

“When the Council was first set up it was mentioned that it was not being given statutory powers, but without prejudice to the consideration of the question in the future. Now, in January, 1951 the Central Advisory Board of Education considered this matter and came to the conclusions that it was not necessary to endow this Council with statutory powers. Therefore, the question was not considered. As I have told you, the Council itself has taken the view that it was not necessary for it to have these statutory powers.”

9.8. All India Council for Technical Education is assisted by the following bodies:—

- (i) Coordinating Committee
- (ii) Regional Committees
- (iii) All India Boards of Technical Education.

Coordinating Committee.

9.9. The Coordinating committee consists of 26 members and is presided over by the Union Education Minister. The Coordinating Committee considers all recommendations made by the Boards of Technical Studies concerned and place them before the All India Council with its recommendations, or pass its decisions thereon.

9.10. The Committee has power to grant recognition to institutions on the recommendations of the Regional Committees and the Boards of Technical Studies.

9.11. This Committee also corresponds with and receives reports from the Regional Committees and coordinates their work where necessary.

Regional Committees:

9.12. The All India Council for Technical Education is assisted by four Regional Committees with their headquarters at Bombay, Calcutta, Madras and Kanpur. The Regional Committees are serviced by the Regional offices of the Ministry of Education and Social Welfare.

9.13. Each Regional Committee consists of about 35 members representing the Central Government, State Governments, technical

institutions, industry etc. The Chairman is elected by the members. The State Governments in the region submit their proposals for expansion and development of technical education to the Regional Committees, and the Regional Committees examine the same with the assistance of the Visiting Committees. The recommendations of the Regional Committees are placed before the Council for final decision before the same are implemented by the State Governments.

9.14. The All India Council for Technical Education at its meeting held in May, 1976 reviewed the functions of Regional Committees. The Council, revised the functions of the Regional Committees which include survey of facilities, liaison between technical institutions, Industry and other research establishments, review critically the academic aspects of training, and to tender advice and guidance to technical institutions etc., etc. The revised functions of the Regional Committees are:—

- (i) To survey facilities for technical education in all the States and to make recommendations to the Coordinating Committee/Council on the consolidation and development of existing institutions, introduction of new courses and establishments of new institutions, wherever necessary;
- (ii) To promote liaison between technical institutions, industry and other technical/research establishments;
- (iii) To review critically the academic aspects of training, such as the levels of performance achieved in the laboratories and the standards of institutions and examinations at the first degree level;
- (iv) To review critically the academic aspects of training, such as the levels of performance achieved in the laboratories and the standards in institutions and examinations at the diploma level in collaboration with the respective State Boards of Technical Education;
- (v) To tender advice and guidance to technical institutions within the region in respect of financial aid from the Central/State Governments as well as to such other institutions as may seek the same;
- (vi) Any other function that may be assigned to the Committee by the Council.

9.15. The recommendations of the Regional Committees go before the All India Council for Technical Education for approval. The recommendations of the Regional Committees on consolidation, diversification and quality improvement are approved by the Chairman of the Council.

9.16. During evidence the Committee enquired whether Government have examined the question of setting up more Regional Committees in view of the growth of Industries since the setting up of these Regional Committees. The Additional Secretary, Department of Education replied "we shall consider this suggestion."

Boards of Studies of AICTE:

9.17. The Department of Education have stated in a written reply that the All India Council for Technical Education was served by the following Boards of Studies prior to the year 1976:—

1. Boards of postgraduate Engineering and Research.
2. All India Board of Technical Studies in Management.
3. All India Board of Technical Education.
4. All India Board of Technical Studies in Engineering and Metallurgy.
5. All India Board of Architecture and Regional Planning.
6. All India Board of Applied Arts.
7. All India Board of Chemical Engineering and Technology.
8. All India Board of Textile Technology.
9. All India Board of Commerce.
10. Pharmaceutical Education Committee.

9.18. The All India Council for Technical Education at its meeting held on 17 May, 1974 while noting the membership of various All India Boards of Studies, authorised its Chairman to examine the existing functions of these Boards and to revise them wherever necessary in accordance with the major responsibilities to be entrusted to them in consultation with the Chairmen of these Boards. As recommended by the Council, the comments of the Chairmen of the Boards were invited regarding revised composition and functions of the Board. On the basis of their comments and in view of the fact that the All India Council is serviced by one Postgraduate Board to look after postgraduate engineering education in all subject fields, Technicians Board to look after diploma education in engineering and technology in all fields, it was felt by Government that it would be most appropriate to combine these six Boards of Studies in different fields and the Pharmaceutical Education Committee, into one Board to deal with postgraduate education in all engineering and technological subjects. This Board, might be named as All India Board of Undergraduate Studies in Engineering and Technology.

9.19. The matter was placed before the All India Council for Technical Education in its meeting held on 21st May, 1976. The Council after considering the views of the Chairmen of various Boards recommended that in future it should be serviced by the following Boards of Studies:—

- (i) The All India Board of Post-graduate Engineering Studies and Research.
- (ii) The All India Board of Under-graduate Studies in Engineering and Technology.
- (iii) The All India Board of Management Studies.
- (iv) The All India Board of Technician Education.

9.20. The revised functions of the Board mentioned at S. Nos. (i) and (ii) are given below:—

All India Board of Post-Graduate Studies & Research

- (i) To coordinate the development of Post-graduate education and research in engineering and technology in the country.
- (ii) To formulate a detailed plan for the development of Post-graduate Education and Research during each Plan period.
- (iii) To lay down the standards and fields of study and to ensure that correct standards are maintained.
- (iv) To advise the All India Council for Technical Education how and where facilities for Post-graduate education and research should be provided and what assistance should be given by the Central Government for the purpose.
- (v) To make a survey of the needs of research, design and development engineers in various specialities in the country and to formulate programmes to meet the requirements of such personnel for industry, research laboratories technical institutions.
- (vi) To promote collaboration between technical institutions offering Post-graduate programmes on one side and research laboratories and industry on the other.

All India Board of Under-graduate Study in Engineering and technology

- (a) To coordinate the development of under-graduate education in engineering and technology in all fields.
- (b) To lay-down the standards and fields of studies in engineering and technological institutions including admission

requirements, duration of courses, practical training, curriculum and teaching methods etc. and to ensure that correct standards are maintained.

- (c) To prescribe standards of instructional facilities to be provided in engineering and technological institutions.
- (d) To identify subjects, and specialities in which degree courses may be conducted to meet the current requirements for engineers and technologists and to formulate appropriate courses for those subjects and specialities.
- (e) To advise the All India Council for Technical Education on all other aspects of engineering and technological education, including continuous evaluation of the engineering education system.
- (f) To appoint such discipline oriented or inter disciplinary committees as the Board may consider necessary consisting of members of the Board as well as persons having special knowledge of industry.
- (g) Any other function that may be assigned to the Board by the All India Council for Technical Education.

Meetings

9.21. In the Resolution establishing All India Council for Technical Education the periodicity of the meetings of the Council has not been stipulated. Asked about the number of meetings held by the All India Council for Technical Education during the last ten years, the Department of Education have in a note stated that six meetings as detailed below were held from 1966 to 1976:—

Date	Persons attended
22-7-66	58 +8 (Special invitees)
25-5-68	66 +2 (Special invitees)
23-9-69	68 +13 (Special invitees)
22-4-72	69 +13 (Special invitees)
17-5-74	61 +7 (Special invitees)
21-5-76	70 +6 (Special invitees)

9.22. The All India Council for Technical Education at the initial stages during the First and Second Plan periods used to meet at least once a year, but at times twice a year. However, since the expansion of technical education was completed during the Fourth and Fifth Plan periods and the emphasis was on consolidation and quality improvement, the Council did not meet frequently. The frequency of the meetings of the Council in the Fourth and Fifth Plans was reduced as most of the major States had established the Boards of Technical Education and the Council also had ceased to conduct National Certificate and National Diploma Course examinations.

9.23. Regarding Regional Committees of the All India Council for Technical Education, the Department of Education have stated in a note that the Regional Committee generally meet twice a year. During the last two years each of the four Regional Committees met three times as indicated below:—

	Date of meetings
Eastern Region	31-1-75 16-1-75 7-12-76
Western Region	5-12-74 30-10-75 14-9-76
Northern Region	15-1-75 1-12-75 4-12-76
Southern Region	1-4-75 25-10-75 8-5-76

9.24. During evidence the Additional Secretary, Department of Education was asked to state whether the present frequency of the meetings of the Regional Committees was considered adequate. He replied:—

“I would say that the periodicity of the sittings of the Regional Committees has been better than that of the All India Council. Actually, except for the Eastern Regional Committee, all other Committees have met more often. The Eastern Regional Committee met on seven occasions in the last four years while the other Committees have met on eight occasions. . . . Earlier no periodicity was fixed. We feel that the provision which exists that in addition to the periodicity, the Committee can meet as and when necessary should be adequate.”

9.25. In the revised constitution of the All India Board of Undergraduate Studies in Engineering and Technology and All India Board of Technician Education, it has been stated that the "Board should ordinarily meet twice a year but it will be open to the Chairman to summon the meetings of the Board as and when necessary. "However, in the cases of the remaining two Boards viz. All India Board of Post-graduate Engineering Studies & Research and All India Board of Management Studies no such provision has been made.

Working of the All India Council for Technical Education

9.26. Regarding the working of the All India Council for Technical Education, it has been stated in a memorandum to the Committee that:—

"The All India Council for Technical Education, which is the main advisory body of the Government, is far too large and meets very infrequently, sometimes once in two years. It is not possible for important decisions to be taken in one session of a body consisting of 40 to 50 members. Although the AICTE has a coordinating Committee, it meets only a day before the Council itself to prepare the necessary briefs. Obviously, this system is not very satisfactory. I would suggest that the All India Council for Technical Education should have a standing committee which should meet at least three times a year and take decisions on its behalf."

9.27. A non-official during his evidence before the Committee stated as follows:—

"It (AICTE) is an advisory body, its meetings are infrequent, its recommendations are nothing more than pious pronouncements, nobody ever bothers whether anything has been implemented. Its advice relates mostly to the introduction of courses in various institutions in the country, and there is always a provision "subject to the availability of funds". That is a very important and great constraint. There is always the possibility of taking shelter under it and saying that no funds are available and therefore nothing has been done. We should not approve of something if there is no means of implementing it because then it remains merely a declaration of intention."

9.28. From the minutes of the meetings of the All India Council for Technical Education held in April, 1972, May 1974 and May 1976, the Committee noticed a number of cases where action on the recom-

recommendations of the Council has not been taken promptly. A few instances are given below:—

Sl. No.	Brief details and date of the recommendation	Implementation
1	The AICTE recommended in 1960 and in 1963 that admissions to technical institutions should not be restricted on the basis of domicile or nativity or other factors.	A number of institutions are still imposing domicile restrictions for admitting students.
	The AICTE recommended that no capitation fee should be charged for admission.	Four approved engg. institutions in Karnataka are still charging capitation fee for admission.
2	The AICTE in April, 1972 recommended that a Joint Committee of AICTE and UGC should be set up to review the whole system of engg. education at under-graduate level.	This Joint Committee was set up in 1974 only. The Committee is likely to complete its work by 1980.
3	The AICTE in April, 1972 recommended that a high level professional unit should be set up in the Central Ministry of Education for the overall execution of the Quality Improvement Programmes.	This recommendation has not been considered by the Ministry so far.
4	The AICTE recommended in 1972 that the Secretariat of the Council (Department of Education) should compile a directory setting out institution-wise the expertise in engineering institutions for taking up consultancy services. Similarly industry on its own part should compile a directory setting out the problems for which different undertakings need consultancy services from institutions.	The R&D Committees are taking up this work.
5	In May 1974 the AICTE laid down certain norms for recurring expenditure in engineering colleges and polytechnics and recommended that the State Governments may be requested to implement the same within the fifth plan period.	None of the State Governments and Union Territories has implemented these norms.
6	The AICTE in 1974 recommended that manpower requirements for the Sixth Plan should be carefully assessed.	The Ministry had asked the IAMR to work out the tentative estimates for making the study on the basis of the estimates given by IAMR, the Ministry are still doing preparatory work for asking IAMR to take up the study.

9.29. During evidence the Committee desired to know how it is ensured that expeditious action is taken on the recommendations of

the All India Council. The Additional Secretary, Department of Education replied that "expeditious disposal of work is the responsibility of the Bureau of Technical Education."

9.30. Asked whether Government are satisfied with the follow up action taken on the recommendations of the All India Council for Technical Education, the witness stated:—

"We ourselves are not satisfied with our functioning. A number of bad cases have come to light in the preparation of replies to this questionnaire but at the same time there are many important matters on which we have taken quick decisions and tried to implement them."

Role of University Grants Commission in Higher Technical Education

9.31. The Department of Education have stated in a note that the University Grants Commission is required to provide facilities to the Universities|university maintained institutions and departments for development, maintenance of standards and in the coordination of higher technical education. Generally, the requirements of the university|institutions for development of teaching and research in engineering and technology are examined and assessed by the visiting committees set up by the All India Council for Technical Education within the broad policies laid down by the AICTE for development of Engineering & Technological Education. The visiting Committees spend sufficient time for discussing the programmes for development in various branches of engineering and technology with the authorities of the Universities, the Heads of Departments, the Faculty members etc., after making physical verification of the facilities already created and the extent of their utilisation by the departments concerned. Based on these discussions with the individual universities, the visiting committees make recommendations for development of teaching and research in engineering|technology at the university, highlighting the focal points of growth, the problems faced by the university in the implementation of the programmes approved during the earlier Plan and the ways and means for their speedy solution. The recommendations pertain to overall development of teaching and research in the Faculty of Engineering in a university comprising both under-graduate and post-graduate courses. The extent of intake to various courses, in engineering|technology at the under-graduate and post-graduate levels indicating the areas of specialisations to be pursued and the electives to be offered, is recommended on the basis of regional and national needs.

9.32. On the basis of intake at the under-graduate and post-graduate levels, the faculty strength, the courses|electives offered and the allocation made in the earlier Plan and its utilisation, the University Grants Commission has suggested provisional allocation of funds to the universities for development of higher technical education during the current Plan period within the overall allocation likely to be provided by Ministry of Education for higher technical education. The Universities|Institutes deemed to be universities are required to formulate their programmes of development within the respective allocation under two or more priorities.

9.33. In a memorandum to the Committee it has been stated:—

“As far as the AICTE is concerned, one must recognise that it played an important and positive role in the early years to develop higher technical education in the country. However, as structured with its unwieldy membership and with the setting up of the University-Grants Commission, a complete reorganisation is called for. A suggestion worth examining is whether the part of the higher technical education now handled by the AICTE and the remaining part by the U.G.C. should not merge into a single effort. In our view there should be a unified single agency preferably with the UGC which should be charged with the responsibility of the development of higher technical education. What one must recognise is the fact that technology and science although distinct are symbiotically related and both together form part of the general higher education in the country and are not distinct from it. The overall integration processes, whose absence is often deplored in the universities, requires special consideration at the Ministry level.”

9.34. In his memorandum to the Committee a Principal of the leading engineering college has stated:—

“.....The (Kothari) Commission has recommended that the responsibility for the development of technical education at the University level and maintenance of standards therein should be vested in a U.G.C. or C.S.I.R. type body to be specially set up for engineering education. A central coordinating Committee consisting mainly of Professionals and industrialists from public and private sectors could continue to operate within the Ministry. But the administrative work as well as the coordination of standards at the University level could be assigned by the UGC type body. This organisation could specially look after the proper management and development of the I.I.T's and

the Regional Engineering Colleges. In the absence of such a body, proper development of research on the one side and constructive youth activities on the other has not been possible to the desirable extent."

9.35. The Education Commission (1964—66) in their report have stated:—

"The AICTE, which is an unwieldy body with the Union Minister as Chairman, meets hardly once a year. Even its Co-ordinating Committees meet very infrequently and obviously the decisions taken tend to be more administrative than technical. The work that should normally be done by universities through their Boards of Studies is done by the Boards of Studies of the Council. While the Council performs a useful function as high level policy formulating agency, we feel that the time has come in higher technological education to place the responsibility for stimulation and organisation on the universities and institutions themselves who should have scope for experimentation and innovation. We recommend that the responsibility for the development of technical education at the university level and maintenance of standards therein should be vested in a UGC type body to be specially set up for engineering education. This should work in cooperation with the UGC and have some overlapping membership. Coordination would still be necessary at the Centre; and a Central Co-ordinating committee consisting mainly of professionals and industrialists from public and private sectors, could continue to operate within the Ministry of Education. But the administrative work as well as the coordination of standards at the university level could be assigned to the UGC type body."

9.36. Regarding the action taken on this recommendation of the Education Commission, the Department of Education have in a note stated that the Government did not consider it necessary to set up an organisation of the type suggested above. "The AICTE, the Regional Committee and the other Standing Committees of the Council are performing these functions quite satisfactorily. A better coordination also has already been achieved by a number of Joint Committees of the AICTE and the UGC having been set up, as for example, to review the under-graduate courses, to set guidelines for assistance to various institutions courses etc."

9.37. During evidence the Committee desired to know the detailed reasons for not accepting the recommendations of the Education Commission regarding setting up of a UGC—type body for dealing with technical education. The Additional Secretary, Department of Education stated:—

“The Government have considered this matter and the decision is not to set up a separate body. The Joint Committee of All India Council of Technical Education and U.G.C. has been set up to look after the work the Kothari Commission wanted to give to this Committee. Whatever was intended to be done by a separate body will be taken care of by this Joint Committee.

The Kothari Commission recommended that UGC type body should work in close cooperation with UGC. For co-ordination at the level of the Central Government there should be coordinating Committee which should consist mainly of industrialists from private and public sectors. This means that we should have UGC on one side and a similar body for Technical Education and over these bodies there should be another Committee in the Ministry. It would be a clumsy arrangement. It was thought that the Joint Committee of All India Council for Technical Education and UGC would perhaps be a more satisfactory arrangement. Although we have not accepted the recommendation in letter we have done so in spirit.”

9.38. The Committee note that the All India Council for Technical Education which is the highest body regarding the development of engineering and technological education in the country and advises the Central and State Governments on all aspects of technical education, was set up by means of a resolution in 1945 as a result of the recommendations made by the Central Advisory Board of Education. Although the Central Advisory Board of Education had recommended that the All India body should be in supreme charge and should be endowed with executive, administrative and controlling powers, it was decided by the then Government that the All India Council for Technical Education should be entrusted, in the first instance with the advisory functions only, without prejudice and without commitment to the full implementation of the recommendations of Central Advisory Board. The Committee have been informed that the Central Advisory Board of Education in January 1951 and the All India Council for Technical Education recently considered the question of entrusting full executive

and administrative powers to the Council. They came to the conclusion that it was neither necessary nor of any special advantage to give statutory powers to the Council.

9.39. The Committee note that the functioning of the All India Council for Technical Education has not been very effective. A number of important recommendations made by the Council have either not been implemented at all or undue delays have occurred in initiating any conclusive action thereon. The meetings of the Council have been held after long intervals. During the last 11 years, the Council has met only 6 times and no effective follow up action has been taken on the recommendations made by the Council.

9.40. The Committee further note that at present both the All India Council for Technical Education and the University Grants Commission are concerned with higher technical and engineering education in the country. Moreover, there are wide disparities in the standard and quality of technical education imparted in the various engineering institutions in the country. There is widespread unemployment among the technical graduates coming out of the engineering institutions in the country which indicates that technical education is not fully attuned to the needs of the industry and the economic development of the country. On the other hand, industries are not able to recruit the right type of engineers they are looking for. All this underlines the need for bringing about meaningful improvement in the curricula, standards of technical and practical education. This could possibly be achieved better if there was a single effective body to look after technical education.

9.41. The Committee note that the Kothari Commission (1966) had observed that the All India Council for Technical Education is an unwieldy body. It recommended that the responsibility for the development of technical education at the University level and the maintenance of standards should be vested in a UGC type body to be specially set up for engineering education. Similar views have been expressed by other knowledgeable persons also.

9.42. The Committee consider that a phenomenal change was taken place in the development of technical education in the country since the All India Council for Technical Education was set up in 1945. There are at present about 150 technical and engineering institutions which impart higher technical education and the annual admission to these institutions is about 22,000. The UGC which was set up in 1956 for the development of higher education in the country is concerned with a large number of these engineering ins-

stitutions which are affiliated to the Universities. As the All India Council for Technical Education which is an advisory body, has not been effective in bringing out the much needed improvement in the quality and standard of technical education, it is high time that the necessary re-organisation of the set up to administer technical education in the country is undertaken by Government. The Committee consider that there is need to have a unified single agency which may be entrusted with the work of development of higher technical education so that there is broad uniformity in the standards as well as in the approach towards the various problems relating to technical education. The Committee, therefore, recommend that a single agency with suitable administrative, executive and financial powers may be set up for the development of technical education in the country at the earliest. . .

9.43. The All India Council for Technical Education is assisted by a coordinating Committee, four regional committees and four All India Boards of Technical Studies. The Coordinating Committee of the Council considers the recommendations made by the All India Boards of Technical Studies and places them before the All India Council with its recommendations or pass decisions thereon. The functions of the Regional Committees as revised by the Council include survey of facility, liaison between the technical institutions, industry and other research establishments; critical review of academic aspects of training and to tender advice and guidance to technical institutions. The Boards of studies of the Council have been streamlined recently and their number has been reduced from ten to four. The Boards concerned with higher technical education are the Boards of Postgraduate Engineering studies and Research and the Board of Undergraduate Studies in Engineering & Technology. Their functions include coordination of the development of Undergraduate and Postgraduate Education and Research in Engineering and Technology in the country and laying down the standards.

9.44. They hope that the revised functions assigned to the Regional Committees recently will make them more effective in discharging the role assigned to them. The Committee would like the working of these Committees to be kept under active review so that necessary action could be taken to improve their effectiveness.

9.45. The Committee suggest that the performance and working of the reorganised All India Boards of Technical Studies may be kept under watch, to ensure that these subserve the purposes underlying their constitution.

9.46. The Committee note that in the resolution constituting the All India Council for Technical Education, periodicity of the meetings of the Council has not been specified. Similarly in the case of the Regional Committees, the periodicity of the meetings of the Regional Committees has not been mentioned in their constitution. However, in the case of All India Board of Undergraduate Studies in Engineering & Technology, and All India Board of Technician Education, it has been stated in their constitution that the Boards will ordinarily meet twice a year. In the case of the remaining two Boards namely, All India Board of Management Studies and All India Board of Post-graduate Studies and Research no such provision has been made. The Committee feel that in view of considerable time gap between the meetings of All India Council for Technical Education and the Regional Committees, the Government may examine the question of laying down the periodicity for the meetings of the All India Council for Technical Education and Regional Committees in their constitutions. Similarly periodicity of the meetings of the All India Board of Postgraduate Studies & Research and All India Board of Management Studies may also be laid down in their constitution.

B—Technical Education Bureau

9.47. The Department of Education have in a written reply stated that the Technical Education Bureau in the Department of Education deals with the higher technical education. In addition to secretarial staff (such as LDCs, UDCs, Assistants and Section Officers) it is manned by Advisory Staff. The advisory cadre consisting of Educational Adviser (T), Jt. Educational Adviser (T), Deputy Educational Adviser (T), Assistant Educational Adviser (T), Education Officer (T), and Asstt. Education Officer (T) is serving in the Technical Bureau.

9.48. The Bureau is divided into seven sections dealing with the (i) All India Council for Technical Education and its various Boards and Committees, (ii) Policy Planning, formulation of schemes etc., (iii) Apprenticeship Training Scheme, (iv) Board of Assessment for recognition of Qualifications and Equivalence of Degrees and Diplomas etc. for recruitment to Government services, Cultural and Technical Education Agreements, (v) statutory institutions like the Institutes of Technology, (vi) autonomous institutions fully financed by Central Government like the Indian Institute of Science, Bangalore, Indian Institutes of Management, National Institute for Training in Industrial Engineering and National Institute of Foundry and Forge Tech-

nology, Ranchi and Regional Engineering Colleges, and (vii) Release of Central Grants to various approved courses of the Institutes.

9.49. The Bureau of Apprenticeship Training which deals with statutory requirements, is headed by an Additional Apprenticeship Adviser.

9.50. The Bureau at the Headquarters is assisted by the Regional Offices of the Ministry of Education at Bombay, Calcutta, Kanpur and Madras.

9.51. Asked about the system of making appointments to the advisory cadres in the Technical Education Bureau, the Department of Education have in a note stated that the following methods are adopted for recruitment to Advisory Cadres:—

Grade	Method of Recruitment
1. Joint Educational Adviser (Technical)	By promotion, failing which by transfer on deputation (including short-term contract).
*2. Additional Apprenticeship Adviser	By promotion, failing which by transfer on deputation (including short-term contract).
3. Dy. Educational Adviser (Technical)	50% by promotion 25% by transfer on deputation (including short-term contract) and 25% by direct recruitment.
4. Assistant Educational Adviser (Technical)	50% by promotion 25% by transfer on deputation (including short-term contract) and 25% by direct recruitment.
5. Education Officer (Technical)	25% by direct recruitment, 25% by transfer on deputation (including short-term contract) failing which by direct recruitment. 50% by promotion.
6. Assistant Education Officer (Technical)	By promotion.

*This provision has been proposed in the draft recruitment rules for the post which have been approved by the Department of Personnel and Administrative Reforms and the UPSC but have yet to be vetted by the Ministry of Law & Justice (Legislative Department) before the Recruitment Rules are notified.

9.52. Asked how the persons appointed in the advisory cadres keep themselves in close touch with the universities and engineering institutions, the Department of Education have stated in a note that the constitution of various academic Bodies like State Boards of

Technical Education, Syllabus Committees of the various Examining Bodies, Board of Governors of autonomous and non-Government Engineering Colleges, Polytechnic etc. provide for inclusion of representatives of the Bureau of Technical Education on these Bodies. Thus, the Advisory Officers of the Bureau are actively participating in all academic activities of the Engineering and Technological Institutions in the country. Further Advisory staff are members of Boards of Governors of Engineering Colleges/Polytechnics and therefore, keep themselves in constant touch with the educational system.

9.53. The Regional officers and other senior officers at the Ministry's Headquarters also keep in touch, with the universities and educational institutions on the various forums such as Board of Examinations, Academic Councils, Expert Committees for various purposes appointed by the Ministry/University and other institutions/other agencies and State Boards of Technical Education, State Industrial Liaison Boards etc.

9.54. Regarding the system of appointments in the advisory cadres of the Technical Education Bureau it has been stated in a memorandum to the Committee:—

“...the present system of permanent advisory cadres in the Ministry of Education is not very satisfactory. The officers appointed to these cadres get out of touch with the activities in the universities and technical institutions. It would be far better to appoint officials in advisory cadres at various levels by deputation of education and eminent teachers from universities and technical institutions.

9.55. In another memorandum to the Committee it has been stated:—

“...Experience over the two decades since Independence has, however, shown that even the top scientists of different fields who were brought into the Government as top level Technical and Scientific Advisers, soon tended to be pucca administrators-cum-bureaucrats over the years. It is necessary to ensure that the technical posts in the Ministry at the Centre as well as at the State Government levels should be filled by men of distinction in their own scientific fields, and to counteract the corroding influence of the bureaucratic climate in which they have to operate, serious consideration should be given to (i) making the top-level technical posts under Govern-

ment as tenure posts of five-year contractual periods and (ii) introducing a system of rotation between the tenure-post holders and the top-level persons working in academic institutions as a regular feature of manning and operating the overall system of administration at Government level of higher Technical Institutes. Such a system would ensure a two-way flow for constant interchange of ideas, new knowledge and a freshness of outlook at higher echelons of Government dealing with technical education."

9.5. In the course of evidence before the Committee a leading educationist stated thus:—

"In the present system, we have two categories in the Ministry. One is secretarial category where IAS and others are there. The second is the permanent advisory category. This permanent advisory category is not very active because here you have recruited people long back and they are on the verge of retirement. They do not have experience of actual teaching or contact with the problem of the industry or of having gone out into the field. That is why, I suggest that a person can go to the technical education for four or five years as education officer, etc. depending upon the status and this will give flexibility to the technical division. I do not know, what is the benefit of having a permanent cadre. It is not very clear to me at all. It was constituted a long time back. It does not have the advantage either of the IAS system or of an advisory system because a person who is supposed to be an advisor must be a technical person."

9.57. The following statement shows the number of Officers in position (October 1977) in the Advisory Cadre of Technical Education Bureau.

Statement showing the actual number of officers in position in the Advisory Cadre of Technical Education Bureau and their Mode of Appointment

Sl. No.	Grade	Actual No. of officers in Position	Mode of Appointment		Remarks
			Direct Deputation	D.P.C. Ad-hoc Promt. Appitt.	
1	JEA (T)	1			1 Proposal to convene DPC (Sr.) to fill up the post on regular basis has been referred to U.P.S.C.
2	Additional Apprenticeship Adviser	None (one post vacant)			Previous incumbent left on deputation in Sept. 1977. Proposal to fill up the vacancy on <i>ad-hoc</i> basis has been submitted to U.P.S.C.
3	D.E.A.(T)	5	..	1	4 ..
4	A.E.A.(T)	6		1	5
5	E.O. (T)	5	1		4 ..
6	A.E.O.(T)	8			7 ..
TOTAL		25	1	3	21

Functions of the Technical Education Bureau

9.58. Asked whether the present set up in the Technical Education Bureau is adequate, the Department of Education have in a note stated as follows:—

- (i) The Technical Education Bureau not only has the advisory role connected with planning and development of technical education but also the normal secretariat functions connected with the administrative matters like release of grants, review and reports to Parliament, etc. The dual functions are inter-related and an intergrated approach has to be taken for the effective functioning of the Bureau.
- (ii) On the recommendations of All India Council in for the past 2 decades, the Technical Education Bureau of the Ministry has concentrated on quantitative expansion and since 1970 have been paying attention to qualitative improvement of technical education. In spite of best efforts it has not been possible for Technical Education Bureau to devote much of its time to review and evaluate projects so far implemented, find out and analyse the deficiencies in the programme and projects and also in the implementation of them and suggest appropriate remedial measures for the rectification of the deficiencies.

9.59. The Department of Education have further stated that the responsibility of the Central Government to maintain uniform standards in technical education all over the country enjoins upon the Government to have constant and continuous dialogue with the various agencies involved in this, i.e., the industry, the institutions and the State Governments. The inadequacy of the staff has made it very difficult for the Government to carry on these functions of liaison, inspection and feed back. Many of the Boards and Committees appointed do not meet as often as they should since the requisite advisory staff both in number and level are not available. The field offices of the Ministry i.e., the Regional Offices situated at Bombay, Calcutta, Madras and Kanpur have not been staffed with adequate senior staff members even at least of the level of the Directors of Technical Education of the State Governments so that effective and useful dialogue can be carried out with the State Governments regarding the implementation of the recommendations of the All India Council from time to time.

9.60. The increased responsibility of the Central Government is reflected also in the Plan provision made in the successive Five-Year Plans as given below:—

1st Plan	Rs. 11.5 crores
2nd Plan	Rs. 26.2 crores
3rd Plan	Rs. 68.8 crores
4th Plan	Rs. 68.6 crores
5th Plan	Rs. 98.0 crores.

9.61. The Advisory Cadre which has to attend to all the functions enumerated above in the Technical Education Bureau of the Ministry has not kept pace with this increased demand on its functions. In fact the total number of staff at present is less than what was available in 1969.

9.62. During evidence the Committee referring to the Department's statement that "inspite of the best efforts it has not been possible to devote much of its time to review and evaluate the projects so far implemented and analyse the deficiencies in the programme and projects and also in their implementation Author's and suggest proper remedial measures", desired to know the reasons for this. The Additional Secretary, Department of Bureau replied that "finance has been the main constraint. We will try to make up the deficiencies which we could not make up."

9.63. The Committee then enquired whether any O&M study of the staff requirement of the Technical Education Bureau was made to assess the staff requirements. The witness replied:—

"An O & M study has been carried out in respect of the staff at the level of Educational Officers and below. Actually it is much more a qualitative study than a quantitative assessment. In respect of higher grades also a general assessment has been made... the question of strengthening the Technical Education Bureau is already under examination.

Monitoring and Evaluation Cell

9.64. The Department of Education have in a written reply stated that a Monitoring and Evaluation Cell has been created in the Statistical and Planning Division to monitor the important programmes

of general education. The Cell was established in 1974 and its main functions are as follows:—

- (i) To collect information about the physical and financial targets of important programmes such as the Minimum Needs Programme, vocationalisation, 10+2+3 pattern and non-formal education with a view to analysing the progress of these programmes.
- (ii) To undertake the responsibility assigned by the Ministry of Home Affairs to Ministry of Education with regard to the educational development of tribal areas.
- (iii) To analyse the sub-plans of tribal areas formulated by the State Governments with a view to assessing the adequacy of otherwise of the programmes included in the Plan and to suggest suitable modifications for the implementation of the programmes.
- (iv) To study and analyse the integrated Plan projects prepared by the various State Governments for accelerating the educational development of Tribal areas in the States, and
- (v) To serve as a clearing house for information regarding Plan activities of Central and various State Governments.

9.65. The activities of this Cell are at present restricted to the collection and analysing the educational programmes included in the State plans and sub-plans for general education. But such Monitoring in the area of technical education has not yet been undertaken.

9.66. The Committee note that the Technical Education Bureau which acts as the Secretariat of the All India Council for Technical Education is manned by a cadre of advisory staff. The system of making appointments to the advisory cadre varies from post to post. In recruitment rules for the advisory cadre post, provision has been made for appointing staff on permanent basis as well as on transfer/deputation including short-term contracts.

9.67. The Committee are however surprised to note that in spite of the fact that provision has been made for appointment of officers on deputation, not a single officer has been appointed on deputation. What is more surprising is that out of the 25 officers working in the advisory cadre, (October 1977) 21 have been appointed on ad hoc

basis. The Joint Educational Adviser (T), 4 out of the 5 Deputy Educational Advisers (T), 5 out of the 6 Assistant Educational Advisers (T), 4 out of 5 Educational Officers (T) and 7 out of 8 Assistant Educational Officers (T) have been appointed on ad hoc basis. The post of Additional Apprenticeship Adviser has been vacant since September, 1977.

9.68. Some eminent educationists have expressed the view that the system of permanent advisory cadre is not satisfactory as the officers appointed on permanent basis get out of touch with the activities of industry and changing needs of the educational institutions. According to them it would be purposive and meaningful if eminent faculty members are appointed on tenure/contract basis, so that there is continuous flow of fresh thinking in the higher echelons of the administration. As the Technical Education Bureau is responsible for dealing with planning and policy matters in regard to technical education as also for ensuring the implementation of the recommendations of the All India Council for Technical Education, it is of utmost importance that the advisory staff in the Bureau is of high calibre, who are in close touch with the conditions in the industry and in the technical institutions. It would therefore, be more appropriate if majority of the staff in the advisory cadre in the Technical Education Bureau are drawn from the Faculty members of the engineering institutions or senior engineers in industry on tenure basis. Pending amendment to the recruitment rules, which may be undertaken very early, the existing provision in the recruitment rules for appointing staff on deputation basis including short term contract, may be put to full use and strictly followed, so as to man the Bureau with eminent faculty members from leading engineering institutions and experienced engineers from industry with the requisite aptitude. The Committee also recommend that the appointment at present made on ad hoc basis should also be reviewed immediately and appointments made on regular basis.

9.69. The Committee need hardly add that the persons appointed on tenure basis may not normally be allowed to continue beyond their tenure period as this would not be conducive to continuous flow of fresh thinking on the subject and inter change of positions between those in the Bureau and the Faculty members and engineers working in the industry. The Committee would also like to point out that it would be difficult to attract competent faculty members/practising engineers to serve in the advisory cadre unless the pay and allowances as also other facilities provided to those appointed on tenure/short term contract basis are commensurate with their

talents/experience and the emoluments and facilities which they may be getting elsewhere.

9.70. The Committee are concerned to learn that the Technical Education Bureau has not the requisite staff to the required extent. This is inspite of the fact that the Plan allocation for Technical Education in the Central Sector has increased manifold from Rs. 11.5 crores in the First Five Year Plan to Rs. 92 crores in the Fifth Five Year Plan. The Department of Education have admitted that because of the inadequacy of staff, the Bureau's activities have not been effective as these ought to be in different fields. For example:—

- (i) It has not been possible for the Technical Education Bureau to devote much of its time to the review and evaluation of projects implemented, to find out and analyse deficiencies in the programme and suggest appropriate remedial measures for the rectification of deficiencies.
- (ii) Constant and continuous dialogue with the industry, institutions and State Governments, etc. could not be undertaken.
- (iii) It has become difficult to carry out the work of inspection and feedback.
- (iv) Many of the Boards and Committees appointed do not meet as often as they should since the requisite advisory staff both in number and level are not available.
- (v) The field offices of the Ministry i.e., the Regional Offices have not been staffed with adequate senior staff members so that effective and useful dialogue could be carried out with the State Governments, regarding the implementation of the recommendations of the All India Council for Technical Education.

9.71. The Committee were informed that a general assessment of the Technical Education Bureau has been made and that the question of strengthening the Bureau is already under examination. The Committee urge the Government to undertake a review of the staff requirements of the Technical Education Bureau specially at higher echelons on a scientific basis and to strengthen the Bureau suitably so that the functions expected of the Bureau are discharged efficiently.

9.72. The Committee also note that the Department of Education have recently strengthened the Planning and Statistical Division and

APPENDIX I

(Vide Para 2.68)

List of State universities imposing restrictions on admission to Engineering Colleges

Name of the University and College	Restrictions
	Under the six point formula—
1. J.N. Tech. University, Andhra Pradesh . (i) Engg. College, Kakinada (ii) Engg. College, Anantpur (iii) Nagarjunasagar Engg. College, Hyderabad.	85% of seats are reserved for local candidates in respect of local areas in respect of Andhra University, Osmania University and Shri Venkteswara University.
2. Osmania University, Hyderabad . . .	85% for local candidates.
3. Shri Venkateshwara Univ., College of Engineering, Tirupati.	85% of seats are reserved for local candidates. A local candidate is one who has studied for a fixed period in the institutions located in Andhra Pradesh. 15% seats are for others if available otherwise offered to local candidates.
4. Delhi College of Engg., Delhi	75% seats reserved for students passing qualifying examinations from Delhi. 5% for students passing from Union Territories other than Delhi and Chandigarh. 20% for other candidates.
5. Universities located in Maharashtra . . .	A candidate must pass the qualifying exam. from one of the statutory institutions in the State and also SSC or its equivalent from one of the recognised Schools in the State. 25 seats are reserved for Defence Personnel and Marathi speaking candidates from Mauritius.
6. University of Jodhpur, MBM Engg. College, Jodhpur.	50% on all India basis. 50% from bonafide residents of Rajasthan.
7. Punjab University, Chandigarh. G.N. Engg. College, Ludhiana.	95% for bonafide residents of Punjab. 5% for other States.
8. Punjab Agricultural University, Ludhiana- College of Agricultural Engineering	B. Tech. and M. Tech. 80% for candidate from Punjab.
9. Gorakhpur University, MMM Engg. College, Gorakhpur.	10 seats reserved for students other than from UP.

Name of the University and College	Restrictions
10. Universities/Colleges in Madhya Pradesh	Admission allowed to those who have passed the qualifying exams. from Institutions in M.P.
11. <i>Patna University</i> —Bihar College of Engg., Patna.	50% for those residing in Bihar. 50% for students of Patna University.
12. <i>Bihar University</i> —Muzaffarpur College of Engg., Muzaffarpur.	50% for those residing in Bihar. 10% for other State candidates on reciprocal basis.
13. <i>Bhagalpur University</i> —Bhagalpur College of Engg., Bhagalpur.	Do.
14. <i>Ranchi University</i> —Bihar Institute of Technology, Sindri.	Do.
15. <i>Sambalpur University</i> —Burla College of Engg., Burla.	93% reserved for those who passed qualifying exam. from institutions located in Orissa.
16. <i>Gauhati University</i> —Assam Engineering College, Gauhati.	25% seats kept for students from other States on reciprocal basis.
17. <i>Dibrugarh University</i> —Jorhat Engg. College, Jorhat.	Do.
18. Madurai University, Madurai	Only those who have qualified from the institutions located in Tamilnadu are considered. Students from other States admitted on reciprocal basis.

APPENDIX II

(Vide Para 2.74)

No. F. 10-45/74-T. 6

Government of India

Ministry, of Education & Social Welfare

New Delhi, the 5th September, 1974

To

The Chairman, Board of Governors,
Indian Institute of Technology,
Kharagpur/Bombay/Madras/Kanpur/Delhi.

SUBJECT: *Orders of the Visitor on the report of the Reviewing Committee of the Indian Institute of Technology at—*

Sir,

I am directed to say that according to sub-sections (2) and (3) of Section 9 of the Institutes of Technology Act 1961, the Visitor appointed a Reviewing Committee in March, 1970 to review the work of the Indian Institute of Technology. Having received the report of the Reviewing Committee and having received comments of the respective Boards of Governors, this matter has been also considered in detail by the Council of Indian Institute of Technology. On the report of the Reviewing Committee of the Indian Institute of Technology, by virtue of sub-section 9(3) of the Indian Institutes of Technology Act, 1961, the Visitor has directed that the Indian Institutes of Technology at Bombay, Madras, Delhi, Kanpur and Kharagpur should implement the recommendations of the Reviewing Committee in accordance with the following directions, within the actual financial provisions made available to the Institute out of the total financial outlay for educational development under the 5th Five Year Plan:

- (1) The admission to the under-graduate courses in the I.I.T. should be restricted to the same level of intake as obtaining at present and that admission to the post-graduate and research courses should be increased. This is desirable because the facilities at post-graduate level will be available to students from the Universities also. Flexibility in

admissions to the post-graduate level should, however, be planned on the basis of requirements of industry, and the I.I.T. should utilise its usual grants for strengthening the courses. Where increase in activity is proposed, the same should be related to the capacity of the IIT to secure finances from industry and other government organisations. The choice of field of post-graduate and research activities should bear relationship to Science and Technology plans and the technological manpower needs of the country. The Government department, public and private sector enterprises should be approached to depute their staff for post-graduate and research courses.

- (2) Both the 3 years degree courses for science graduates and 5 years degree courses be conducted in such a manner that selectivity of courses depend upon the infrastructural facilities available at the institute; the support received from industry and the dynamism exhibited by the faculty. Students admitted for the 3 years degree courses should mostly be required to have prior experience in industry and preferably be sponsored by the Government departments/industries. Further, admission to the over-all three years degree under-graduate courses should be part of the total student intake.

- (3) While the Institute should freeze the admission to under-graduate courses as well as total under-graduate population, there should be flexibility in the total intake of students among various disciplines and various courses offered. In the I.I.T. and between I.I.T. and other research organisations, priority should be given in allocating funds to joint research work between several organisations. The areas in which new courses of inter-disciplinary nature, particularly at post-graduate level, needs to be explored by the I.I.T. are as under:—

Marine Engineering, Marine Biology, Rock Mechanics, Atmospheric studies, Photography, Ocean Bed Engineering, Development of Food Processing, Aircraft Structures, Defence oriented fields, courses related to Development of Power, Exploration and Development of Fuel and other fields of immediate relevance to the economic needs. Such courses should be developed mainly on

sponsorship basis. Under-graduate courses with core curriculum in new areas should be formulated only where sizeable curriculum and subject content have been developed at the post-graduate level and trained faculty is available.

- (4) With regard to (a) Collaboration with industry (b) Faculty development (c) inter-action with other institutions (d) inter-disciplinary programmes (e) establishment of computer service and system engineering department and (f) Training and placement department, these should be effectively carried out as under.

(a) Collaboration with Industry

The I.I.T. should have a separate organisation for industrial collaboration which will develop and promote growth of relationship between the I.I.T. and Industry and the I.I.Ts. and other technical institutions in the region. The organisation must promote conditions necessary for growth of inter-disciplinary courses and industry associated research activity. This organisation should endeavour to secure live projects, practical industrial problems, consultancy work and visiting personnel from industry and arrange on a reciprocal basis, for institute faculty to visit and work in industry. The organisation eventually should carry qualitative assessment of its work done and re-orientate strategies accordingly.

(b) Faculty Development

(i) Faculty training and development programmes should be expanded considerably on a part of Quality Improvement Programmes (of the Ministry of Education). Administrative bottlenecks faced should be removed. A deliberate effort is to be made during the 5th Plan to train all teaching personnel in a phased manner with a view to provide in service training, and industrial experience through summer schools. This alone will lead to better and efficient methods of teaching. Modern educational aids, as well as established educational practices should be extensively employed.

(ii) The I.I.T. within the funds available under the 'Quality Improvement Programme' should draw a programme of exchange of their faculty with other technical institutions and provide opportunities in I.I.T. for training of faculty from other technical institutions/technical departments. Programmes of faculty exchange are to be critically evaluated by a technical committee appointed by the Board of Governors whose report should periodically form the basis of further academic development on correct lines. Faculty so trained should be given specific opportunity to utilise the experience acquired and this should also be evaluated.

(c) Inter-action with other institutions in the region.

Selective programmes of exchange of faculty between the I.I.T. on the one hand and engineering departments, research laboratories of the CSIR, R&D establishments etc. on the other hand should be developed by the I.I.T. Similarly, inter I.I.T. exchange of faculty is to be encouraged on a larger scale.

(d) Inter-disciplinary programmes

Inter-disciplinary research should be the principal direction of growth in the I.I.T. during the 5th Plan. The I.I.T. should work closely with the CSIR, R&D Departments of Ministry of Defence, Department of Space and Aeronautics, Department of Heavy Engineering, Ministry of Petroleum and Chemicals and other interests like Irrigation and Power etc. to locate valuable inter-disciplinary programmes of importance for which these establishments would contribute both financially and in the shape of provision of experts and sponsorship of candidates. Within the overall fund available for the I.I.T. during the 5th Plan period at least 20 per cent should be earmarked for such programme.

(e) Establishment of Computer Service and System Engineering Department

(1) Establishment of separate department of Systems Engineering in the I.I.T. may not be necessary. However, computer and systems engineering should be developed.

(2) Problems of spares is very genuine. Local equivalents have to be explored. Some foreign exchange should also be made available.

(3) New equipments should be invented by the I.I.T. for replacing the existing ones requiring replacement. Industries have to be encouraged in this regard by the I.I.T.

(4) A central instrument service centre should be established in the I.I.T. in order to service and repair instruments and machines.

(f) Training and Placement Department

In order that the trained manpower in the I.I.T. contributes effectively to the development of the country, an attempt should be made to secure jobs for the trained I.I.T. students within India,

while a few students would always go abroad. Opportunities existing in India should afford a challenge. Establishment of a Department of Training and Placement in the I.I.T. would secure I.I.T. students placements in effective positions which could take them to commanding heights of the economy. Each such department should have close and effective links with manpower units, government departments, employing agencies, and develop its own strategies of securing placement. Follow-up studies of placement would yield valuable information to correct, where necessary, the methods of teaching in the I.I.T. These feed-back data requires to be scrutinised by an effective faculty committee.

(5) The staff-students ratio should be 1:8 at the under-graduate level and 1 : 4 at the post-graduate level. There should be in future only 3 categories of teaching staff, viz. Lecturers, Assistant Professors and Professors and while the total strength of staff should be fixed, there should be flexibility in the number comprising each cadre so that there is no stagnation at any lower cadre.

(6) A senior faculty member should be encouraged to handle junior classes. A reserve upto 20 per cent of the total cadre should be maintained in the I.I.T. to cater to the needs of the faculty for deputation or training or long leave. Such reserve should also include Research Associates to be trained under a senior faculty member of the I.I.T.

(7) No expansion of administrative staff should be made in the I.I.T. The emphasis should be laid on reorientation of the staff for new functional requirements.

Kindly acknowledge the receipt.

Yours faithfully,
Sd/-

(S. VEDANTHAM)
Deputy Educational Adviser (Tech.)

Copy to:

- (1) The Director, Indian Institute of Technology.
- (2) The Registrar, Indian Institute of Technology.

APPENDIX III

(Vide Para 2.96)

Composition of the Advisory Committee on Regional Engineering Colleges

Constitution

- (1) Union Education Minister Chairman
- (2) Chairman of the University Grants Commission Member
- (3) Chairman of one Regional Engineering College Society
to (which have changed the constitution of the Board of Go-
(6) vernors in accordance with the recommendations of
(AICTE) in each region by rotation Members
- (7) One Principal of a Regional Engineering College (which
to have changed the constitution of the Board of Governors)
(10) from each region, so selected by rotation that the Chairman
of Board of Governors of the same College is not concurrently
a Member of the Committee Members
- (11) One Professor of Regional Engg. College (which have
to changed the constitution of the Board of Governors) from
(14) each region, so selected by rotation that neither the Chair-
man, Board of Governors, nor the Principal of his College is
concurrently a Member of the Committee Members
- (15) A representative of the Ministry of Education & Social Wel-
fare, Government of India Member
- (16) Financial Adviser, Ministry of Education and Social Welfare,
Government of India Member
- (17) A nominee of the AICTE Member
- (18) One of the Directors of IITs nominated by the Chairman,
IIT Council Member
- (19) A nominee of the Department of Science and Technology,
Government of India Member
- (20) A representative of the Planning Commission Member
- (21) A representative of the CSIR Member
- (22) Four persons from industry, one from each region to be no-
to minated by the Chairman Members
- (25)
- (26) Joint Educational Adviser (Tech.), Ministry of Education
& Social Welfare, Government of India. Member Secretary

Functions

- (i) To coordinate the functions of all the Regional Engineering Colleges.
- (ii) To advise on matters, relating to the duration of the Courses, admission standards and other academic matters within the framework of the general regulations of the concerned affiliating Universities.
- (iii) To lay down policy regarding cadres, methods of recruitment and conditions of service of employees, institution of scholarships and freeships, levying of fees and other matters of common interest.
- (iv) To examine the development plans of each Regional Engineering College and to approve such of them as are considered necessary and also to indicate broadly the financial implications of such approved plans.
- (v) To examine the annual budget estimates of each Regional Engineering College and to recommend to the Central and State Governments the allocation of funds for the purpose.
- (vi) To perform such other functions as may be assigned to it by the Central Government on the advice of the All India Council for Technical Education from time to time.

Term of office—Three years.

The Resolution to constitute the Committee is being finalised in consultation with the Ministry of Law.

APPENDIX IV

(Vide Para 2.99)

Revised Composition of the Board of Governors of Regional Engineering Colleges

- (1) Chairman to be appointed by the State Government with the approval of the Central Government.
- (2) to (4) Three nominees of the State Government.
- (5) to (7) Three nominees of the Central Government.
- (8) A representative of the AICTE.
- (9) Vice-Chancellor or a University Professor nominated by the Vice-Chancellor of the University to which the College is affiliated.
- (10) & (11) Two industrialists/technologists (non-official representatives) in the region to be nominated by the Central Government in consultation with the State Government.
- (12) A nominee of the I.I.T. in the region.
- (13) A nominee of the University Grants Commission.
- (14) to (15) Two representatives of the Faculty of the College.
- (16) Principal of the College as ex-officio Member-Secretary.

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APPENDIX V

(Vide Para 6.2)

Annexure IX

No. F. 1-13/74-T.2

**GOVERNMENT OF INDIA
MINISTRY OF EDUCATION & S.W.**

(Dptt. of Education)

New Delhi, dated the 20th September, 1974.

To

1. All State Governments.
2. All Directors of Technical Education.
3. The Directors|Principals of all I.I.Ts., Regional Engineering Colleges and Indian Institute of Science, Bangalore.

SUBJECT:—*To organise Joint and Cooperative efforts between industry and technical institutions for development of educational system and setting up of Industrial consultancy Centres in the institutions.*

Sir,

I am directed to state that the All India Council for Technical Education at its last meeting held on the 17th May, 1974, considered the question of Interlinking technical education and research with industry and made the following recommendations:—

- (i) The Council recommended that the technical institutions should accept the responsibility within the limitations of the resources and the range of expertise and experience available with them to initiate concerted efforts by organising cooperative programmes like apprenticeship training, sandwich courses and practice schools, reviewing the course-content from time to time to meet the operational and design requirements of industry, organising short-term programmes including non-formal education for serving personnel from industry, assigning specific projects on 'live problems' of industry to students and organising special seminars|symposia etc. with participants drawn from institutions and industry.

- (ii) The Council further recommended that State Govts. and other agencies may be requested to permit teachers in technical institutions to undertake consultancy practice etc. in accordance with the normal rules accepted by the Govt.

The All India Council considered that in order to equip the students for undertaking, in due course, research development and consultancy work, there is a need to develop a system of education through joint and cooperative effort with industry. The institutions must not only keep the syllabi and curricula consultancy primed up and geared to the needs of industry, but should also ensure that there is continuing exchange of expertise and experience, through guest speakers, seminars and workshops etc. between the faculty and the students on the one hand and appropriate industrial undertakings on the other. Above all, the willingness to work with the two hands rather than aspiring for white-collar positions should be the basic motivation to be inculcated in the young students mind. Some of the important measures which technical education institution could well undertake and intensify in this direction are:—

- (i) Organisation of cooperative programmes like apprenticeship training, sandwich courses and practice schools.
- (ii) Periodical review, in consultation with the University as necessary, of the design and orientation of courses to ensure that they meet the operational and design requirements of industry.
- (iii) Organisation of short-term and other courses for the benefit of people in industry in the area to meet their specific needs.
- (iv) Assignment to the students of projects related to live problems of industry, to be identified by mutual consultation between the institution and industry.
- (v) Provision of facilities, as may be feasible, for further, if necessary, non-formal education for personnel already in industry.
- (vi) Organising special seminars, symposia etc., with participants drawn both from the institutions and industry.
- (vii) Organising "open days" to give industry an opportunity to have a look at the activities and the problems of the institutions.

In so far as consultancy practice is concerned the Council observed that institutions based consultancy practice is also essential to keep the faculty alive to the need of the industry. It contributes to faculty development and thus improve the effectiveness of teaching and the standards of technical education as well. It helps to recruit well qualified, competent, motivated and practising engineers to the faculty.

There are, however, certain aspects of institution based consultancy work which have to be carefully borne in mind in order that there is sufficient incentive and justification for such work alike for the institution and the consultant. A satisfactory procedure for the distribution of revenues derived from the consultancy work has to be adopted. So far as Govt. institution and autonomous institutions set up by the Central Govt. are concerned, certain guidelines have already been laid down in the Ministry of Finance (Deptt. of Expenditure) O.M. No. F. 11(2)-E II(B)|63 dated the 6th May, 1963, copy enclosed for ready reference.

The Higher Technological institutions, Regional Engg. Colleges, some of the Universities and other Technical Institutions have gathered teams of highly qualified scientists and engineers and possess modern sophisticated equipment and other facilities. The expertise and facilities available, however, are not fully and effectively utilised although research and consultancy work is being carried out by some of these institutions. It is further necessary to corelete and mobilise the resources for achieving better results.

Industry is not completely aware of the expertise available in the institutions. Industry is also not very sure about the extent to which the individual institution can contribute to the solution of problems encountered in industrial development and growth. Each institution has therefore to project an adequate image of the expertise and capabilities for extension service and spell out the help it can render for the solution of problems faced by the industry.

Having regard to the consideration and recommendations of the All India Council stated above, it is suggested that:—

- (i) State govts. may request the technical institutions, both Goyt. and non-goyt. and Universities which have technological departments to take steps on the lines indicated above, for organising cooperative efforts between institutions and industry to develop a need based and job-oriented system of education in the technical institutions at the degree or even post-graduate level;

(ii) Well developed technical institutions viz. the Indian Institutions of Technology, Regional Engg. Colleges and some of the University Deptts. and other engg. colleges where the facilities and expertise are available, for undertaking research, design, development of consultancy work, should take immediate action, wherever possible, to set up Industrial Consultancy Centres (such as the one already set up at the Indian Institute of Technology, Madras), headed by the fulltime member of the staff. He may be assisted, if necessary, by others on a full-time or part-time basis to take care of the managerial functions. These Centres should act as links between the industry and the institutions to enable the existing expertise and capacity in terms of men, machines and methods, to be effectively used for the growth and development of industry based on indigenous know-how and competence on the one hand and competence of the institution itself on the other. An illustrative list of functions of such a Centre is enclosed for information and guidance. These centres should be self supporting and need not involve any additional expenditure. However, in the initial stage of 2-3 years, if there is any additional expenditure on this account, the same may be met from the overall budget/Plan provision of the Institute/State Govt.

In other technical institutions, State Govts. are requested to permit teachers to undertake consultancy work etc. in accordance with the rules accepted by the State Govts. concerned.

For employees of the fully-financed Central Govt. institutions, the procedure outlines in the Ministry of Finance O.M. referred to above may be adopted.

Yours faithfully,

Sd/-

(I. B. SANGAL)

Asstt. Educational Adviser(T)

Copy for information to:—

1. All Regional Officers.
2. The Secretary, University Grants Commission, New Delhi-110001.
3. Section T. 4, T. 5, T. 6.

APPENDIX VI
(Vide Para 7.57)

Annexure to Item No. 54

No. F. 9|80|75-SR. I

GOVERNMENT OF INDIA

DEPARTMENT OF SCIENCE & TECHNOLOGY

Technology Bhavan,
New Mehrauli Road,
New Delhi-110029,
Dated 13th August, 1976.

CIRCULAR

SUBJECT:—Scheme for utilisation of talented Indian Scientists and Technologists for development programmes in India.

The Department of Science and Technology has formulated a scheme for the effective participation and utilisation of talented Indian Scientists, Engineers and Technologists settled abroad in the development programmes of the country. There is great enthusiasm and desire on the part of many top-level Engineers, Technologists and Scientists of India, who have taken up permanent careers abroad, to contribute their scientific and technological capabilities for the development of the country. The present scheme, the salient features of which are given below, is intended to provide an opportunity to eminent Engineers and Scientists of Indian origin who might have opted for long term residence in a foreign country, to contribute in the country's efforts to become self-reliant in "High Technology" areas, which are considered crucial for development. The scheme would be applicable to such persons, who have achieved eminence in such sophisticated fields and could be regarded as persons of proven ability and skill. Besides, the Scientists and Technologists, who are working on problems of applied nature and of immediate relevance to the technological development of the country, outstanding scientists working in theoretical and pure science would also come under the purview of the scheme. Preference should be

given to the scientists and technologists in the age group of 30—45, although the age limit could be kept somewhat flexible.

The salient features of the scheme are given below:

- (i) The Indian Embassies abroad and Science Attaches in particular would be requested to compile the names of suitable scientists and technologists according to the fields of specialisation. This would be updated from year to year through additions and deletions. Intensive efforts would be made particularly in the following countries—U.K., U.S.A., Germany, Canada and France.
- (ii) The Embassies in the selected countries would endeavour to prepare a directory of Indian Scientists and Technologists with their brief bio-data and relevant particulars. The Science Attache or an Officer of sufficient seniority and rank designated by the Ambassador would review the comprehensive list which would be examined by an Advisory Committee consisting of the Ambassador as its Chairman an eminent Scientist/Technologist, who has settled in that country and who have retained strong links and affinity with the mother land. The Science Attache of the Embassy would be the Secretary of this Committee and would report directly to the Ambassador and to the Secretary, Department of Science and Technology in India. After carefully scrutinising the bio-data papers, the Advisory Committee would identify such individuals whose participation in the scheme would be of real value to the Country. The Science Counsellor or Attache or the Minister in the Embassy would then address personal letters to these Scientists and Technologists urging them to take part in India's developmental efforts. This would be followed in most of the cases by a telephonic conversation or personal meetings wherever possible. In some cases it might be necessary to motivate the persons through personal discussions, as many of them in the past have had bitter experience or did not receive sympathetic treatment. The Scientists who indicate their willingness to take advantage of the scheme would be requested to prepare a short work plan indicating the facilities required by them and institutions in India which they feel would be suitable for conducting their work. It is anticipated that the Scientists would spend at least a period of three months or even longer if he happens to be enjoying sab-batical leave.

- (iii) The Secretary, Department of Science and Technology would constitute an Advisory Committee consisting of the representatives of scientific agencies, namely, Space, Electronics; Atomic Energy; SCIR; ICMR; ICAR and the Ministry of Education as well as the Cabinet Secretariat and Ministry of External Affairs to consider the lists prepared by the Science Attaches. This Committee will consider in depth the desirability or the utility of inviting or extending a formal invitation to the Scientists and even to suggest plan for effective utilisation of their services during their stay in India. The Secretariat for the work of the Advisory Committee in India would be provided by the Division of International Scientific and Technological relations, Department of Science and Technology. It is expected that a decision on the Scientists' participation would be conveyed to him through the Indian Embassy or as well as directly within a period of three months from the date he was first addressed to or contacted by the Embassy. Efforts would be made to adhere to this deadline, because the success of the scheme would depend upon the expeditious clearance of the formalities connected with the visit.

The Advisory Committee would also with the help of the various departments, institutions and Ministries identify specific R & D problems, where participation by Indian Scientists of eminence settled abroad would be useful.

- (iv) As regards international travel expenses, it is expected that most of the Scientists would be in a position to meet their travel expenses. The concerned institutions in India would pay for boarding and lodging expenses plus a suitable honorarium, the total expenses being limited to a sum of Rs. 3,000 p.m. The receiving institution in India would also be expected to defray the (internal) travel expenses within the country to such institutions or places which are considered to be of importance for the implementation of the Project in hand.
- (v) Department of Science and Technology would welcome suggestions from institutions, Scientists, Engineers, Technologists regarding the persons whom they think should be invited for participation in this national scheme. The suggestions would be considered by the Secretary, De-

partment of Science and Technology in consultation with the Advisory Committee. Similarly, it is expected that the Advisory Committee in different countries abroad would also welcome specific suggestions from the visiting Indian Scientists or high ranking officials or Technologists from Public Sector Undertakings. This would be processed in the manner described above. The Secretariat of the Committee would keep constant touch with the Heads of the Scientific Agencies and Directors of National Laboratories and Heads of Public Sector Undertakings eliciting their suggestions from time to time.

- (vi) The visits of the Scientists would be used also for doing collaborative research on other specific projects. Joint Collaboration would not be limited to R&D only but would be extended to industry also. Once the line of communication has been established, the official channels would serve only as monitoring mechanisms and essentially act as catalysts for further accelerating the same. Background information on collaborating scientists and industry would be made available to the interested parties at the time of establishing tenable arrangements.
- (vii) If any of the visting Scientists wishes to bring with him sophisticated equipment or spare parts for the implementation of the Project, necessary clearance would be given to him provided the title of the equipment is transferred to the institutions in India, where he would be working.

Sd/-

(R. D. DESHPANDE)

Director.

To

1. All Indian Missions abroad.
2. All Research Institutions/Public Sector Undertakings in India.
3. All Ministries/Departments of Government of India.

APPENDIX VII

(Vide Para 9.4)

ANNEXURE 'I'

MINISTRY OF EDUCATION

RESOLUTION

New Delhi-2 the 30th November, 1945.

(The resolution below incorporates all amendments made from time to time)

(ESTABLISHMENT OF AN ALL INDIA COUNCIL FOR TECHNICAL EDUCATION)

No. F. 16-10|44 E. III.—In their plan for post war Development in India the Central Advisory Board of Education have given reasons for their belief that technical education at the higher stages cannot in modern conditions be effectively organised on a provincial basis. They have emphasised the need for planning this particular branch of education on an All India basis if there is to be substantial industrial development in the post-war period and have remarked that “to stimulate, co-ordinate and control the provision of the educational facilities, which such a development as well as existing industry will need there must be an All India body in supreme charge”. They have accordingly recommended the establishment of a National Council for Technical Education which they suggest, should control policy in technical education generally and deal with all technical institutions above the higher school stage except the Technological Departments of Universities. It is obvious that this recommendation raises issues, agreement on which is likely to be reached only after considerable discussion with the various authorities concerned. At the same time the development of technical or practical instruction at all stages is important not only in view of the accepted need for making Indian Education generally more realistic but also because it has an essential and urgent contribution to make towards other branches of post-war reconstruction which will demand a large increase in the available supply of Indian technologists and technicians. A necessary preliminary to any planned and balanced development of technical education is a survey by a single competent body of existing facilities, probable post-war requirements and present and prospective proposals for development in this important sphere of

education. For the immediate task of survey and advice it is not necessary that an All India Council for Technical Education should be endowed with executive, administrative or controlling powers of any kind or that its establishment should be delayed until all the issues raised by the Central Advisory Board's recommendations have been settled. It has accordingly been decided that the All India Council for Technical Education should be set up immediately, composed in the way suggested by the Central Advisory Board, but entrusted in the first instance with advisory functions only.

It will be understood that the decision to set up the Council immediately with advisory functions is without prejudice and at the same time without commitment to the full implementation at a later date of the proposals in this behalf of the Central Advisory Board.

2. *Functions:* The immediate task for the Council for Technical Education will be to survey the needs of the country as a whole for higher technical education, with special reference to prospective post-war needs, and to advise in what areas technical institutions should be established, for what branches of technology each should provide and up to what standards they should operate. In particular it will be empowered:—

- (a) To survey the whole field of technical education in consultation with Provincial Governments and such acceding States as may be willing to co-operate with it;
- (b) To consider such immediate projects as are already under consideration by various Ministries of the Government of India, i.e., the provision of senior All India Polytechnics on the lines of the Massachusetts Institute of Technology or the establishment of a Technical College of Electrical (Power) Engineering, and to assign to these their appropriate place in an All India Scheme; and
- (c) To conduct preliminary investigations with a view to ascertaining the conditions on which the authorities in control of existing technical institutes would be prepared to give their appropriate place in an All India Scheme; and

3. *Constitution:* The Central Advisory Board have envisaged the establishment of a Council representative of all the main interests concerned with technical education. Acceptance of this view pre-

cludes the setting up of a small and compact body. Technical Education has many facts and the representation of the interest best qualified to assist the attainment of the project in view can be achieved only at the expense of enlarging the size of the Council. It will be open to the Council to appoint such executive committee or other subordinate bodies as may be required to facilitate the discharge of its business. The Council will be composed as under:—

(i) **Members**

- (a) Chairman—Minister-in-Charge Central Government (On occasions when he is unable to preside over a meeting of the Council, the Vice-Chairman will preside over the meeting. In the absence of both Chairman and Vice-Chairman, the members present should elect a Chairman from amongst themselves for the particular meeting).
- (b) Vice-Chairman—Minister of State for Education and Social Welfare in the Central Government.
- (c) (i) Educational Advisor to the Government of India.
(ii) Educational Adviser (Tech.) to the Government of India.
- (d) Chairman of the Regional Committees of the Council (Ex-officio).
- (e) Chairmen of the All India Boards of Technical Studies and Post-Graduate Studies (Ex-officio).
- (f) Representatives of the Ministries and Departments of the Government of India.
- (g) Two members of the Lok Sabha elected by it.
- (h) One member of the Rajya Sabha elected by it.
- (i) (i) One representative of each of the States.
(ii) One representative each of the Union Territories having Engineering College and/or a Polytechnic.
- (j) Eight representatives of Industry and Commerce to be nominated by the Organisations approved by the Government of India.
- (k) Four representatives of Labour to be nominated by organisations approved by the Government of India.
- (l) One member of the Central Advisory Board of Education.
- (m) One member of the Inter-University Board of India.

- (n) Two representatives of the Indian Society for Technical Education.
- (o) Twelve representatives of Professional Bodies.
- (p) Not more than two members nominated by the Government of India to represent other interests.
- (q) (i) Chairman, University Grants Commission (Ex-officio).
 (ii) One representative of the University Grants Commission.
- (r) One representative of the National Institute of Sciences of India.
- (s) One representative of the National Council for Rural Higher Education.
- (t) One representative of the National Productivity Council.
- (u) Director, Institute of Applied Manpower and Research, New Delhi (Ex-officio).
- (v) Director General, Council of Scientific and Industrial Research (Ex-officio).
- (w) Member-Secretary.

(ii) *Terms of Office:* The term of office of all non-official members who were first elected or nominated to the Council shall be 3 years reckoned from the first day of the first meeting of the Council namely the 30th April, 1946, and the term of office of all non-official members subsequently elected or nominated shall be three years reckoned from the appropriate anniversary of the day; provided that member elected or nominated under-clause (g), (h), (l) and (m) above shall cease to be member of the Council if he ceases to be a member of the Lok Sabha, the Rajya Sabha, the Central Advisory Board of Education or the Inter-University Board of India as the case may be. The official members of the Council will continue until they are replaced by others. All casual vacancies among the members (other than ex-officio members) should be filled by the authority or body who nominated or elected the member whose place becomes vacant, and the person appointed to a casual vacancy shall be a member of the Council for the residue of the term for which the person whose place he fills would have been a member.

4. No proceedings of the Council shall be invalidated merely by reason of the existence of a vacancy or vacancies among the members.

5. Vice-Chairman shall perform such functions as may be assigned to him by the Chairman from time to time.

6. The All India Council for Technical Education will be attached to the Ministry of Education. A member of the staff of that Ministry will be the Member-Secretary of the Council. It will be the function of the Education Adviser (T) to the Government of India assisted by the Member-Secretary of the Council to prepare the agenda for its meetings and attend to all work relating to the Council.

7. The names of the members of the Council under para 3(i) above will be announced in due course.

1. ORDERED that a copy of this Resolution be communicated to all principal Governments and minor Administrations and all Ministries of the Government of India.

2. ORDERED also that the Resolution be published in the Gazette of India for information.

Sd/-
D. M. SEN,
Secretary.

APPENDIX VIII

SUMMARY OF RECOMMENDATIONS CONTAINED IN THE REPORT

Sl. No,	Reference to Para No. of the Report	Conclusions/Recommendations
1	2	3
1	1.14 1.15	<p>It is well known that higher technical education is an essential prerequisite for economic development of the country. An industrial society can-not prosper unless it obtains on a continuous basis the services of the people trained in various aspects of technology. The Committee consider it extremely important that the higher technical education system which was originally fashioned on the models existing in Western countries, should be reoriented to suit the Indian conditions. At the same time it should not remain in complete isolation from the latest developments in other countries. The higher technical education has particularly to play an important role in the rural development by helping the rural population in amelioration of their sufferings and raising the standard of living. It is therefore necessary that the objectives of the higher technical education should be carefully redefined.</p> <p>The Committee are unhappy over the delay of 1/1 2 years in appointing the Joint Committee of the All India Council for Technical Education and University Grants Commission to Study the whole system of engineering education at the first degree level in the light of latest advancements in science and technology and to suggest the lines along which the first degree courses should be organised. The Committee</p>

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2

3

stress that the study now undertaken by the Working Groups of the Joint Committee should be completed and finalised well before the beginning of the Sixth Plan so that the conclusions are available by the time of drafting and finalising the Sixth Plan Document. The Committee except that the studies be concluded and necessary conclusions drawn up in time.

2

1.39

1.40

The Committee regret to observe that the studies on the technical manpower planning made in the past have been unrealistic which resulted in large scale unemployment of engineering graduates. A view has been expressed before the Committee that it is a strange paradox that on the one side there is an overflow of unemployed engineers while on the other, suitable candidates are not available to fill all the posts advertised by Public Service Commissions and the Industry. Even in specialised branches of engineering like Aeronautical Engineering, avenues of employment for graduates in the country are limited. The Committee strongly feel that there is an imperative need for realistic assessment on scientific lines of the requirements of engineers, discipline-wise, sub-discipline-wise particularly in the context of the Sixth Five Year Plan.

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The Committee need hardly stress that the **assessment of the requirements** of technical personnel of various categories on a long term basis should be undertaken in such a way that the availability of technical education facilities and the out-turn of technical personnel, broadly matches job requirements. It is also essential that the assessment is made for each sector and sub-sector of the industry as also for the various regions so as to meet the requirements in full. It is of the utmost importance in this

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regard that these studies are made in full consultation with the concerned industries both in the public and private sectors.

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The Committee note that the All India Council for Technical Education recommended in May, 1974, that manpower requirements during the Sixth Plan period should be carefully assessed on a disaggregated basis after taking into account the specific requirements discipline-wise, State-wise and region-wise and that selected institutions may be assigned the responsibility to assess the manpower requirements in all principal sectors of employment. The Committee are concerned to note that even after the lapse of 3 years since the All India Council recommended that selected institutions should undertake manpower surveys, all that has been done in that a team has been constituted by the IIT, Madras. The IIT Bombay and Kanpur are yet to formulate their proposals. The Committee are unhappy over the inordinate delay in the implementation of the recommendations of the All India Council for Technical Education. The Committee feel that the engineering institutions particularly Indian Institutes of Technology and Regional Engineering Colleges should be assigned suitable roles in conducting technical manpower surveys which should be completed according to time bound programmes.

The All India Council for Technical Education at its meeting held in May, 1976 again recommended that a realistic study to assess the technical manpower requirements should be undertaken so that meaningful assessment of manpower requirements on a long term basis could be worked out. The Council suggested that the Institute of Applied Manpower Research should undertake this task and complete it

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during the coming two years. The Committee have been informed that the Institute of Applied Manpower Research has worked out tentative estimates for this project which would cost about Rs. 1.5 crores. The Committee were informed in October 1977 that the Ministry of Education proposed a Budget provision under the Plan to the tune of Rs. 1.50 crores for the approval of the Planning Commission/Ministry of Finance. In the discussions regarding educational policies and programmes for Sixth Five Year Plan held in July 1977 in the Planning Commission, it was decided that as far as the technical education was concerned, it would have to be related to demand for engineering personnel in the Organised sectors and also for self employment. The matter regarding entrusting the work to institute of Applied Manpower Research and also the necessary provision for the work was being reopened. The Committee stress that every decision should be taken by Government in this regard so that results of the survey to be undertaken are available well in time for use in the implementation of the technical education programme for while undertaking the manpower studies, the the Sixth Plan. The Committee also desire that areas of study to be undertaken by the IITs, IAMR and other agencies should be clearly demarcated so as to avoid duplication of efforts.

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The Committee stress that while undertaking manpower surveys, proper coordination amongst the Planning Commission, Institute of Applied Manpower Research, IITs Ministry of Home Affairs and Department of Education should be maintained so as to ensure an integrated approach in preparing manpower surveys.

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The Committee need hardly emphasise that it takes 5 to 6 years to train engineers. If the

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		manpower study is to serve any useful purpose, it should be undertaken atleast 8 to 10 years in advance. The Committee hope that Government will take necessary steps to expedite survey for the Sixth Plan.
7	1.46	The Committee note that the ratio between technical degree and diploma holders was 1:1.289 in 1955, 1:1.295 in 1960, and 1:1.414 in 1974 and it would be 1:1.456 in 1978. This indicates increasing trend in the out-turn of diploma holders as compared to degree holders. The Committee desire that keeping in view the requirements of the industry etc. and advances made in the technological field the optimum ratio among the three main categories of technical personnel, viz. graduates, diploma holders and craftsmen should be worked out and the programme for technical education training formulated accordingly.
8	1.47	The Committee would suggest that Government should encourage engineering institutions/polytechnics and industrial units, particularly those employing a large number of workers to jointly organise courses designed to update the knowledge of the workers to help them in improving their productivity as also to train them to operate modern machinery etc. Such courses should obviously be of sandwich pattern giving both theoretical knowledge and inplant practical training. Adequate opportunities should be afforded to the craftsmen, skilled workers, etc. for upgrading their skills and for acquiring higher qualification.
9	2.18 to 2.21	The Committee further note that there is concentration of engineering institutions in Karnataka, Maharashtra and Tamil Nadu with 20, 19 and 16 institutions respectively, while some bigger States like U.P., Bihar, Andhra Pra-

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desh and Rajasthan have only 14, 7, 11 and 5 institutions respectively. In the matter of availability of seats also, there is concentration in Karnataka, Maharashtra, and Tamil Nadu with 3198, 2764 and 2370 seats respectively while the States like Orissa, Rajasthan, Bihar, Andhra Pradesh and Uttar Pradesh have 380, 715, 1295, 1375 and 2085 seats respectively. The North Eastern States put together have only 3 institutions with 390 seats. From the State-wise seat-population ratio also it is seen that there is concentration of facilities for higher technical education in some States. For example, while for every lakh of population there are 10.94 seats for degree courses in engineering in Karnataka, 7.38 seats in Gujarat, 5.77 seats in Tamil Nadu and 5.5 seats in Maharashtra, the number of seats in other States are 1.7 seats in Orissa, 2.3 seats in Bihar, 2.36 seats in Uttar Pradesh, 2.78 seats in Rajasthan, 3.17 seats in Andhra Pradesh and 3.3 seats in Madhya Pradesh.

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It is well recognised that development of industries in a region or area also depends to a great extent on the technical manpower available there. Even the development and the setting up of agro-industries requires an industrial and technological base. It is therefore of utmost importance that for proper development of an area, adequately trained technical manpower is made available in that area for which requisite number of engineering colleges and institutes are necessary. In the absence of these facilities, there is bound to be a widening gap in the economic development of areas having technical manpower and those without it. The Committee consider that the existing imbalance in the availability of the engineering colleges in the various regions of the country had

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already adversely affected the equitable development of such areas and regions. The Committee are unable to appreciate that the Government's role is merely to supplement in equal measure local initiative and effort in the matter of setting up of technical education facilities in various regions of the country. The Committee consider that such an important matter cannot entirely be left to the initiative and interest of private enterprise, universities etc., particularly when the private technical educational colleges have largely been financed from public funds. In the opinion of the Committee, the Central Government should take positive steps to provide technical education facilities in those regions/States where they are deficient at present so as to bring up the seat population-ratio in regions/States of the country where these are lagging, in the interest of equitable development of such regions/States.

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The Committee are surprised to note that although the number of seats in the engineering institutions decreased from 25070 in 1967-68 to 22499 in 1976-77, the number of institutions increased from 136 in 1969-70 to 152 in 1976-77. It is all the more surprisng that the increase was made in States likes Maharashtra and Karnataka which already had the largest number of institutions, thus aggravating the regional imbalances, in the availability of these facilities. The Committee would like Government to go into this aspect in depth and take concerted measures to first remedy the existing imbalance in the availability of engineering education facilities in the various regions of the country.

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The Committee find that in the whole of the North-Eastern region, the expansion of facili-

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ties in engineering education during all this period has been insignificant. The number of institutions increased from 2 in 1960-61 to 3 by 1976 and the number of seats from 240 to 360. It is distressing the proposal made for the establishment of a Regional Engineering College at Silchar as early as 1962 has been processed in such a halting manner that Classes with an intake of 60 students could be started with effect from 2 November, 1977 i.e. after a lapse of 15 years. Surprisingly, the principal of the college has been in position since October 1967 to look after the work of establishment of the College.

The Committee have been informed that an increased activity for the establishment of the college was started from 1975-76 and funds to the extent of Rs. 57.17 lakhs were provided during the year 1976-77 for providing initial facilities such as workshop building, lecture halls etc. The Committee would like construction of lecture halls, workshop, administrative buildings, acquisition of equipment, library books, recruitment of staff should be completed expeditiously so that the college starts working in full swing at the earliest.

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The Committee are not satisfied merely with the plea that seats are being reserved for students from the North-Eastern States in other engineering institutions in the country. The Committee are perturbed to learn that out of 24 seats reserved for Sikkim, only 8 are being utilised by the students as the seats are reserved either in far off places like Rajasthan, Gujarat, and Kerala or these are reserved in institutions having courses the duration of which does not correspond to the secondary system of education in Sikkim. Marked difference in climate could be another limiting factor.

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The Committee are concerned to note that the reservations for the States in the North Eastern Region made in the Regional Engineering Colleges have not been fully utilised as evident from the fact that only 3 out of the 9 seats reserved in Regional Engineering College, Surathkal, 7 out of 14 seats in Regional Engineering College, Durgapur, 3 out of 7 in Regional Engineering College Jamshedpur and 4 out of 8 in Regional Engineering College Kurukshetra have been utilised in 1976, while not a single seat out of the 7 seats in Regional Engineering College, Jaipur and 2 seats in Regional Engineering College, Allahabad has been utilised. The Committee feel that the reservation of seats in other institutions could be purposeful only if these are made available in the institutions nearer to these States and the courses are such as to be suitable to the educational background of the students. The Committee, desire that the Government should go in depth into the utilisation of seats reserved for the students from North-Eastern region in the various institutions in the country in order to remove the inhibiting factors which lead to non or under utilisation of seats by these States.

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The Committee note that different methods are being followed at present by the various engineering institutions for admission to undergraduate courses. While the five IITs hold a joint entrance examination, the Regional Engineering Colleges, except the one at Allahabad, and the other engineering colleges admit the candidates on the basis of marks obtained by them in the qualifying examination. The result is that a candidate seeking admission to an engineering course has to apply to several institutions. Moreover as different standards of teaching **and examination** are followed in respect of the qualifying examinations, the existing system of admitting candidates on the basis of marks ob-

tained at the qualifying examination, tends to be inequitable. In the interest of providing an equitable opportunity to the candidates and ensuring a broad uniformity in the standards, it would be ideal if a common national entrance examination for all the engineering institutes/colleges is held in advance and the candidates are admitted to the under-graduate engineering courses in the various institutions/colleges on the basis of the marks obtained by them at such examination.

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The Committee note that the Review Committee on the Regional Engineering Colleges had recommended as far back as 1974, that admission to the under-graduate courses in all the Regional Engineering Colleges should be through an entrance examination for both the State quota as well as outside the State quota. The All India Council for Technical Education recommended in May, 1974 that an Advisory Committee to advise the Minister on all policy matters and lay down guidelines in respect of these colleges might be appointed. The Advisory Committee which has recently been appointed should examine the question of holding an entrance examination to all the Regional Engineering Colleges and that a time-limit should be laid down for the submission of its recommendations. The Committee consider that there should be no difficulty in holding a combined entrance examination for admission to all the Regional Engineering Colleges for both the State quota of seats and the quota of seats for other States as already a joint entrance examination for admission to IITs is being held.

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The Committee are unhappy to note that there was delay in starting reservation of seats for Scheduled Caste/Scheduled Tribe candidates in the Indian Institutes of Technology. While IIT

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Bombay and Delhi started reserving seats from 1958 and 1962 respectively, the IIT Kanpur started reservation from 1971 for Post Graduate admissions and from 1973-74 for undergraduate admissions, IIT Kharagpur and Madras from 1973.

- 17 2.46 The Committee are unhappy to note that the reserved seats for Scheduled Caste/Scheduled Tribe candidates in under-graduate and post-graduate courses in engineering are not fully utilised. In the case of IITs out of the 265 seats reserved in under-graduate courses in 1977, only 204 candidates have been admitted against these vacancies. The utilisation of seats in post-graduate courses is very disturbing. Out of 139 reserved seats in post-graduate courses only 16 seats have been utilised by Scheduled Caste/Schedule Tribe candidates. The Committee would urge the Government to take concerted measures to improve the intake of students belonging to these communities by giving wider publicity and offering concessions and incentives to attract them.
- 18 2.47 The Committee further suggest that special coaching facilities may be afforded at plus (+) 2 stage in schools to promising scheduled caste and scheduled tribe students who desire to compete in the entrance examination of engineering institutions. Such a special coaching, besides improving the educational standard of these candidates, would also go a long way in reducing the psychological barrier that may exist between the students coming to IITs through the Joint Entrance Examination and those admitted directly through quota reservation.
- 19 2.49 The Committee would like the Central Government to examine in consultation with the State Governments, the question of making re-

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servations for students hailing from backward regions as is being done in Motilal Nehru Regional Engineering College, Allahabad in other Regional Engineering Colleges so that students are afforded greater opportunities for higher technical education, which would help in the development of these areas.

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The Committee feel that it may be desirable if suitable aptitude tests are introduced as part of the admission procedure to these institutions as the marks obtained by the students in the qualifying examinations or in the competitive entrance examinations may not be proof of the aptitude of the students to work with their own hands on the shop floor. The Committee would like Government to examine the feasibility of introducing suitable aptitude tests as part of the admission procedure to these institutions.

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The Committee note that seven engineering institutions were started during 1957 to 1963 in the Karnataka State without the specific approval of the All-India Council for Technical Education and Central Government and hence did not receive any grants either from the Central Government or from the State Governments towards their recurring and non-recurring expenditure. These institutions collected considerable amounts as capitation fee for admitting students to meet their cost of running the engineering colleges. Three of these seven institutions which were charging capitation fee, have with the assistance of the State Government of Karnataka been persuaded to accept the standard pattern prescribed by the All India Council for Technical Education and come under grants-in-aid code of the State Government. The four remaining institutions viz., Manipal Engineering College, R. V. College of Engineering Bangalore, Sidhaganga Institute of Technology Humkur and

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M. S. Ramaiah College of Engineering Bangalore. are still charging capitation fee from students admitted to these institutions.

The Committee are surprised to note that all these institutions were allowed to be established without prior approval of the All-India Council for Technical Education and Government of India and have started the undesirable practice of charging of capitation fees by them. The Committee are concerned at the helplessness of the Government and the University Grants Commission in stopping the practice of charging capitation fees from students for admission to engineering courses by the four engineering institutions in Karnataka. They are not satisfied with the reply of the representative of University Grants Commission that "there is no power with us to disaffiliate a college. It is only with the University." The Committee feel that the Universities concerned should have been persuaded to follow up the matter conclusively with these colleges to give up the undesirable practice of charging capitation fees. The Committee would like to be informed of the concrete measures taken in pursuance of their recommendations and the success achieved. The Government should also see that in future no institution is set up without the specific prior approval of the All India Council for Technical Education. If there are any legal or procedural loopholes which make it possible for an institution to get round this requirement, the Committee expect Government to take effective action to plug all these loopholes.

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The Committee note that in five non-Government institutions in Karnataka, 20 per cent of the sanctioned seats is placed at the disposal of the Management, Society or Trust sponsoring the institution. These institutions are also permitted by the State Government to levy higher fee

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which is twice the fee charged in Government Colleges to meet their share of expenditure and running the institutions. The Committee find that there are 4 other institutions in Gujarat, Bihar and Punjab charging higher fees than that charged by the corresponding Government institutions in the State. In view of the fact that Government have accepted the recommendations of the All India Council for Technical Education that the fee charged by all institutions, whether Government or non-Government institutions, should be uniform, the Committee desire that necessary steps may be taken to persuade the State Governments to ensure that these institutions charge the normal fees applicable in Government institutions.

The Committee are not quite happy over the system of reserving 20 per cent seats as management quota followed in 5 engineering institutions in Karnataka on the ground that the respective managements contribute a proportionate amount for running the engineering institutions. The Committee desire that this matter may be gone into in depth and such reservation quotas, which militate against admission on merits, done away with at the earliest.

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The Committee are distressed to note that a number of universities and engineering institutions have imposed restrictions on admission to engineering courses on the basis of domicile or nativity. The Committee emphasise that necessary steps should be taken by Government to ensure that these recommendations made by the All India Council for Technical Education (1960 and 1963) and the National Integration Council (1968) against the admissions on the basis of domicile or nativity are implemented in letter and spirit by the universities and institutions.

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24	2.71	<p>The Committee also suggest that Government should examine the question of enacting a legislation to stop the practice of charging capitation fee, higher tution fees, reservation of seats as management quota by private educational institutions and to abolish domicile restrictions for admissions placed by educational institutions for admitting students, in order to bring about uniformity in this regard.</p>
25	2.82 2.83	<p>The working of the five Indian Institutes of Technology has been reviewed by five different Reviewing Committees, appointed in March, 1970. The Reviewing Committees submitted their reports between August 1971 and March 1973. Based on these reports, orders of the Visitor were issued on 5 September, 1974 laying down specific directions for implementing the recommendations of the Reviewing Committee. The Committee are distressed to note that there was inordinate delay in submission of the reports by the Reviewing Committees particularly by the Reviewing Committees on IIT, Kanpur, and IIT, Delhi. There was further delay in processing and taking action on the reports submitted on the five IITs. The Committee are unable to appreciate why such a long time has been taken by the Reviewing Committees in submitting their Reports and by the Ministry in processing them. It is normally expected that time limits are laid down for the submission and processing of such reports. It is unfortunate that this was not done.</p>
26	2.84	<p>In view of the fact that these Institutes have special responsibility to improve the tone of engineering and technological education in the country as well as to meet the special needs of the industry, the Committee hope that the directions of the Visitor which are of far reaching nature, will be implemented by the Institutes. The Ministry should also monitor the progress of im-</p>

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plementation of these directions by each Institute. The Committee trust that the Institutes will also take necessary action on the other recommendations made by the Reviewing Committees in respect of individual IITs.

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Having regard to the fact that these Institutions are of national importance and are expected to play a leading role in setting a high standard of education and in meeting the technological requirements of development, the Committee feel that it is but appropriate that the activities of the Institutes are reviewed by a Committee of experts drawn from the fields of education, industry, applied research etc. The Review Committee may be asked to go specifically into areas where deficiencies are known to exist as also in disciplines and research programmes which are of special relevance to the developmental requirements of the country. The Review Committee may be asked to report within a specified time and it should be obligatory for the Ministry to process the matter with expedition and obtain and issue Visitor's directions thereon.

The Committee suggest that such a review should be undertaken and completed well before the Plan period so that its findings may provide a firm basis for planning for the next plan period.

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Needless to say that conclusive and timely action should be taken to rectify all deficiencies which are brought to notice and to see that the high standard which has earned these Institutions a name for excellence both within and outside the country, is not only sustained but continuously improved upon.

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The Committee note that the Ministry set of a Review Committee in consultation with the

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Planning Commission to examine the progress of the Plan schemes during the first three years of the Fifth Plan and the projected schemes for the remaining two years of the plan. The Committee has recommended that the Fifth Plan allocations for IITs may be increased from Rs. 31.90 crores to Rs. 39.41 crores. The Committee desire that additional funds required for the IITs may be made available so that the Plan Schemes of IITs do not suffer due to shortage of funds.

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The Reviewing Committees on IITs have recommended that IITs should concentrate on post-graduate and research programmes. In the Visitor's orders of September 1974 also it has been emphasised that admission to Post-graduate and Research Programmes should be increased. From the admission figures, the Committee, however note that there is larger intake of students in undergraduate courses as compared to post-graduate courses in all IITs.

The Committee would like this aspect to be specially examined by the Government so that a proper balance is maintained between the under-graduate and post-graduate courses in the best overall interests of meeting the technological requirements of development.

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2.104

The Committee were informed that the State Government of Jammu & Kashmir have some reservations about the reconstitution of Board of Governors of the Regional Engineering College, Srinagar, and that the matter was stated to be under active consideration with the State Government. The Committee desire that effort may continue to persuade the State Government to adopt the revised pattern and accordingly reconstitute the Board of Governors.

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The Committee feel unhappy at the dilatory manner in which important recommendations

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having a bearing on the management of the Regional Engineering Colleges and of taking advice from Central Advisory Committee to improve their functioning has been handled. The Committee stress that Government should see that Boards of Management are duly constituted for all the Regional Engineering Colleges and that the Central Advisory Committee function effectively to provide advice and guidance in the urgent matter of improving of the facilities in the Regional Engineering Colleges.

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2.124

The Committee are concerned to note that the Regional Engineering Colleges which are designed to serve as pace-setters for other technical institutions in the States/Regions are not adequately equipped.

Due to a drastic cut in the allocation for the development of Regional Engineering Colleges during the Fifth Plan from Rs. 10.50 crores to Rs. 5.793 crores, it has not been possible to provide new development facilities such as computer facilities, development of libraries, consolidation of equipment etc. as recommended by Development Committee headed by Dr. Jai Krishna. It has been decided to defer this programme to the Sixth Plan. In view of the importance of the development of the Regional Engineering Colleges which have to play the role of pace-setters for other colleges in the States, the Committee feel that the Government should take necessary steps to equip these colleges adequately and provide funds for this purpose.

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The Committee desire that an in-depth study may be undertaken to assess the extent of utilisation of the costly and sophisticated equip-

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ment available in the IITs with a view to taking necessary measures for their fuller utilisation.

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The Committee note that the All India Council for Technical Education at its meeting in May, 1976 decided that Visiting Committee for each State should be appointed to make, *inter alia*, an assessment for development and consolidation of engineering colleges. It is, however, surprising that the Department of Education are still in the process of setting up these Visiting Committees. The Committee feel that the tasks assigned to these Visiting Committees are very important and that steps in this direction were overdue. The Committee are particularly anxious that the Visiting Committee should identify the centres where adequate facilities exist and ensure that these centres are notified to other institutions and made available for their use. The Committee hope that the Visiting Committees will complete this work as early as possible so that their findings are available at the time of formulation of the programmes for the Sixth Plan.

36 2.127

Since the IITs have got excellent facilities in terms of equipment, facilities etc., the Committee emphasise that they should act as leaders in engineering education and develop collaborative linkages with other institutions and identify the areas in which the IITs could help these institutions in upgrading the standard of education. Steps like exchange of academic staff between the IITs and other institutions, and affording laboratory and library facilities to other institutions etc. would go a long way in improving the quality of engineering education provided by other institutions. The Committee desire that this matter should be seriously considered and the areas in which IITs and Regional Engineer-

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		ing Colleges can help other institutions, identified and concrete measures taken in pursuance thereof.
37	2.133 to 2.136	The Committee note that the cost per undergraduate engineering student during 1971-72 ranged from Rs. 3496 in Regional Engineering Colleges to Rs. 6794 in IITs. Similarly, the cost per post-graduate engineering student varied from Rs. 6136 in Jadavpur University to Rs. 11306 in Roorkee University during the same period.
		The Committee note that the Institute of Applied Manpower Research has been requested to prepare cost per student by adopting a uniform basis of calculation to project the difference in expenditure in different types of institutions after taking into consideration the different norms.
		The Committee suggest that the study should be comprehensive covering all IITs, Regional Engineering Colleges and other selected institutions.
38	2.137	In the light of the study being made by the Institute of Applied Manpower Research, Government may critically analyse the reasons for wide variation in the per capita cost of engineering education in the various institutions with a view to effecting rationalisation. They may also evolve norms of educational facilities including equipment per student for various categories of engineering institutions so as to initiate measures to raise the standard to the optimum level.
39	2.142	The Committee find that there were large scale variations in the allotment of funds to the different Indian Institutes of Technology for

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		<p>providing students amenities. While Indian Institute of Technology, Bombay has been given Rs. 35 lakhs during the current Plan period, the Indian Institute of Technology, Delhi has been allotted only Rs. 10 lakhs. They would like the Ministry to lay down norms for provision of such amenities depending upon student population the status of present amenities, so that there is equitable allotment of funds among the Indian Institutes of Technology.</p>
40	2.144	<p>The Committee stress that technical institutions in India should not merely limit themselves to imparting of formal education, but should also help the students in identifying their particular aptitudes, encourage and motivate them to develop these aptitudes, provide opportunities for education and training, help them in getting suitable employment where their knowledge and skills may make the best contribution to industrial and economic development. The Committee understand that IITs and some Regional Engineering Colleges have established Career Counselling and Guidance Bureaus. The Committee suggest that a review of the working of these bureaus may be conducted to effect improvement and streamline their functioning in the interest of rendering better service to the students. The Committee desire that such units may be established in those institutions where they do not exist at present taking care to see that the set up of the Bureaus is right from inception on the lines which would best serve the interests of the students.</p>
41	2.151 2.152	<p>The Committee are distressed to note that there have been considerable wastages in technical education in the past. They however understand that the All India average wastage of 30—40 per cent has now been brought down</p>

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to 15—20 per cent, but in some States like Tripura, Assam, Kerala and Punjab the wastage rate is as high as 66.7 per cent, 52.8 per cent, 44.1 per cent and 41.5 per cent. The Committee consider that the present wastage rate is still high and should be further brought down and special attention should be paid to the institutoins/ States where the wastage rate is higher than the national average. As a result of a survey made by the Institute of Applied Manpower Research a few years ago, the factors leading to wastages have been identified. These include lack of institutional facility like accommodation and equipment quality of teachers, students' aptitude, financial conditions, overloaded curriculum in some subjects etc. The Committee would like Government to examine critically the various reasons for these wastages in consultation with the Universities and engineering institutions and take effective remedial measures. The Ministry should keep a constant watch over the progress made in this regard.

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2.159

The Committee note that special Cells have been established in India Institutes of Technology to look after the interests of the Scheduled Caste and Scheduled Tribe students. IITs have also taken special measures to bring up the standard of the Scheduled Caste and Scheduled Tribe candidates. The Committee desire that the working of the special cells and the impact of the special coaching programme on the performance of SC/ST students should be kept under constant watch with a view to effecting improvements. The Committee need hardly point out that the efficacy of the special coaching programmes would be judged by the reduction in the wastage of Scheduled Caste and Scheduled Tribe students.

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43	2.160	<p>The Committee recommend that based on the experience gained from the working of the special cells in IITs and other arrangements made for raising the standard of Scheduled Caste/ Scheduled Tribe students, necessary steps should be taken to provide similar facilities in Regional Engineering Colleges, and other engineering colleges.</p>
44	2.161	<p>The Committee understand that the engineering institutions have language laboratories where special attention is given for improving the expression skills of students. The Committee recommend that Scheduled Caste and Scheduled Tribe students should be given special training for improving their performance in viva-voce for employment purposes so that they are able to face the interviews with confidence.</p>
45	2.179	<p>Indian economy, like most of the other developing nations, is predominantly based on agriculture. More than seventy per cent of the population live in rural areas. It is, therefore, important that science and technology must not only be utilised for building the industrial infrastructure, but also help solving the day-to-day problems of the country-side by improving the age-old implements used by agriculturists, craftsmen, artisans for increasing their productivity and efficiency. The rural transportation system also needs improvement. The Committee stress that the engineering institutions with their teams of highly qualified engineers and scientists should involve themselves in this task of development of rural areas.</p>
56	180 2.181	<p>The Committee are happy that some of in-like IIT Madras have established Rural Development Centres and have taken up some</p>

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steps in the cause of rural development. The Indian Institute of Science, Bangalore has set up a Cell for the Application of Science and Technology to Rural Areas with the objectives of (i) development/testing of village oriented technologies, and (ii) establishing Extension Centres to accomplish and monitor the transfer of the developed technologies to rural areas. The Cell had also held seminars on subjects such as bullock-carts, bicycles, solar energy, rural housing, hand pumps etc. The Committee suggest that the important areas in which the engineering institutions could undertake rural development schemes should be identified and the various institutions encouraged to take up such schemes depending upon their place of location, facilities available etc.

- 47 2.182 The Committee feel that the efforts should as far as possible be directed towards achieving integrated deveiopment of rural areas. Particular attention should be paid to (i) the development of technologies suited to rural areas so as to utilise the rural manpower, (ii) setting up rural industrial estates, (iii) development of low cost houses, (iv) training enterprising rural youths for setting up industries as well as other specialised practical training in technical trades to local artisans, craftsman etc. The Committee also suggest that the progress of these schemes should be properly monitored and the results exchanged amongst the institutions so that improvements could be made in the light of experience gained.
- 48 2.183 The Committee feel that the immense potentialities of the engineering institutions, particularly Indian Institutes of Technology could be utilised for undertaking techno-economic surveys and planning work. The Commit-

tee would like Government to assess the potentialities of Indian Institutes of Technology in this regard so that suitable roles in the preparation of preliminary surveys, project reports etc., could be assigned to them to meet the development needs of the surrounding areas. Although there has been increasing realisation on the part of the Indian Institutes of Technology that they should take in hand this type of work, no formal role has been assigned to them. The Committee note that Indian Institute of Technology, Kharagpur undertook an agro-socio-economic survey of a village in West Bengal to study the resources availability and its inter-action with new technology of production and processing. The Committee would like that the results achieved by the Kharagpur Institute as a result of their survey should be studied and if found useful, commended to other institutes and engineering colleges for adoption. The Task Force and Steering Group on Education had as early as 1973 urged that technical institutions should not represent merely an educational complex but must contribute effectively in certain well-defined areas of common interest and solving important problems which the country face. The Task Force recommended that technical institutions should undertake these activities as an integral part of their educational programmes. The Committee appreciate that undertaking such programmes will depend on the quality of the institutions and their stage of development. The Committee urge Government to examine this question seriously and define the roles of the various institutions in this task depending on their stage of development, and the economic condition of the areas surrounding them. A beginning in this behalf may well be made with the Indian Institutes of Technology and Regional Engineering Colleges.

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49	2.184	The Committee stress that in a developing country like India the technical institutions must keep foremost in mind their role not only as centres of imparting formal education but also of extending a helping hand in devising and implementing schemes of social relevance which would upgrade the economic and technological skills of the people.
50	3.10	The Committee understand that one of the important programmes in technical education taken up during the Fifth Plan was diversification of courses, and that the All India Council for Technical Education has from time to time been assessing the need for diversified courses and whenever there was need in a particular area, new courses were introduced. The Committee, however, note that in certain important branches of engineering like Aviation Engineering, Energy Systems, Plant Design, Steel Technology, Urban Development Engineering, no separate courses are available but facilities are available in related fields. The Committee would like a critical survey to be undertaken of the requirements of the industry in the various specialised fields in consultation with industries concerned with a view to modifying the existing courses/introducing separate courses, wherever necessary.
51	3.11	The Committee note that in some other specialised branches, such as Printing Technology, facilities at degree/post-graduate level have not been introduced on the plea that the survey made in 1968-69 showed that there was need for technicians in printing technology and not for engineers.
52	3.12 3.13	The Committee suggest that similar surveys as made in Western and Northern Regions may

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be undertaken in Eastern and Southern Regions expeditiously. They would like to point out that large printing units have already come up in the country and the demand for technologists in this field is bound to increase. The Committee desire that as recommended by the All India Board of Under-graduate Studies in Engineering and Technology sandwich type courses at technician and postgraduate level in different areas of felt needs such as printing machinery, printing material, etc. should be started at the earliest.

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3.14

The Committee note that Indian Institute of Technology, Madras has introduced Industrial Management & Industrial Engineering courses at postgraduate level and the experience of the Institute regarding these courses has been satisfactory. The Committee suggest that in view of the growing importance of these two courses in the context of industrial development, the desirability of introducing similar courses in other IITs and Regional Engineering Colleges be explored.

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The Committee note that since the setting up of the curriculum development centre in IIT, Madras in 1973, the curriculum in mechanical engineering has been revised twice. The Curriculum Development Centres in IIT, Kanpur and Roorkee University have also revised the syllabus once after 1970. The other Curriculum Development Centres in IIT, Bombay, Kharagpur and Delhi are also reported to be doing useful work in this direction. The Committee would like the Government to evaluate the work done by all the curriculum development centres and take suitable follow up action to ensure that the Centre continuously review the curriculum, revise and update the curricula,

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develop teaching material, laboratory manual etc. in the light of the current advancements made in science and technology, teaching methodology, and the requirements of the industry so that the curricula truly reflect the technological advances and innovations, changing professional practice, and the technical manpower requirements of the country.

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The Committee note that in pursuance of the recommendations of the All India Council for Technical Education made in May, 1976, a Joint Committee of the All India Council, University Grants Commission and Indian Council of Social Sciences and Research was set up under the Chairmanship of Secretary, Department of Science and Technology to work out a curriculum in order to give the students of engineering courses a proper perspective to understand human behaviour and culture. A curriculum incorporating the recommendations of this committee, is being drafted by the Curriculum Committee for undergraduate courses. The Committee hope that the revised curriculum will be finalised and adopted early. The Committee are concerned to note that no detailed study of the system of technical education, courses, curriculum etc., prevailing in other advanced countries like USSR, Germany, Japan etc. has been made by the Ministry. It is normally expected that before the development of curriculum in technical education, a detailed study of the systems prevailing in other advanced countries, should have been made so as to benefit from their experience.

The Committee suggest that the systems followed in the curriculum formulation, method of updating the curriculum, its adoption by engi-

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		<p>neering institutions in technically advanced countries like U.S.A., U.K., USSR, Japan, Federal Republic of Germany and German Democratic Republic may be studied on a regular basis with a view to adopting the useful aspects of the same in India.</p>
56	3.47	<p>The Committee would also like Government to examine the feasibility of introducing a system whereby the experts in technical education or members of the faculty in the engineering institutions sent abroad by Government are encouraged to give suggestions, in their reports, on the system of technical education particularly the curricula, the teaching methodology and practical training in industry in the light of their studies. Their Reports may be examined by the Curriculum Development Centres and made use of in the process of revising the curricula.</p>
57	3.48	<p>The Committee consider that the setting up of 6 Curriculum Development Centres, a study Group of the Joint Committee for the Development of curriculum in technical subjects and a Joint Committee to work out a curriculum for understanding human behaviour and culture has resulted in diffusion of responsibility and lot of delay. The Committee would like Government to critically review the position and devise an institutional arrangement for continuous development of curricula and teaching material to reflect the known and projected needs of industry. The Committee need hardly point out that for this purpose there should be close coordination with the Planning Commission, the manpower projection authorities and the industry both in public and private sectors.</p>

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58	3.52	<p>The Committee note that the All India Council of Technical Education in May, 1976 recommended the constitution of a group to re-examine the entire post-graduate diploma courses by the Board of Graduate Studies which has been recently constituted. The Committee regret the delay in the constitution of the group to re-examine the entire system of post-graduate courses. They would like Government to expedite the matter and ensure that the review is completed within a specified period. The Committee would like to be informed about the progress made in this regard in six months.</p>
59	3.53	<p>The Committee need hardly point out that in reviewing the post-graduate courses, special attention should be given to the desirability of providing specialised practical training in the selected discipline and of providing a wide background in production and management techniques.</p>
60	3.61	<p>The Committee are distressed to learn that workshop facilities in many engineering institutions including some Government and private institutions are not adequate and often the equipment available is obsolete. The Committee need hardly emphasise that proper workshop facilities are necessary to ensure that the engineering course students gain practical knowledge on latest equipment. In the absence of these facilities, the engineering education imparted in the institutions will lack proper practical orientation which is so vital in making a successful engineer. It is imperative that the engineers turned out by these institutions should have first hand experience of working on upto date machinery and equipment to be able to play the role of innovators and leaders in industry. The Committee were informed that the question of augmenting workshop facilities had been taken up</p>

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with the State Governments. The Committee desire this matter should be vigorously pursued with the State Governments.

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Although the All India Council for Technical Education recommended as early as 1974 that the Curriculum Development Centres should lay down detailed guidelines for equipping the laboratories and workshops in engineering colleges, only two of these centres i.e. Curriculum Development Centres at IIT, Bombay and Kharagpur have prepared and circulated the necessary material on a few subjects. The Curriculum Development Centre at IIT, Delhi has taken up the work of preparing manuals of laboratory experiment. The Committee would urge the Government to ensure that the Curriculum Development Centres finalise detailed guidelines for workshop and laboratory facilities for all the subjects and communicate to the State Governments/Engineering Colleges/Universities for necessary action. The Committee would like to be informed about the progress made in laying down these guidelines as well as their implementation by engineering colleges.

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The Committee feel that the suggestion that the Public Sector Undertakings may be persuaded to supply items of workshop equipment required by educational institutions on no-loss-no-profit basis and surplus stores and machinery at book or scrap value, merits serious consideration. The Committee would like Government to examine this matter in consultation with the Bureau of Public Enterprises and Standing Conference of Public Enterprises and lay down guidelines to Public Sector Undertakings so that Engineering institutions which often face shortage of funds, are able to procure workshop items at a comparatively cheaper price.

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63	3.65	<p>The Committee also feel that leading private enterprises could also be persuaded to supply workshop items required by the educational institutions on a no-loss-no-profit basis. They suggest that this may be pursued through their leading associations like Federation of Indian Chambers of Commerce & Industry, All India Manufacturers Organisation, Associated Chambers of Commerce and Industries of India, etc.</p>
64	3.66	<p>The Committee suggest that leading Public Sector Undertakings may adopt an engineering college or IIT/Regional Engineering College in their regions for giving assistance in modernising workshop machinery and equipment and devising workshop assignments of relevance to industry.</p> <p>The Committee would like to be informed in due course of the action taken by Government in this regard and the results thereof.</p>
65	3.72 3.73	<p>The Committee are distressed to note that the scheme of modernisation of workshops has not received the priority that it deserved from the State Governments. The Committee suggest that the State Governments should be persuaded to make adequate provision of funds for improvement of workshops in engineering institutions.</p>
66	3.74 3.75	<p>The Committee note that recently Central Government have decided to provide Rs. 1.5 crores annually during the current plan period as direct Central assistance to non-university institutions for modernisation of libraries and workshops.</p> <p>The Committee feel that this decision should have been taken at the commencement of the Fifth Plan and plan of priorities and implementation worked out so that the modernisation of workshops and laboratories could be completed</p>

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in a phased manner during the plan period. They urge the Government to complete expeditiously the process of identifying institutions that require assistance and disburse the funds so that these institutions can modernise their workshop facilities.

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The Committee are anxious that the Central Government act as pace setter in assisting the engineering institutions in modernising their workshops and laboratories and also involve the State Government in this task to make effective contribution.

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The Committee are distressed to note that non-availability of funds for contingencies for providing raw materials, lubricants, power etc. for the workshops has adversely affected the workshop practice classes. They were informed that funds therefor have to be provided by the State Governments and very often funds for these purposes are not given, as bulk of the funds in the meagre provision made in the State Plans go towards salaries of staff etc. The Committee note the latest instructions that engineering institutions should take up consultancy work, entrepreneurship practice for students, repair and maintenance work, etc. so as to generate resources. They stress that all the leading technical institutions should undertake consultancy services with a view to fully utilising the expertise available in the technical institutions and augmenting the resources of the institutions. Such activities would also help to inculcate a feeling of confidence among the students.

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69	3.83	<p>The Committee note that in the Banaras Hindu University, production-cum-training workshop has been set up and that the workshop is undertaking some work from the Diesel Locomotive Workshop, Varanasi. They desire that the working of the production-cum-training workshop at Banaras Hindu University, Varanasi may be studied and evaluated with a view to determining whether similar facilities would be useful if established in other engineering institutions. They feel that such centres would not only afford facilities for the much needed practical training for the undergraduate students but also generate revenues for the institutions.</p>
70	<p>3.88 to 3.91</p>	<p>The Committee need hardly emphasise the importance of laboratory experiments and workshop practice in engineering colleges.</p> <p>The Committee would like that senior teachers should also take up workshop classes so that the deficiency in equipment is made up by better and mature guidance. The senior teachers should prepare workshop assignments, in consultation with the industry so as to ensure that the assignments are challenging and relevant to the industry and the students develop capacity to tackle the various problems in the world of engineering after completing the course. The Committee suggest that the Ministry should lay down suitable guidelines in this regard.</p>
71	3.92	<p>The Committee suggest that the detailed study of the workshop practice including time spent, nature of problems etc. assigned to undergraduate engineers in U.S.A., U.S.S.R., Federal Republic of Germany and Japan should be made with a view to adopting useful aspects in India.</p>
72	3.125	<p>The Committee note that Government of India have in the National Policy on Education</p>

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approved by Parliament in 1968 laid down that practical training in industry should form an integral part of technical education. The Committee have been informed that at present practical training to graduate engineers is arranged at two stages i.e. during studentship and after graduateship. At the first stage the training in Industry is given to students from third year onwards during vacation. At the second stage one year's practical training is offered to graduates under the Apprenticeship Act. Since practical training under Apprenticeship Act which is given after successful completion of the degree course is not compulsory for all students, it can hardly be treated as an integral part of technical education as envisaged in the National Policy on Education.

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3.126

The Committee were informed that the recommendation of the Study Group appointed by the Joint Committee of All India Council for Technical Education and the University Grants Commission that one year's industrial training should be compulsory after the undergraduate course, is under further examination with a view to working out mechanism for its implementation. The Committee would like Government to ensure that the modalities for the implementation of this recommendation are worked out soon.

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The Committee note that in India the practical training being given to the students is combined with their annual vacations and is not very satisfactorily organised and planned. The students are generally left alone in the industry without any guidance and supervision. Many of the students spend their time as sightseers and watching the various industrial operation from a "safe distance". The Industry on the other hand feel that these students are not trained for any speci-

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		fic task and as such their presence interferes with the production. The Committee emphasise the need for imparting meaningful practical training at under-graduate level and making it an integral part of the Curricula.
75	3.129	The Committee consider that if practical training to engineers at under-graduate level is to be meaningful, and has to serve any purpose, it is essential that there is a proper planning and organisation of the training programme and the work done during the training period is evaluated. The Committee feel that the industry also owes an obligation in the training of under-graduates and it should involve itself fully in the training programme of the graduate engineers. The Committee suggest that the training programme should be prepared in close consultation with the industry. They understand that 50 per cent of the amount donated by an industry to the Universities/Institutions qualifies for exemption from Income tax etc...The Committee suggest that the question of giving further incentives/concessions to the industry to incur expenditure on training facilities to engineering students may be examined by Government.
76	3.130	The Committee suggest that the system of practical training given to students in under-graduate and post-graduate engineering courses in technically advanced countries like USA, UK, Germany, USSR and Japan may be studied in detail with a view to adopting useful aspects of the same in India.
77	3.131	The Committee note that as on 31 October, 1976 out of 12,889 seats created for Graduate Apprentices, under the Apprenticeship Act, 11,267 seats were utilised. The Committee emphasise that wider publicity of the training facilities and

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		incentives available under the Act should be given particularly among the fresh graduates coming out of colleges and unemployed engineers registered with employment exchanges.
78	3.132 3.133	The Committee were informed that under the Act, the Apprenticeship Board and other authorities have to ensure proper training. The Committee desire that the authorities concerned with supervising the trainees should exercise necessary checks to ensure that the industry pays serious attention to the programme. The Committee understand that the question of providing employment opportunities to apprentice engineers is also under consideration. The Committee would like to be informed of the decision taken in the matter and progress made in implementing it. Certain Inter-disciplinary centres of studies in five Indian Institutes of Technology have been identified.
79	3.138	The Committee feel that the Indian Institutes of Technology which have been in existence for more than two decades to serve as centres of excellences should also have facilities for specialised courses for advanced studies and research. The Committee desire that early steps should be taken to introduce advanced studies and research in the special areas identified for each IIT.
80	3.147 to 3.149	The Committee also note that both the Under-graduate and Post-graduate students are being assigned project work. The projects at the under-graduate level are selected in consultation with the industry and mostly relate to design, fabrication, investigation etc. while at the post-graduate level the projects are more sophisticated in nature and are chosen from areas relating to contemporary problems of the industry.
		The Committee would like that a review be undertaken to ascertain whether all engineering

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institutes running post-graduate courses have identified the problems of live interest that can be undertaken by them and whether such problems are being assigned to the students at post-graduate level as project work. The Committee need hardly point out that improvements may be made in the light of experience so as to enhance the utility and relevance of these live assignments.

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3.164

The Committee note that sandwich courses were introduced during the Fourth Plan in 10 engineering institutions at under-graduate level. The main objective of the scheme was to cross fertilize theoretical education at the institutions with actual practical experience in industry in design, production and construction work. For the first five years the programme was financed from the grants by the Central Government on cent per cent basis. After five years, the State Governments were to take over the programme. The Committee are concerned to note that after the expiry of five years period at the end of Fourth Plan some of the State Governments have discontinued the courses. The Committee were informed that this programme is now going to be taken up in another form under the Apprenticeship Act. The Committee consider it very unfortunate that the sandwich courses which were introduced for improving the quality of technical education at undergraduate level have been discontinued in some States because of the withdrawal of the Central Assistance. The Committee desire that the State Governments concerned may be persuaded to revive this useful programme.

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The Committee note that as a part of the Fifth Plan programme in technical education, industry oriented post-graduate courses have been

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started in nine Regional Engineering colleges. This programme was started with assistance from UNDP and UNESCO but this assistance has ceased since 1975. These courses are now being assisted as part of the normal budget of the Regional Engineering Colleges. The Committee were informed that the introduction of new industry oriented courses would depend upon the decision of the Board of Postgraduate Engineering Studies of the All India Council for Technical Education. The Committee are anxious that these industry oriented postgraduate courses and problem oriented research laboratories already provided in some Regional Engineering Colleges should not be allowed to suffer because of lack of funds. The Committee would like that a periodical evaluation of these courses should be carried out and improvements should be made on the basis of experience gained.

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The Committee note that two other colleges viz., College of Engineering, Trivandrum and Thapar Institute of Engineering and Technology, Patiala are also conducting industry oriented post-graduate courses. The Committee hope that the Board of Postgraduate Engineering Studies of All India Council for Technical Education will seriously consider the question of introducing new industry oriented post-graduate courses in other institutes also as per a programme to be drawn up in that behalf, care being taken to see that leading disciplines/various regions are appropriately covered.

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The Committee note that one of the important problems identified in the Third Plan programmes for technical education was adequate supply of text-books on technical subjects at reasonable prices, the method of their production, the availability of foreign publications to the increasing

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number of students. The Committee have been informed that by and large the present position regarding availability of text-books on engineering subjects was satisfactory, but there were some difficulties in making arrangements for printing and publication of foreign text-books. The Committee would like Government to ensure that standard text-books are available to the students at cheap prices. It is also important that quality text-books in engineering disciplines are printed and published in the country itself. The Committee would like the Government to give serious attention to this problem and take concerted measures to encourage production of quality text books written in the country on technical subjects largely taught in IITs/Engineering Colleges.

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The Committee note that all IITs and Regional Engineering Colleges have established book-banks and that State Governments have been requested to provide book-banks in other engineering colleges also. A scheme in this regard is also being implemented by the University Commission. The Committee desire that concerted efforts should be made to set up book-banks in all such engineering institutions which do not have book-banks so that the students of engineering courses are not denied of adequate book facilities.

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3.181

The Committee are unhappy over the inadequate allotment of the funds to the Regional Engineering Colleges for the purchase of books and journals. While the IITs received recurring grant of Rs. 10 to 20 lakhs a year, Regional Engineering Colleges are provided just Rs. 20 thousand to 30 thousand per year. The Committee understand from the Secretary, University Grants Commission that even the Engineering Departments of University Colleges were better equip-

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		ped with books than the Regional Engineering Colleges. The Committee feel that the question of providing adequate funds to the Regional Engineering Colleges should be considered seriously by the Central Government and State Governments who share the recurring expenditure on a matching basis.
87	3.182	The Committee desire that earnest efforts should be made to translate text-books and other teaching materials into Hindi and Regional languages as per a well thought out programme to be drawn up in consultation with all those concerned.
88	4.14	The Committee feel that facilities for continuing education in the form of short-term and refresher courses and part-time courses for diploma holders in Engineering which are at present existing in IITs and in a few other engineering institutions may be extended suitably to more institutions, in the light of experience gained in this behalf.
89	4.15	The Committee hope that the Study Group which is studying the aspects of continuing education and the Joint Committee will go into all aspects of short-term, refresher and part-time courses, as also multi-point entry system and suggest measures for effecting improvement. The Committee would like this study to be completed well before the launching of the Sixth Five Year Plan so that concrete measures may be taken in pursuance thereof to improve the facilities.
90	4.21	The Committee would like Government to conduct a thorough review of these examinations conducted by the professional bodies which are recognised by Government as equivalent to a University degrees with a view to assessing the standards of examination and bringing about improvements where necessary.

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91	4.22	<p>The Committee understand that the examinations conducted by the professional bodies have not been recognised by engineering colleges for admission to Post-graduate courses, except by Mysore and Roorkee Universities which have been permitting such candidates to pursue higher studies. The Committee would like the Ministry to assess the position in the light of experience gathered by the Mysore and Roorkee Universities so that the facilities for postgraduate admission could be got extended by other Universities/Institutions.</p>
92	5.16 5.17	<p>The Committee feel that under the qualifications prescribed for recruitment to the post of Lecturers in engineering colleges, it should be laid down as to what posts would attract industrial experience or research experience so that the candidates having industrial background are recruited for certain posts and their teaching has a practical bias.</p> <p>The Committee are unable to appreciate why in the qualifications for senior Faculty positions like Professor, Assistant Professor, no industrial experience has been prescribed. They were informed that for the post of Assistant Professor generally the lecturers for whom industrial experience has been prescribed, apply. The Committee are not satisfied with the clarifications for they feel that quite often persons are also taken in the higher grades of Assistant Professors/Professors. The Rules should clearly lay down that industrial experience for a certain minimum period of five years or more is an essential condition for a candidate to be considered for appointment as an Assistant Professor/Professor. The Committee attach importance to this matter as in a developing country like India it is of the utmost importance that teachers in the technical institutions are fully conversant with the problems of the industry so that they devise the cur-</p>

ricula and training programmes in such a manner as to equip the students with skills and knowledge which would be pertinent and relevant to the challenges which awaits them in industry.

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The Committee understand that in several countries it is obligatory for the teachers to refresh their knowledge of industry and for this purpose they are given facilities for being seconded to an industrial unit of excellence relevant to their discipline. The Committee recommend that the position may be reviewed so as to make it obligatory for Professors/Assistant Professors/Lecturers, etc. to undergo refresher courses and update their experience of industry first hand. In fact it would be a good idea if it was made incumbent for the teachers in technical institutions to refresh their knowledge of industry before they can be considered for promotion to the next higher post.

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The Committee would like Government to consider whether apart from making the appointments of teachers, particularly senior teachers in Institutes of Technology, on tenure basis, it may be laid down that they would be considered for another term only after successfully completing vacation/refresher training in the related industry and putting it to constructive and effective use in the teaching programme for the students.

The Committee understand that in the Indian Institute of Science, Bangalore Indian Institute of Technology, Madras, Birla Institute of Technology & Science, Pilani and Regional Engineering College, Suruthkal teachers are appointed on tenure basis. The Committee suggest that the system followed in these institutions in this regard may be carefully studied with a view to examining the feasibility of introducing it in other institutions.

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The Committee have a feeling that appointment of senior/teachers on tenure basis may serve the two fold purpose of ensuring that the teachers give off their best and that only those who have aptitude for the work stay on and that exchange of competent persons between industry and teaching institutions is encouraged.

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The Committee need hardly emphasise that teaching positions should carry adequate emoluments to attract the best talented persons to teaching profession. The Committee urge the Government of India to make all efforts to persuade the State Governments to implement the revised pay scales for Faculty members as recommended by the University Grants Commission in the engineering colleges.

The Committee feel that with the revision of scales of pay which compare not unfavourably with those prevailing in the industry and other services, it should be possible to attract and retain the services of really competent teachers who are deeply and truly interested in the work of imparting professional education. It may be advisable to take advantage of this revision of scale of pay to link it up with the system of tenure appointment as recommended in the earlier part of the Report.

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The Committee note that the survey of the sanctioned staff strength and vacancies made in 1969 revealed that there was acute shortage of "professors" in Regional Engineering Colleges and IITs, the shortage being 38.3 per cent and 34.8 per cent respectively. The Committee are informed that an expert Committee has been appointed to review the Quality Improvement Programme and that as part of the review of the Quality Improvement Programme, a survey of

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		the position of the teachers has been undertaken by the review Committee. The Committee desire that the review should be completed expeditiously.
97	5.42 5.43	The Committee are not happy that the Central Government have not kept track of the staff position even in the Indian Institutes of Technology and Regional Engineering Colleges apart from other recognised engineering institutions. The Committee recommend that Government should devise an institutional arrangement by which the position is reviewed once every year so that necessary follow-up action can be taken to see that the vacancies particularly in disciplines which are of greater relevance to the existing state of industrial development are filled up.
98	5.44	The Committee suggest that a comprehensive review in depth may be made in the fourth year of the each plan period so as to assess the actual position and take timely measures to see that deficiencies do not continue into the next Plan period.
99	5.49 5.50	The Committee desire that heads of institutions should make sure that senior Faculty members not only take classes of undergraduates, but also take active and sustained interest in teaching and practical work at the under-graduate level so as to provide proper orientation to the course and inspire the students to achieve excellence in their respective subjects.
100	5.54 5.55	The Committee were informed that the performance of the students, research and consultancy work done by the particular staff member along with his involvement in the institutional academic activities including the maintenance of laboratories and workshops and handling of lecture classes etc. are taken into consideration

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while evaluating the performance of a teacher. A detailed picture of the methods of evaluation in vogue in various institutions/universities would be available when the review of the Quality Improvement Programme is carried out by the Review Committee.

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The Committee need hardly stress that the review should be completed at the earliest. The Committee however desire that in the meantime, broad guidelines regarding the system of promotions to be followed by the various Engineering Colleges/Institutions may be evolved. The system for evaluation should, besides the performance in teaching, take into account the research work and consultancy work done by the teachers. The guidelines may be reviewed after the report of the Review Committee of the Quality Improvement Programme is received.

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The Committee are disappointed to find the progress made in implementing the Faculty Exchange Programme amongst IITs and Indian Institute of Science in pursuance of the Visitor's orders issued in September, 1974 is very slow. In the case of IIT, Kanpur the recommendation has not been implemented at all on the plea that there is shortage of accommodation, and difficulties in schooling for children.

The Committee desire that there should be more earnest consideration of the idea underlying the exchange programme and the IITs should arrange for inter-change with a view to enriching the experience of the Faculty members and adding to the knowledge and experience of the students. The Committee would like to be informed within six months of the mechanism and details of the scheme worked out and the progress made in implementing it.

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The Committee would also suggest that in the light of experience gathered such inter-changes may also be extended as between Regional En-

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gineering Colleges, between IITs and Regional Engineering Colleges and between Regional Engineering Colleges and State Government Engineering Colleges with a view to providing deeper and more varied knowledge to students.

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5.106

The Committee are surprised that the entire Quality Improvement Programme including summer schools which involve considerable expenditure is being conducted by the Indian Society for Technical Education, a private organisation of teachers. The expenditure on this programme has increased from Rs. 29.26 lakhs in 1970-71 to Rs. 76.80 lakhs in 1976-77 and the total expenditure on this programme till March 1977 was Rs. 443.03 lakhs. The total amount given to the Indian Society for Technical Education alone for organising these courses from 1972 to 1976 is Rs. 85,42,000/-. The All India Council for Technical Education as early as April, 1972 had recommended that a high level professional unit should be set up in the Ministry of Education for the overall execution, coordination and direction of the Quality Improvement Programme. But the recommendation of the All India Council was not considered due to a serious omission on the part of the Department of Education. The Committee regret to observe that this is a sad reflection on the working of the Ministry. The Committee would like the Government to investigate why no follow up action on this recommendation was taken and fix responsibility therefor. It should also be ensured that in future conclusive follow up action is taken promptly on the recommendations of the All India Council for Technical Education.

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The Committee desire that immediate steps should be taken to set up a high level professional unit in the Department of Education for overall execution of the Quality Improvement Programme.

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106	5.108	<p>The Committee desire that this review of the Quality Improvement Programme being made by an expert Committee should be completed expeditiously. They hope that this review Committee would cover all aspects of this programme and its utility. It should be particularly examined how far the present programmes, both long term and short-term are really useful and what improvements and modifications are necessary. The Committee are anxious that the short-term courses especially summer and winter courses should really be effective and that teachers should take up these courses seriously and not merely treat them in a casual manner. Further, there should be a regular system of deputing teachers for these courses to enable all teachers to avail themselves of the benefits of these courses, if found useful.</p>
107	5.109	<p>The Committee note that no review of the present teaching methodology has been made. They suggest that the modern methodology of teaching, communication skill, multi-disciplinary approach in teaching, etc. prevailing in technically advanced countries like U.S.A., U.K., Germany, USSR and Japan may be studied with a view to suitably adopting useful aspects of the same in India.</p>
108	5.110	<p>The Committee suggest that while reviewing the summer school programmes, the review committee should also look into all the aspects including teaching methodology, Communication skills, discussions on live problems etc. as part of the summer school programme.</p>
109	5.111 5.112 5.113	<p>The Committee note that at present under the Faculty Development Programme, teachers in engineering institutions are sent to industry for practical training for a period upto 3 months.</p>
		<p>The Committee consider that the industrial training for teachers would be useful in giving</p>

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them first hand experience of latest technological development and practical and technical problem faced by the industry requiring new skills, expertise to be developed in different disciplines. The Committee urge the Government to review the usefulness of the present industrial programme for teachers and take appropriate steps to ensure that the industrial training given to teachers is made more and more meaningful, relevant and purposive.

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5.122

The Committee note that the Review Committee on IIT, Delhi had recommended as early as 1972 that a programme for the exchange of teachers employed in the Institute and experts engaged in industry should be drawn up and implemented. However, no decision on this aspect was taken at the time of issue of the orders of the Visitor in 1974 on the report of the Review Committee on the working of IITs. The Committee have been informed that the All India Council for Technical Education in their recent meeting had suggested that the Secretariat might formulate a pilot project in this regard. The Committee are unhappy at the delay in reaching a decision on this important recommendation of the Review Committee on IIT Delhi.

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While the Committee can understand that there might be some administrative difficulties in implementing the scheme of exchange of teachers and experts, they feel that considering the usefulness of the scheme, these difficulties could have been sorted out particularly in case of exchange programme with public undertakings. They note that such schemes are in operation in other advanced countries like West Germany, USSR etc. The Committee desire that the pilot project, suggested by the All India Council of Technical Education should be prepared and implemented without further delay. Based on the experience of the working of the pilot scheme, it may be extended further by making suitable im-

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provements, where necessary. The Committee would like to be informed about the progress made in this regard.

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5.124

The Committee find that in case of universities, a scheme of visiting professors from the industry has been introduced. The Committee desire that this scheme may be studied carefully for adoption in Indian Institutes of Technology and Regional Engineering Colleges.

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6.10

The Committee need hardly stress the importance of close linkage between the engineering institutions and industry as it not only would enable the engineering institutions to produce the technical personnel required by the industry but would also help the industry in resolving technical problems and challenges facing them. In short it would help in developing a need based and job-oriented system of education in technical institutions. The Committee are, however, anxious that these measures for establishing close linkage should be implemented by the various Engineering institutions and the Industry in actual practice. For this purpose both the engineering institutions and industry would have to make concerted efforts and ensure that the linkage between them which would be of immense mutual benefit, is not only maintained but continuously strengthened. The Committee would like that the Department of Education should play an effective role in this matter and closely watch the implementation of these programmes and resolve difficulties, if any.

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6.11

The Committee understand that the Birla Institute of Technology and Science, Pilani has achieved some success in establishing linkage with industry by organising practice stations in industry and research laboratories etc. where the

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students continue their educational process in the real life setting by using real life problems. Such practice stations would not only make the students aware of the world of work but would develop in them willingness to work with their own hands rather than aspiring for white collar jobs. The Committee would like the Department of Education to carefully study and evaluate the working of these practice stations and if found suitable commend it for adoption by other engineering institutions, with such improvements as are considered necessary in the light of the experience.

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6.12

The Committee note that in 13 States and 3 Union Territories, Industrial Liaison Boards have been constituted and these have been entrusted with a wide variety of functions like formulation of training programmes in industry for students, recommending exchange of personnel between industries and technical institutions, etc., which would go a long way in fostering inter-action between engineering institutions and industry. The Committee desire that setting up of Industrial Liaison Boards in other States/Union Territories may be vigorously pursued. The Committee further suggest that the working of these Boards may be periodically reviewed with a view to effecting improvements in their functioning.

116

6.22

The Committee understand that at present consultancy services are being extended by all the five Indian Institutes of Technology and some Regional Engineering Colleges. The Committee consider that undertaking of consultancy work by the engineering institutions is very important to keep the faculty alive to the needs of the industry as also to create greater awareness among them of the industrial problems which would make them better teachers. Consultancy work would thus contribute greatly to the faculty

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development and in improving the effectiveness of teaching and the standard of technical education. The Committee recommend that consultancy centres may be set up in leading engineering colleges which have already established a name for themselves. The Committee would like the Department of Education to pursue the question of setting up Consultancy Centres with the State Governments and engineering institutions concerned vigorously, where these have not been set up so far.

117

6.23

The Committee are concerned to note that while IIT Madras and IIT Bombay earned Rs. 12.94 lakhs and Rs. 11.21 lakhs respectively during 1976-77, the IIT Kanpur earned only Rs. 4.31 lakhs. The Committee desire that wider publicity may be given to the consultancy services available in these institutions so that the Industry is aware of the expertise available in the Institutions and the extent to which the Institutions can help in the solution of the problems of the Industry. The Committee urge the Ministry to keep a close watch over the consultancy services rendered by the IITs and Regional Engineering Colleges with a view to effecting improvements wherever necessary. The Committee also feel that while evaluating the performance of the IITs, and Regional Engineering Colleges, the quality and extent of consultancy services rendered by them may also be taken into consideration.

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6.24

The Committee would like to sound a note of caution in developing the consultancy services. It may be ensured that the relationship between the Industry and the Institution may be one of mutual benefit and that students may be involved to the maximum extent possible; under no circumstance the consultancy service may be allowed to come to a point where teaching and

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		<p>instructional work suffers. Continuous vigilance may be exercised by the Management of the technical institutions and engineering colleges to see that the consultancy services are developed and expanded on the right lines from the beginning and that no malpractices are allowed to creep in.</p>
119	6.25	<p>The Committee are distressed to note that though the All India Council of Technical Education recommended as early as May, 1974 that the Secretariat of the Council (Ministry of Education and Social Welfare) should compile a basic directory setting out Institution-wise the expertise and capabilities which the different engineering institutions have and what each Institution can provide in terms of consultancy services to Industry, the directory has not yet been prepared. The Council further recommended that the Industry should compile another document on its own, setting out the problems and purposes for which different firms may need consultancy services from Institutions.</p>
120	6.26	<p>It is well known that some of the engineering institutions have a team of highly qualified engineers and possess modern sophisticated equipment and other facilities. This expertise and the facilities are not being fully and effectively utilised as the Industry is not fully aware of the expertise and equipment available in these Institutions. Industry is also not sure about the extent to which the problems encountered by them can be solved by these Institutions. It is therefore, necessary that the expertise and capabilities available in each Institution may be identified and made known to the Industry. The Committee consider that the two documents would be of immense help to the Industries/Institutions in identifying the problems where consultancy services may be developed for mutual benefit. The Committee urge the authorities to expedite the compilation of the two directories.</p>

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121	6.37	<p>The Committee are not convinced that engineering Institutions like IITs should devote as much as 20 per cent to 35 per cent of their resources for research in pure sciences. The Committee need hardly point out that researches in IITs and other engineering Institutions should have greater relevance to the needs of the Industry and development. Some of the engineering Institutions have gathered teams of highly qualified scientists and engineers and possess modern sophisticated equipment and other facilities. The Committee are anxious that the expertise and the facilities available in these Institutions should be fully utilised for research and solution of important live problems of the Industry and the community.</p>
122	6.38	<p>The Committee note that the panel of the National Committee on Science and Technology has identified certain areas for intensive and analytical studies. The sub-groups on these areas with which IITs and other engineering institutions are also associated have submitted their reports. The recommendations made by these sub-groups are being considered by a Working Group which shall prepare an integrated document by the end of December, 1977. The interim reports will be available by the end of January, 1978. The Committee urge that the report of the Working Group should be expedited and conclusive action taken on the recommendations.</p>
123	6.39	<p>The Committee suggest that after these studies are completed special areas for research should be identified and allocated to the engineering institutions so that the available expertise and facilities are put to the best use. The Committee need hardly stress that detailed estimates of the time and money required for each research project</p>

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should be made and a periodical watch kept on the progress made.

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6.40

The IITs have taken up a number of inter-disciplinary reearch programmes particularly in Bio-Medical Engg., Systems Engineering, Environmental Engineering, Material Science. Bio-Sciences, Rural Development, Energy problems, etc. The Committee feel that such inter-disciplinary programmes of importance should also include the problems of the common man which are represented by the need for water for irrigation and drinking, shelter particularly for those in the low income groups and agro-industrial technology which is relatively simple and can effectively contribute towards development.

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6.41

In commending the inter-disciplinary approach the Committee have not only in view teams drawn from different Faculties working on a specific problem, but meaningful and well-coordinated research and development effort being undertaken by the IITs and engineering colleges in conjunction with the national research institutions, laboratories, industries etc. The Committee feel that this concept and approach have undoubted potential and relevance to our present conditions and it is, therefore, of the utmost importance that Government should bring about close and meaningful cooperation and coordination between the Institutions to take up problems of national importance e.g. agro-industries for rural development, mass housing, transport etc., and provides the necessary funds and facilities as per a time bound programme, monitor the progress in order to lend a helping hand to resolve difficulties but above all see that the results are commensurate with the effort and investment and are in fact pressed into use to accelerate the process of development.

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126	6.42	<p>The Committee note that the Department of Science and Technology has set up 17 R & D Committees which study and identify the problem of design, development and production posed by the Small Scale Units and refer them to the appropriate institutions for expert advice. The Committee also note that certain associations are taking up research activities in which the engineering institutions are associated. The Committee were informed that research centres with industrial participation would be established in engineering institutions in course of time. The Committee need hardly emphasise that such research centres with industrial participation would be very beneficial both to the institutions and industry. The Committee suggest that the progress made in establishing such centres should be kept under close watch.</p>
127	6.45	<p>The Committee note that Indian Institute of Technology, Madras has taken up a number of important programmes of research in Solar Energy. The Committee have been informed that the project regarding Solar Air-conditioning has been designed and fabricated and the testing is in progress. The one on Vapour Absorption Refrigeration system working on Solar Energy, is being processed and is expected to be completed by early 1978. Besides a number of other programmes including Solar Cooker-Laboratory Project are at various stages of research. The Committee urge that the progress made in these research programmes should be regularly monitored so as to ensure their completion within the stipulated period.</p>
128	6.46	<p>The Committee need hardly point out that energy is an essential infra-structure and input for developmental processes. It is well-known that even amongst the developing countries the availability of energy in India is relatively low.</p>

It is, therefore, of the utmost importance that taking advantage of our equatorial geographical conditions and abundance of sun-shine, concerted efforts are made to have a break-through in solar energy. In this context the Committee would like to point out that priority should be given to projects like development of solar power stations for rural communities, refrigeration systems of relevance to rural community so that solar energy can be made available in economically viable form and comparable rates in rural areas where the overwhelming majority of Indian people stay. The Committee feel that this is an area where it is of the utmost importance that there should be a well-coordinated and integrated effort by institutes of technology, research, industry etc. so as to achieve the requisite break-through at the earliest. The Committee attach great importance to these recommendations and would like to be informed of the precise action taken in pursuance thereof.

- 129 6.47 The Committee further desire that concerted action should be taken for commercial exploitation of the successful research projects expeditiously.
- 130 6.54 The Committee note that the All India Council for Technical Education at its meeting held in April, 1972 recommended that a Committee should be set up to promote collaboration amongst National Laboratories, Institutes of Technology and Universities to undertake major research projects for the technological development of the country. The Committee are however distressed to note that the standing Inter-Ministerial Committee was set up only in 1974 after a lapse of two years. They feel that such delays are totally unwarranted and should be avoided.

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131	6.55	<p>This inter-ministerial Committee has set for itself the objectives of identifying areas of co-operation with CSIR organisations, IITs, and institutions controlled by the University Grants Commission, establishing linkage and monitoring the progress of the objectives. This Inter-Ministerial Committee has so far held only three meetings in September, 1974, February, 1975 and January, 1977. The Committee emphasise that effective and meaningful cooperation should be established between IITs and laboratories of CSIR in the various fields, like research and exchange of faculty, in order to maximise utilisation of personnel, material and resources available. The Committee would like that this Inter-ministerial Committee should be more active and that it should meet at least once in six months.</p>
132	6.56	<p>The Inter-ministerial Committee has identified a number of areas where fruitful collaboration could be established between engineering institutions and CSIR laboratories. The Committee urge the Government to take suitable follow up action on the actual progress made in these areas. The Committee would like to be informed in due course about the results achieved in this regard.</p>
133	6.57	<p>The Committee have earlier recommended that there should be a budget-bound and time-bound integrated programme of collaboration on assignments of relevance to development. The Committee would like this concept to be worked out in detail. The Committee would like to emphasise that what is required is result-oriented approach. The modalities of working of the scheme should be such as to clearly define the roles and responsibilities of the collaborating institutions and it should be possible also to call them to account where necessary for producing results.</p>

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134	7.11 7.12	It is a long time since the last survey of unemployed graduate engineers and diploma holders was undertaken. The Committee suggest that a critical analysis may be made of the unemployed graduate engineers and diploma holders in order to identify the branches/disciplines of engineering where acute difficulty is being felt in finding placement. This may also give a clue whether the difficulty is experienced in respect of graduates/diploma holders turned out by a particular institution or in a particular State/region so that corrective remedial measures could be taken.
135	7.13	The Committee would also like to point out that in the light of the analysis it should be possible for the Government to co-relate admissions to technical institutions in accordance with the known requirements of the industry. This is of particular importance at the present juncture when efforts are being made to step up admissions to under-graduate courses in engineering colleges to 25,000 which had come down to a level of 18,000 in 1969-70 from 25,000 in 1966-67.
136	7.14 7.15	There is a feeling that one of the reasons for unemployment among the engineers is large turn out of sub-standard graduates. As engineering education is costly and heavy amounts are spent by the parents/guardians on the education of the engineering graduates, apart from the enormous expenditure incurred from public exchequer on this education, it is of prime importance that the quality of technical education is maintained at a high level. The Committee would like Government to go into this matter in depth and bring about perceptible improvements in the quality of education of those engineering colleges where it is lacking at present. Government should not hesitate to de-recognise such colleges which do not show marked im-

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provement in the quality of technical education imparted by them as sub-standard technical education is not only frustrating to the students but results in national waste and discontentment.

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7.16

As a very high priority is being accorded to the rapid development of rural areas, the Committee would like Government to prepare a meaningful programme for the setting up of small village and cottage industries in rural areas and provide adequate package of facilities by way of finance, power, water etc. for such industries so as to attract engineering graduates to involve themselves in this work. Such a programme not only solves the problem of unemployment among the engineering graduates and diploma holders but would also promote rapid development and establishment of the much desired agro-industrial base in the rural areas.

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7.17

The Committee would like to point out that if the graduates and diploma holders are to be involved extensively in the development programme in the rural areas, the curricula and training programme would have to be so modified as to provide the students with first-hand experience of rural conditions and inculcate in them a feeling of involvement and dedication to take technology to the rural areas and help in the process of regeneration and development. In this context it is equally important that the young engineers and diploma holders are extended a package of facilities by way of adequate finance, power, water and other infrastructural facilities which are a pre-requisite for development of agro-industrial centres in the rural areas.

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7.18

The Committee suggest that having regard to the importance of the subject and the avowed policy of the Government to devote greater re-

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sources for the development of the rural areas, the experiment of enthusing the young engineers, graduates and diploma holders may be tried out on a pilot scale by some of the leading Institutes of Technology and Regional Engineering Colleges and after it has shown results, it may be extended to other institutions.

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7.39

The Committee learn that because of the innumerable difficulties like shortage of credit facilities, raw materials, realistic market surveys, cumbersome procedures, marketing problems etc., young engineers are not taking up self-employment schemes. The Committee were informed that no systematic study of the problems coming in the way of engineers in taking up self-employment schemes, has been undertaken by the Government. The Committee suggest that the Government may immediately arrange to have such an analysis made by an expert team having representative from Ministry, industry, institutions with a view to identifying the problems that are coming in the way of young engineers in taking up self-employment schemes and taking remedial measures. It is evident that self-employment schemes to be successful, should provide for a package programme including necessary assistance and guidance required in preparation of project report and market surveys, credit facilities, arrangement for technical know-how, licensing, marketing etc.

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7.40

The Committee consider that the training in entrepreneurship is essential if the young graduate engineers are to have the skill and confidence to undertake self-employment schemes. The Committee recommend that the curricula may be suitably amplified to include essential aspects of entrepreneurship such as fundamentals of market research, forecasting of demands, eco-

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conomic analysis, process planning, machinery requirement calculation, plant layout, cost control, material management etc. It would be a good idea to involve in this training programme senior representatives of scheduled banks, Small Industries Development Corporations, Faculty members etc. so as to provide realistic and well informed grounding in these essentials. The Committee suggest that the approach indicated above may be tried out in some of the Institutes of Technology and in the light of experience gathered in turning out genuine entrepreneurs, it may be improved and extended to other institutions in a phased manner, taking care to cover all regions/States.

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7.41

The Committee note that Motilal Nehru Regional Engineering College, Allahabad has organised an industrial estate and has promoted self-employment schemes. A Review Committee was appointed to enquire into the affairs of the Industrial Estate in 1975. The report of the Committee has been received and would be placed before the Board of Governors of the Regional Engineering Colleges for consideration. The Committee expect that early action will be taken on the findings of the Review Committee. The establishment of the industrial estate by the college *prima facie* provided the students the desired training facilities for self-employment; although there might be scope for improving its working. The Committee have no doubt that necessary improvements would be made in the working of the industrial estate as a result of the report of the Review Committee.

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7.42

The establishment of an industrial estate by a college on the face of it is an interesting development, but it remains to be seen how far and to what extent it has been possible to generate

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through this extension agency genuine engineering entrepreneurs. The Committee need hardly point out that based on evaluation of this experience, the Government may consider the feasibility and desirability of providing similar extension services by way of industrial estate etc. in other well-known institutions like the Indian Institutes of Technology, Regional Engineering Colleges etc. but they would like to stress that there should be continuous monitoring of this effort so as to effect timely improvements and ensure that the underlying objectives are being truly fulfilled.

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7.62

The Committee note that at present students are permitted to study abroad only at post-graduate level. However, in cases where no degree courses are available in the country study at degree course level is also permitted. The Committee, however, feel that since a number of institutions have got adequate facilities for post-graduate courses, it may be examined whether the permission to study abroad at post-graduate level may be confined to those courses for which adequate facilities or specialisation do not exist in the country. This would not only save foreign exchange but also reduce brain drain of qualified engineers trained at a considerable cost.

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7.63

The Committee feel that it is important to maintain a close follow up of alumni of all engineering institutions particularly those turned out by IITs and Regional Engineering Colleges.

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7.64

The Committee are concerned to note that a large number of Indian engineers have chosen to stay on in foreign countries. As per the National Register of Scientific and Technical Personnel as many as 4205 Indian Engineers are living abroad. Since registration in this National Regis-

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ter is voluntary, it is quite possible that many other engineers residing abroad might not have registered themselves. The Committee reiterate their earlier recommendation in their Eighty-eighth Report on Deputation of Indian Experts and Officers abroad that in view of the heavy cost incurred by the country on the education of these specialists, the country has a prior claim on the services of these persons.

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The Committee reiterate further that those who have been trained at public expense should compensate at least for the expenditure incurred on their training by serving in the country or by remitting an equivalent amount.

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7.66

The Committee note that a number of steps are being taken by the Government to attract specialists working abroad to come back and work in the country. Also, a number of incentives like package schemes for specialists abroad for setting up industries in India, Research Associateship and short-term appointments, etc. are being offered. The Committee would like government to monitor the outcome of these measures and improve and amplify them as necessary in the light of experience so as to achieve the objective of attracting back the talented engineers and specialists whose knowledge and expertise are relevant to the present development needs of the country.

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8.19

The Committee note that a sum of Rs. 156 crores has been provided for technical education in the Fifth Five Plan which works out to about 0.39 per cent of the total plan outlay. It is significant that allocation for industry and mining for which sectors, technical education provides an essential input in the form of technical personnel, is to the tune of Rs. 10,200 crores. The Com-

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mittee further note that considerable reductions have been made by the Planning Commission in the allocation for technical education in the Annual Plans proposed by the Department of Education, the extent of reduction being 31.8 per cent in 1974-75, 24.7 per cent in 1975-76 28.6 per cent in 1976-77 and 26.5 per cent in 1977-78. The Committee have been informed that on account of these reductions in the Annual Plan allocations, various Schemes, like acquisition of essential equipment, running of refresher courses, imparting practical training etc., have received a set back. While the Committee agree that the Planning Commission has to take an overall view of the resources in allocating funds for technical education, they would stress that adequate funds should be provided for technical education to meet the manpower requirements for the economic and industrial development of the country. It should also be ensured that there is sufficient provision for the implementation of schemes which would result in significantly improving the standard and quality of technical education and the out-turn of really competent technical personnel. At the same time, the Committee suggest that the Department of Education should ensure that utmost economy and austerity is exercised in the use of the allotted funds and all wasteful and ostentatious expenditure avoided.

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8.20

The Committee would in particular, urge that a critical review may be carried out to identify the areas where economies could be effected in the expenditure incurred on the 5 IITs, and Regional Engineering Colleges without militating against the quality of instructions in disciplines which are relevant to the present day development requirements of the country.

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151. 8.21 The Committee are distressed to note that the allocations made in the State sector for technical education are not fully utilised but are diverted to other purposes. During the Fourth Plan, out of a provision of Rs. 58.38 crores in the State sector, only Rs. 41 crores were spent on technical education by the States. Similarly, it is apprehended that out of a sum of about Rs. 64 crores provided for technical education in the State sector during the Fifth Plan, the expenditure may amount to only about Rs. 50 crores. According to the representative of the Department of Education, the diversion of funds in the States is to the extent of about 40 per cent. It is evident that such a large scale diversion of funds in the State sector is bound to adversely affect the implementation of important schemes for the improvement of technical education. They would like Government to take suitable steps to persuade the State Governments, to see that the funds allocated for technical education are actually utilised for this purpose in the larger interest of the States and the country.
- 152 8.22 The Committee have been informed that due to paucity of funds, the State Governments/ Union Territories have not been able to adhere to the norms laid down by the All India Council for Technical Education for maintenance expenditure on various items like staff salary library etc. The Committee are unable to appreciate the plea of paucity of funds as the funds available to technical education are not being fully utilised and are being diverted by the State Governments. They would like the Central Government to impress upon the State Governments the desirability of implementing the norms for maintenance expenditure.
- 153 8.23 The Committee have no doubt that with the expertise and equipment available in the techni-
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cal institutions, sufficient amounts could be earned if consultancy repair and maintenance work etc. are taken up by them in right earnest and with a sense of dedication. The Committee hope that with the increase in these activities, the technical institutions would be able to generate adequate resources for meeting, inter alia, the recurring expenditure required for implementing the norms laid down by the All India Council for Technical Education.

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8.24

The Committee note that the Task Force and Steering Group on Education had recommended in 1973 that "the industry for whom the technical education system prepares its manpower resources, should have a greater share in financing not only the practical training in industry but also the institutional programmes." The Committee note that the Department of Education have formulated certain new programmes and are requesting the industry to adopt poly-technics. They hope that these programmes will be soon implemented.

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8.25

The Committee learn that the Department of Science and Technology is seriously considering the question of levying Research and Development Cess on industry. The Committee feel that the industry which is benefited by the technical personnel turned out by the technical institutions, should at least share a part of expenditure on technical education so that additional financial resources are available for improving the quality of technical education and introducing other meaningful schemes which would result in higher productivity. The Committee hope that an early decision would be taken in regard to the imposition of a Research and Development Cess on industry.

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156	9.38 9.39 9.40	<p>The Committee note that the functioning of the All India Council for Technical Education has not been very effective. A number of important recommendations made by the Council have either not been implemented at all or undue delays have occurred in initiating any conclusive action thereon. The meetings of the Council have been held after long intervals. During the last 11 years, the Council has met only 6 times and no effective follow up action has been taken on the recommendations made by the Council.</p> <p>The Committee further note that at present both the All India Council for Technical Education and the University Grants Commission are concerned with higher technical and engineering education in the country. Moreover, there are wide disparities in the standard and quality of technical education imparted in the various engineering institutions in the country. There is wide-spread unemployment amount the technical graduates coming out of the engineering institutions in the country which indicates that technical education is not fully attuned to the needs of the industry and the economic development of the country. On the other hand, industries are not able to recruit the right type of engineers they are looking for. All this underlines the need for bringing about meaningful improvement in the curricula, standards of technical and practical education. This could possibly be achieved better if there was a single effective body to look after technical education.</p>
157	9.41 9.42	<p>The Committee note that the Kothari Commission (1966) had observed that the All India Council for Technical Education is an unwieldy body. It recommended that the responsibility for the development of technical education at the University level and the maintenance of standards should be vested in a U.G.C. type body to</p>

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be specially set up for engineering education. Similar views have been expressed by other knowledgeable persons also.

The Committee consider that a phenomenal change has taken place in the development of technical education in the country since the All India Council for Technical Education was set up in 1945. There are at present about 150 technical and engineering institutions which impart higher technical education and the annual admission to these institutions is about 22,000. The U.G.C. which was set up in 1956 for the development of higher education in the country is concerned with a large number of these engineering institutions which are affiliated to the Universities. As the All India Council for Technical Education which is an advisory body, has not been effective in bringing out the much needed improvement in the quality and standard of technical education, it is high time that the necessary re-organisation of the set up to administer technical education in the country is undertaken by Government. The Committee consider that there is need to have a unified single agency which may be entrusted with the work of development of higher technical education so that there is broad uniformity in the standards as well as in the approach towards the various problems relating to technical education. The Committee, therefor, recommend that a single agency with suitable administrative, executive and financial powers may be set up for the development of technical education in the country at the earliest.

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The Committee hope that the revised functions assigned to the Regional Committees of the All India Council for Technical Education recently will make them more effective in discharging the role assigned to them. The Committee would like the working of these Committees to be

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kept under active review so that necessary action could be taken to improve their effectiveness.

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9.45

The Committee suggest that the performance and working of the reorganised All India Boards of Technical Studies may be kept under watch, to ensure that these subserve the purposes underlying their constitution.

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9.46

The Committee feel that in view of considerable time gap between the meetings of All India Council for Technical Education and the Regional Committees, the Government may examine the question of laying down the periodicity for the meetings of the All India Council for Technical Education and Regional Committees, in their Constitutions. Similarly periodicity of the meetings of the All India Board of Post-graduate studies & Research and All India Board of Management Studies may also be laid down in their constitution.

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The Committee are surprised to note that in spite of the fact that provision has been made for appointment of officers on deputation in the Technical Education Bureau, not a single officer has been appointed on deputation. What is more surprising is that out of the 25 officers working in the advisory cadre (October 1977) 21 have been appointed on *ad hoc* basis. The Joint Educational Adviser (T), 4 out of the 5 Deputy Educational Advisers (T), 5 out of the 6 Assistant Educational Advisers (T), 4 out of 5 Educational Officers (T) and 7 out of 8 Assistant Educational Officers (T) have been appointed on *ad hoc* basis. The post of Additional Apprenticeship Advisor has been vacant since September, 1977.

As the Technical Education Bureau is responsible for dealing with planning and policy mat-

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ters in regard to technical education as also for ensuring the implementation of the recommendations of the All India Council for Technical Education, it is of utmost importance that the advisory staff in the Bureau is of high calibre, who are in close touch with the conditions in the industry and in the technical institutions. It would therefore, be more appropriate if majority of the staff in the advisory cadre in the Technical Education Bureau are drawn from the Faculty members of the engineering institutions or senior engineers in industry on tenure basis. Pending amendment to the recruitment rules which may be undertaken very early, the existing provision in the recruitment rules for appointing staff on deputation basis including short term contract, may be put to full use and strictly followed, so as to man the Bureau with eminent faculty members from leading engineering institutions and experienced engineers from industry with the requisite aptitude. The Committee also recommend that the appointments at present made on *ad hoc* basis should also be reviewed immediately and appointments made on regular basis.

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The Committee need hardly add that the persons appointed on tenure basis may not normally be allowed to continue beyond their tenure period as this would not be conducive to continuous flow of fresh thinking on the subject and inter change of positions between those in the Bureau and the Faculty members and engineers working in the industry. The Committee would also like to point out that it would be difficult to attract competent faculty members/practising engineers to serve in the advisory cadre unless the pay and allowances as also other facilities provided to those appointed on tenure/short term contract basis are commensurate with their talents/experience and the emoluments and facilities which they may be getting elsewhere.

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163	9.70 9.71	<p>The Committee are concerned to learn that the Technical Education Bureau has not the requisite staff to the required extent. This is in spite of the fact that the Plan allocation for Technical Education in the Central Sector has increased manifold from Rs. 11.5 crores in the First Five Year Plan to Rs. 92 crores in the Fifth Five Year Plan. The Department of Education have admitted that because of the inadequacy of staff, the Bureau's activities have not been effective as these ought to be in different fields.</p> <p>The Committee were informed that a general assessment of the Technical Education Bureau has been made and that the question of strengthening the Bureau is already under examination. The Committee urge the Government to undertake a review of the staff requirements of the Technical Education Bureau specially at higher echelons on a scientific basis and to strengthen the Bureau suitably so that the functions expected of the Bureau are discharged efficiently.</p>
164	9.72	<p>The Committee also note that the Department of Education have recently strengthened the Planning and Statistical Division and that a Monitoring and Evaluation Cell has been set up. The activities of the Cell at present have, however, been confined to collecting and analysing the data about implementation of the general educational programmes. But such monitoring in the area of technical education has not yet been undertaken. The Committee need hardly emphasise that it is very important to have suitable machinery in the Ministry to evaluate the technical educational programme on a continual basis. The Committee desire that necessary steps in this behalf may be undertaken without delay and the Committee informed.</p>