

Alternative to IIT-JEE, AIEEE and State JEEs

An Interim Report

Submitted by the Committee

Prof. Devang V. Khakhar	Member
Prof. S. C. Saxena	Member
Prof. M. S. Ananth	Member
Prof. D. Acharya	Chairman

September 1, 2010

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ALTERNATIVE TO IIT- JEE, AIEEE AND STATE JEEs

The following Committee was formed vide Order No. F.19-2/2010-TS.I dated, 8th March, 2010 (Copy given in Annexure-I) to explore possible alternatives to the present IIT-JEE, AIEEE and other State Joint Entrance Examinations for admission to engineering programmes in the country:

- | | | |
|--|---|----------|
| 1. Prof. D. Acharya, Director, IIT Kharagpur | - | Chairman |
| 2. Prof. M. S. Ananth, Director, IIT Madras | - | Member |
| 3. Prof. Devang V. Khakhar, Director, IIT Bombay | - | Member |
| 4. Prof. S. C. Saxena, Director, IIT Roorkee | - | Member |

The Committee also had the mandate of streamlining and rationalizing other examinations such GATE, JMET, JAM etc. The Committee was advised to invite / associate Chairman CBSE, COBSE officials and Chairman CCB for AIEEE.

The Committee met six times:

- (1) On 16th March, 2010 in IIT Madras. Chairman, COBSE, COBSE officials, Chairman CCB, AIEEE, JEE Chairman of all IITs were present. The Committee took cognisance of the report of the IIT-JEE reform committee set up by the Directors in 2007 with Prof. V. G. Idichandy, Deputy Director, IIT Madras as Convenor and the findings of Prof. A. N. Samanta, Chairman, JEE, IIT Kharagpur in 2010. Prof. M. Anandakrishnan, former VC, Anna University, shared the experience of Tamil Nadu in the abolition of JEE in the state and admission based on the normalized +2 results with the Committee. The Committee discussed the JEEs and their impact on school education in general and technical education in particular and prepared a document suggesting alternatives.
- (2) Four different consultations were held with the stakeholders in different zones.
 - In Kolkata (East Zone) on May 17, 2010
 - In Delhi (North Zone) on May 19, 2010
 - In Hyderabad (South Zone) on May 25, 2010 and
 - In Mumbai (West Zone) on May 31, 2010

The stakeholders included the Vice Chancellors / Directors of the Universities, Secretaries of Technical Education and Directors of NITs and one of the Directors of IISER. The MHRD was represented by the Additional Secretary and a Director in some of the consultations. While the Chairman of IIT Delhi participated in Delhi consultation, the Chairman of IIT Kanpur participated in both IIT Madras and IIT Hyderabad consultations. The Directors and senior colleagues of IIT Delhi and IIT Bombay

participated in the consultation meetings held in these Institutions. Director IIT Hyderabad participated in the consultation held in Hyderabad. Representatives of the Directors of IIT Patna, Guwahati, Bhubaneswar and Ropar participated in Kolkata consultation.

- (3) The outcome of these consultations was discussed by the Committee on 15th June in Kolkata and a draft proposal was prepared. The proposal was then circulated in IITs for wider consultations.
- (4) The Directors of the IITs met in IIT Kharagpur on 11th July 2010 to deliberate on the proposal and arrived at a consensus on the proposal on a subject test for select few and on making the merit list available to all those Institutes who have research and innovation focussed education.
- (5) The proposal was discussed with the members of COBSE in Delhi on August 27, 2010 to ensure the full support and cooperation of School Boards in bringing in desired reform in Plus 2 education.

1. Joint Entrance Examinations

Joint Entrance Examinations are being conducted to admit students to a group of Institutions offering degree programmes in Engineering, Medicine, Pharmacy, Architecture, Management, and Computer Applications. Students from various Boards at XII level whose curriculum, syllabus and standards vary appear at All India, State and Institution level JEEs. Each JEE prescribes its own syllabus which may be different from or similar to a Board's syllabus. Each JEE serves as a common base to evaluate students from various Boards and rank them in the order of their test score.

The JEEs differ in terms of the syllabus and the method of examination and evaluation. This calls for extra preparation and coaching. The performance in the JEE is the sole basis of ranking. Other inputs such as XII performance, aptitude, teachers' feedback etc. to judge the merit and suitability of a student are conspicuously absent in the admission process.

The Common Entrance Examination (CEE) for admission to IITs in 1961 evaluated students on a common curriculum and syllabus. CEE did away with the multiplicity of tests, minimised costs and inconveniences to the students. The test format was designed to evaluate the higher analytical skills and ability to use combination of concepts in solving problems. Test of English, General Knowledge, Engineering Drawing etc. helped to evaluate the communication, aptitude and general awareness of the students. The

students were ranked based on CEE Score and Institution – Branch of study allocation was done as per the choice of the student and availability of seats.

Institutions like IITs used the All India Rank. The State conducted JEEs used the State level rank for admission to State level Institutions. AIEEE used both All India and State level ranks to facilitate admission to Institutes having both State and Central quota. Other Institutions also used these ranks to admit students as per their requirement. All JEEs also prepared ranks category-wise (General, SC, ST, OBC, Female and Physically Challenged etc.) to facilitate category-wise admission to Institutions.

With the increase in number of Institutions and number of candidates appearing at JEE, pen and paper mode of examination gave way to answering Multiple Choice Questions and their evaluation through use of OMR sheets.

2. Current Status

The IIT JEE is considered to be one of the toughest examinations. Nearly 500,000 students appear at IIT JEE and compete for about 10,000 seats. The number in terms of both the candidates and the available seats is likely to grow by 10% every year.

Nearly 11 lakhs students appear in the AIEEE for admission to about 20 NITs, some of the Deemed Universities and over 100 Private Colleges. This number is also expected to grow by about 10 percent a year.

For admission to State level Government and Private Engineering Institutions, State level JEE is conducted, practically in every State except Tamil Nadu. Tamil Nadu has dropped State level JEE and admits students to their Engineering Institutions based on normalized +2 marks. Though a student now appears at 3-5 Entrance Examinations to get an admission into a Technical Institution, the total number of students appearing at one Joint Entrance Examination or the other is around 25 lakhs.

A student is offered admission to the Institution and discipline of his / her choice based on his / her rank. The rank of the students in the JEE is determined by his / her score in the JEE. Some JEEs prescribe an eligibility criteria based on +2 examination result. For instance, IIT JEE prescribes 60% mark for General candidates and 55% mark for SC/ST candidates. Some State JEEs also insist on minimum of 40-45% mark in +2 Examination. Some States like Gujarat and Andhra Pradesh gives 50% and 25% weightages respectively to the +2 performance in preparation of the Merit List.

The number of students appearing in the JEEs in many States is less than the number of available seats. Therefore, the qualifying mark for inclusion in the Merit List of the Joint

Entrance Examinations even goes down to below zero! Some of the States such as Bihar, Jharkhand and North-Eastern States do not have many Government or Private Institutions. Students of these States appear at either AIEEE or State Level JEEs of other States to seek admission to Technical Institutions.

The JEEs are limited to multiple choice questions in Physics, Chemistry and Mathematics (PCM) for Engineering or Bio-Science (PCB) for Medicine and Pharmacy,. For admission to Architecture, in addition to a test in PCM, one has to take Aptitude Test. For lateral level admission to Engineering, the syllabus for the JEEs is limited to that of the discipline specific diploma programmes.

3. Evolution of JEE Patterns

As noted earlier, the “Common Entrance Examination” was started in 1961 for admission to 4 IITs for nearly 700 intake at both First Year and Second Year level. Nearly 15,000 candidates appeared. CEE used long answer, problem-solving, manual evaluation format to search for talent. In the early 60s, the name of the examination was changed to the JEE. In the late 70s Engineering Drawing and General Knowledge were dropped and in 1988 English was dropped. Coaching for JEE started in 70s. The perceived competition between coaching classes and paper setters made the examination more tougher and the students became more dependent on coaching. IIT JEE remained a low scoring tough examination. To cope with the increase in number of candidates, two stage JEE was introduced in 2000: an objective Screening Test followed by a Main paper that was evaluated only for those who qualified in the Screening Test. Objective testing alone was introduced in 2006.

With expansion in Engineering Colleges JEEs at State level started in late 80s. The AIEEE was introduced in 2002. RECs / NITs opted for AIEEE while deemed Universities and Colleges opted for AIEEE for some percentage of their seats. Multiple Choice Test is being followed in AIEEE and State JEEs from the beginning. Most JEEs have focused only on testing PCM or PCB neglecting other attributes.

4. Variations among the JEEs and Admissions

The country has large number of Institutions with widely varying capabilities, focus and standards. Institutes like IITs and IISER are on the top of the ladder. These Institutions offer research and innovation focused education that requires higher analytical abilities and problem solving skills using multiple concepts. Therefore the IIT-JEE tests higher analytical abilities and concurrent use of multiple concepts even from multiple disciplines

in solving problems. Though the syllabus is at the +2 level, the test is well above the XII examinations. It is considered to be one of the toughest examinations and a time-tested filter of talent for admission to the IITs. It has earned a well-deserved reputation for fairness and for the integrity of those organizing the examination.

NITs and several Government and Private Institutions offer quality technical education. They admit students through the AIEEE. AIEEE tests the students on clear understanding and application of concept covered at standard 12 level in PCM. The syllabus used for the AIEEE is primarily the CBSE syllabus with suitable modifications to take care of the needs of other Boards.

The State level JEEs are used to admit students to the large number of State level Government and Private Institutions. The tests are designed based on the State Board syllabus for PCMB.

For admission to B. Pharm Courses, the States conduct Joint Entrance Examination along with the JEE for Engineering Courses. For B. Pharm, normally the States conduct tests on Physics, Chemistry and Bio-Science. However, for admission to Pharmacy Courses, IITs conduct test on Physics, Chemistry and Mathematics. Deficiencies in Bio-Science is made up through bridge courses.

In addition to the above at State level JEE, Entrance Examinations are conducted for lateral entry of Diploma holders in Engineering and Architecture to Degree programmes. Here, the Test syllabus is same as the State level Diploma syllabus.

For admission to many leading Institutions in Medicine and Central quota on State level Medical Colleges, CBSE conducts a Medical Entrance Test. The test is on PCB and the syllabus is CBSE XII level plus. This test is considered to be very tough requiring extensive memorization and coaching to crack.

JEE Merit List is used as the sole criteria not only for admission to an Institution but also for the allocation of the branch of study to a student in that Institution. Institution and branch allocation requires assignment of distinct ranks to individuals. The number and difficulty level of the questions that have to be answered in a limited time have been increased to make the tests more discriminating. Bunching is minimized by the design of the questions and by the use of several tier tie-breaking rules.

5. Impact of JEEs in the present form

- Since the success in JEEs is the sole criteria for admission to many technical Institutions, the focus of the better students has shifted from +2 Science education in School to Coaching for the JEEs.
- School attendance has become a casualty.
- Many coaching classes concentrate on teaching students tricks that help crack Multiple Choice Questions.
- Some students suffer from burn-out syndrome; some think they have “arrived” just because they cracked the JEE; some who failed to get admission to the disciplines of their choice feel frustrated.
- JEEs are urban centric and rural students without access to coaching fail to qualify.
- Girl students fare worse than boys in the JEEs despite their superior Board performance.
- Dearth of quality Institutions has increased the competition for admission to the few available ones beyond desirable limits.
- Increase in number of students has led to Multiple Choice ORS based examination, which is pedagogically not as effective as the long answer format.

6. Expectations from Joint Entrance Examinations

A student seeking admission to Engineering, Pharmacy, Architecture etc., has to have (1) good knowledge and clear understanding of Science subjects and (2) reasonable level of intelligence, analytical reasoning skills, general awareness and communication skills.

Joint Entrance Examinations currently assess the students in the former. Later competencies are not tested. There will be no need for the JEE in the present form if we have (i) only one Board in the country, and (ii) we conduct examinations and have assessment in fair and transparent manner. Present form of JEE in State or AIEEE level only assesses the performance on a common base through one time test. The Board Performance in the subjects is not taken into consideration.

Exception is the JEE conducted by IITs where one tests the higher analytical and problem solving skills using multiple concepts. Such skills are essential to admission to the Institutions having research and innovation focus in their education. Therefore, IIT JEE test items are distinctly different from the other JEEs.

For vast majority of the Institutions who focus on producing engineers for routine jobs in industry and government, a good knowledge and understanding of the basic science concepts is enough. A good XII examination and evaluation system should be able to assess the same. A method to reduce variations from Board to Board and equalization of the score should suffice.

A test needs to be organized to assess the second component as they are not currently being evaluated at the School level.

For research and innovation focused Institutions in Science and Engineering, an add on test is essential to test the higher competency level in Science subjects of Physics, Chemistry and Mathematics. Similarly Architecture will require a special Aptitude Test.

7. Analysis of JEEs and Suggestions for Change

An analysis of the performance of the relatively few students admitted to the IITs over the last decade in the IIT-JEE and subsequently in the IITs (2 tier JEE was conducted between 2000 and 2005 and a single objective-type examination has been conducted since 2006) leads the following broad and somewhat expected conclusions:

- There is a strong correlation between the Standard X and Standard XII marks and CGPA including the final performance in IIT.
- Both AIR and percentage marks at Standard XII are better correlated to the CGPA only upto the end of the first year.
- There is poor correlation between AIR and the CGPA of GE and OBC candidates from 2nd year onwards.
- Percentage of marks at XII level better explains group performance in later years.
- Students with high AIR (less than 1000) have higher score at XII level while aberrations are more prominent at lower AIRs.
- An analysis of the performance of students in the screening and main tests of IIT

JEE between 2000 and 2005 showed a considerable overlap between the sets of top 5000 students although their ranks within the sets showed little correlation. Hence it would be expedient to settle for a completely objective single examination.

The studies recommended (some already implemented)

- Screening based on normalized Board scores at Standard X and/or Standard XII and Multiple Choice examination replacing the two stage JEE from 2006.
- Entry barrier to be raised to 60% in the +2 examinations.
- Factors, other than the Standard XII marks and AIR based on PCM testing, such as raw intelligence, logical reasoning, aptitude, comprehension and general knowledge need to be considered.
- Need to factor in school performance more significantly into the selection process.

The last two recommendations are applicable to all JEEs. From the discussions held by this committee the following additional desirable features of the admission process were identified:

- Decision based on one time test needs to be re-examined. Opportunities to improve must be built in.
- Students must be relieved of the pressure of multiple JEEs. Currently a student appears on an average at 5 JEEs all within a few days of the Board Examinations.
- Influence of coaching for JEE needs to be minimised.
- Urban-rural and gender bias has to be eliminated or atleast minimised.
- The objective type of examination lends itself to undue influence of coaching. The conventional pen and paper examination with well designed long and problem solving oriented questions should be revived by keeping numbers in any JEE within reasonable limits.
- JEEs, especially the IIT JEE, have become a huge money spinning activity for coaching centres with attendant undesirable consequences.

8. Recommended Alternative

- Scores in a well-designed National Aptitude Test (NAT) should be used to capture parameters of interest such as raw intelligence, aptitude, general awareness, comprehension and written communication skills.
- NAT should not require extensive preparation and coaching. The questions in the test should be so designed that it would not require inputs beyond the +2 level.
- *Ideally candidates should be able to take NAT any time in a year. One can also have the option to improve over (say) 3 attempts. The test could be an online test and the highest of the 3 scores shall be considered.*
- Standard XII Scores normalized appropriately across Boards, considering PCM for Engineering, Science and Architecture and PCB for Medicine and Pharmacy should be used to capture the School Science Performance (SSP).

- A Composite Weighted Performance (CWP) Score may be computed as follows:

$$\text{CWP Score} = X (\text{SSP Score}) + (1-X) (\text{NAT Score})$$

An X value of 2/3 is recommended to begin with. This may be revised after a few year's experience.

- There is wide variation in requirements and standards of admitting Institutions. While CWP Score should be compulsory for all. Some Institutions whose curriculum and syllabus is research and innovation oriented require students with higher analytical skills and problem solving competence using multiple concepts. Such students only can contribute effectively to research and innovation. An add on test need to be conducted in order to meet the specific needs of such Institutions of National Importance and Universities. In these Institutions the CWP Score should be used as a screening criterion to reduce the number of candidates taking the add on test to about 1 lakh. The students qualified in such a National Test should be available for admission to Science and Engineering programmes. To encourage bright students to go for higher education and research in Science and Engineering, the Government may also consider giving scholarships to the Add On Test qualified candidates similar to INSPIRE scholarship for education in Science in leading Institutions. The National Add On Test may be named as National Engineering and Science Test (NEST).

9. The National Aptitude Test

- The test has to be an online test that can be taken by a candidate any time. A candidate must get a chance to improve, thus may have a maximum of 3 chances.
- To handle about 5 million online tests, several test centres of about 500 in number have to be created.
- Each Centre should have its own server, thin clients, printers, storage devices, security and internet connectivity. Power back up has to be ensured.
- Mock testing facility should also be made available with the Test Centres. The same, however, could be made available online.
- The test system has to be designed and test items are to be created to make sure that a large number of unique tests with identical difficulty levels could be administered. This will eliminate the chance of malpractice. Instant evaluation and reporting of scores have to be done.
- To have necessary credibility, the test system has to be created, administered and managed by the Government through a statutory agency.
- The facilities thus created could be used for other tests such as GATE, CAT, PMTS and UPSC for their preliminaries.
- The credibility of the National Aptitude Test has to be high. Active involvement of institutions like IITs is required at the initial stage to make the test credible.
- Implementation of the scheme requires broad consensus building and commitment of the State Government and Boards to improve school education, examination and evaluation systems. They must also adhere to a strict time schedule for publication of results in a form that can be used by the Central Agency and admitting institutions.
- Central Government must commit to the creation of Test facilities, consensus building through CAGE and giving statutory status to the credible Agency.
- To organize 5 million tests a year, 25,000 test seats are to be created to conduct one test of three hours a day for 20 days in a month. The number of tests could be doubled or even tripled to take care of the peak load. Each Test Centre should have 50 test seats and 20 mock test seats. Thus there will be 500 Test Centres. Depending on the load, one city may have several Centres. **Annexure II** gives typical configuration of a Test Centre. Designing, validating and administration of

NAT is crucial to the success of the system. **Annexure III** gives their salient features.

10. Adjusted School Science Performance Score and Ranking

The country has 30 Boards for conducting examinations and evaluation of performance of the students in the Science subjects of Physics, Chemistry, Mathematics and Biology. Currently, the performance evaluation across the Boards vary considerably as they differ in their curricula, syllabi, the setting of the question papers, the conduct of examinations and the evaluation of answered scripts. The variation in performance evaluation can be minimized by adopting a common curriculum and syllabus, by using common format for the question papers, by developing model answers and by adopting model evaluation schemes.

Despite all the above steps, it is not possible to completely eliminate the differences in the performance evaluation across the Boards. It is, therefore, essential to “adjust” the performance evaluation in Science subjects of the students from various Boards by comparison with a reference Board (hereafter referred to as the “Anchor Board”) using the concept of “equivalence”. The score in a Board and the score in the Anchor Board are equivalent if they represent the same relative position in the group of examinees. This will call for “adjusting” the individual Board’s scores by “equating” them to the Anchor score. Choosing the entire population to represent the Anchor Board is the best impartial choice. i.e The Anchore Board will include all the Boards. The following linear equating scheme can then be used for “normalization”.

If X represents a score in a Board and Y represents a score in the Anchor Board, then X and Y are equivalent in a group of examinees when

$$\frac{Y - \text{mean}(Y)}{\text{SD}(Y)} = \frac{X - \text{mean}(X)}{\text{SD}(X)}$$

where, mean (Y) = the mean of performance in a subject in the Anchor Board
 mean (X) = the mean of performance in the same subject in a Board
 SD (Y) = Standard Deviation of performance of all students across in the Anchor Board in a subject
 SD (X) = Standard Deviation of performance of all students in a Board in the same subject

$$\text{Adjusted (X)} = \left[\frac{\text{SD}(Y)}{\text{SD}(X)} \right] X + \left[\text{mean}(Y) - \left\{ \frac{\text{SD}(Y)}{\text{SD}(X)} \right\} \text{mean}(X) \right] = Y$$

The School Science Performance Score will be based on the adjusted scores in the individual subjects. The performance in each subject could be measured in a scale of 0 – 200. Thus, the School performance will be measured in a scale of 0 – 600. As the Adjusted Score is unlikely to be an integer form, we may compute upto 3 places of decimal for ranking purposes.

The score in the National Aptitude Test (NAT) may be obtained on a scale of 0 – 300. The Adjusted SSP score should be added to the scale of NAT score. This will give 2/3 weightage to SSP and 1/3 to NAT scores.

Ranking of the students will be based on the Composite Weighted Performance Score (CWPS). The choice of Scale and computation upto 3 places of decimal will reduce bunching to a great extent. However, some bunching will occur as the number of students involved is large. In such cases the ties can often be broken by using such tie breakers as (i) SSP score, (ii) NAT score in Mathematics, (iii) NAT score in Physics, and (iv) NAT score in Chemistry. Despite such tie breakers, two candidates with the same CWPS will be given the same rank.

11. Plus 2 Reforms

The Committee felt it was advisable to articulate a few necessary reforms in the +2 system in this context:

- *Common curriculum for PCMB across all Boards should be introduced. (According to COBSE, most of the Boards will implement common curriculum and syllabus in Physics, Chemistry, Mathematics and Bioscience by 2012).*
- *Efforts need to be made to ensure free and fair examination and evaluation at the +2 level in all the Boards.*
- *The Board examination results could be brought to a meaningful common base if all Boards use the same question paper for examination and common model answer for evaluation. This can facilitate use of raw SSP scores for computation of the CWP Score. Till then normalized scores can be used to compute CWPS.*
- *An agency to conduct NAT online test should be created. Necessary infrastructure has to be created to conduct test for about 5 million candidates. The physical infrastructure shall include servers, thin client, printers, broadband connectivity, standby generators, security etc. Adequate administrative support infrastructure has to be provided.*

- The availability of Board result in time is critical to the success of the alternative. It was agreed that +2 results could be made available by May 1 in all Boards by 2012.
- The issue of unique identity of a candidate was discussed. It was generally agreed, the Unique Identification Scheme would be operational by then and each candidate would have a UID number.
- The COBSE Members have agreed to the above. They, however, require the support of the States.

12. Some Deadline Dates

- Standard XII results should be available by 1st of May.
- All India Rank based on CWP Score shall be prepared for all candidates by 10th of May.
- All India Rank Certificates shall be made available category-wise : General, SC, ST, OBC, Male, Female and Physically Challenged to all candidates by end of May. This rank shall be used for admitting students to Universities and Institutions who admit students based on All India Rank.
- State and Category-wise Rank Certificates shall be made available for admission of candidates to State Government and Private Colleges to all candidates by 31st of May.
- Based on CWP Scores candidates shortlisted for add-on test for admission to Institutions of national importance and Universities focusing on research/innovation shall be available by 10th of May.
- These add-on tests shall be held by the end of May and the Rank based on the test shall be available by 20th of June.
- Online counseling shall start by 1st of July and be completed by 15th of July. Online counseling can be done at State level for State and Private Colleges and centrally for admission to IITs and NITs based on CWP Score.

13. Expectations from Boards

1. Uniform Curriculum and Syllabus for PCMB.
2. Common structure of Question Paper.
3. Fair conduct of Examination.
4. Model Answer.
5. Model Evaluation Scheme.
6. Allocation of UID to all students admitted to 11th Class.
7. All references to Performance based on UID.
8. Separation of internal and Board Examination Scores.
9. Result Publication by May 1.
10. Common Software for result preparation and processing. This may be developed and distributed to all Boards and portability.
11. Passing of raw scores to the Testing Agency.
12. Encouraging the students to take more than once NAT over two years i.e. 11th and 12th

14. National Testing Agency

- (1) National Testing Agency is to be created by an Act of Parliament. Only a statutory agency can ensure independence, transparency in testing of the magnitude that is being envisaged. It will have the necessary credibility and confidence of the people. To start with, NTA will conduct NAT and prepare State level and National level merit list for admission to the Science, Engineering and Pharmacy programmes. The same agency could prepare merit list for medicine. Later it may be empowered to prepare merit for other examinations such as GATE, CAT, MAT etc.
- (2) The Agency should be run by a Commission with few members of high academic stature and a Chairman.
- (3) Creation, running and maintenance of Test Centres will be the responsibility of the Commission.
- (4) The Commission will have a unit to develop testing plans and test items. Testing and validation of test items will be the responsibility of the unit.
- (5) A research unit attached to the Commission will be responsible for generating several unique test sets with equal difficulty levels besides validating and equalization of test scores.
- (6) The Commission will have a Technology Support Unit to take care of IT needs of the Test Centres, creation of Data Centre, Networking of the Test Centres etc.

15. Conclusion

This Interim Report gives the views expressed after wide consultation with the stakeholders on evolution of an alternative to IIT-JEE, AIEEE and State JEEs. Members of COBSE requested for State level consultations to ensure smooth implementation of teaching, examination and evaluation reforms at +2 level. It is also necessary to work out the nitty-gritty of conducting NAT, design of test system, equalization of Board scores, unique identification of candidates etc. If the alternative is in principle accepted, the details will be worked out and final report will be submitted.

Annexure - I

F.No.19-2/2010-TS.I
Government of India
Ministry of Human Resource Development
Department of Higher Education
Technical Section - I

Shastri Bhawan, New Delhi
Dated the 8th March, 2010

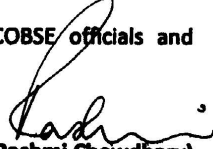
ORDER

Consequent to the decision in the Retreat of IIT Directors and Chairpersons held at Manesar on 4th February, 2010, it has been decided to constitute a Committee having the following composition, to look into the streamlining and rationalizing JEE, GATE, JMET, JAM, etc.

- | | |
|--|------------|
| 1. Prof. D. Acharya, Director, IIT Kharagpur | - Chairman |
| 2. Prof. M. S. Ananth, Director, IIT Madras | - Member |
| 3. Prof. Devang V. Khakhar, Director, IIT Bombay | - Member |
| 4. Prof. S. C. Saxena, Director, IIT Roorkee | - Member |

2. The Committee will explore the possibility of having one exam in place of the present IIT-JEE, AIEEE, and other State Joint Entrance Examinations for admission to engineering programmes. While doing so, due weightage would be given to performance in Board exams and the entrance exam. The CET should consist of an aptitude test which gauges the raw intelligence of the students on the lines of GRE, SAT and lays less emphasis on PCM (Physics, Chemistry and Mathematics), as these are already tested at the Board level.

3. The Committee is advised to invite/ associate Chairman CBSE, COBSE officials and Chairman CCB for AIEEE in the deliberations of the Committee.


(Rashmi Chowdhary)
Director
Tel: 23070987

Distribution :

1. Prof. D. Acharya, Director, IIT Kharagpur
2. Prof. M. S. Ananth, Director, IIT Madras
3. Prof. Devang V. Khakhar, Director, IIT Bombay
4. Prof. S. C. Saxena, Director, IIT Roorkee

Copy for information to :

1. Director, NIT Nagpur, Chairman CCB/ AIEEE) with a request to attend the first
2. Chairman, CBSE) meeting of the Committee scheduled
3. Prof. D.V. Sharma, General Secretary, COBSE) to be held on 16.03.2010 at IIT Madras


9-3-10

Test Centre Design

Each test centre should consist of a reception area and multiple testing rooms. The space designs will be created to efficiently manage test centre operations, minimize disruptions to the candidate testing experience and assure the highest levels of physical security and test integrity. A Centre should also have a mock test area.

Waiting Area

The test centres will have a waiting area for candidates so that once examinees have been checked in, no unauthorized persons—including children, family members, co-workers or friends of the examinee—remain in the waiting area or any other part of the test centre. Only candidates and authorized visitors would be permitted in the test centre. It is proposed to provide a storage facility to the candidates to place their personal belongings before entering the testing area. Within this area all check-in formalities would occur, like image capture, biometric and physical identification document verification, before the candidate is allowed inside to take the test.

Test Area

It is proposed that each testing station will be separated by sound and light absorbing privacy dividers and the computer stations would be placed in a formation restricting visibility of other computer screens. Surveillance cameras will be strategically located in testing rooms to allow viewing and recording at all times when testing is in progress.

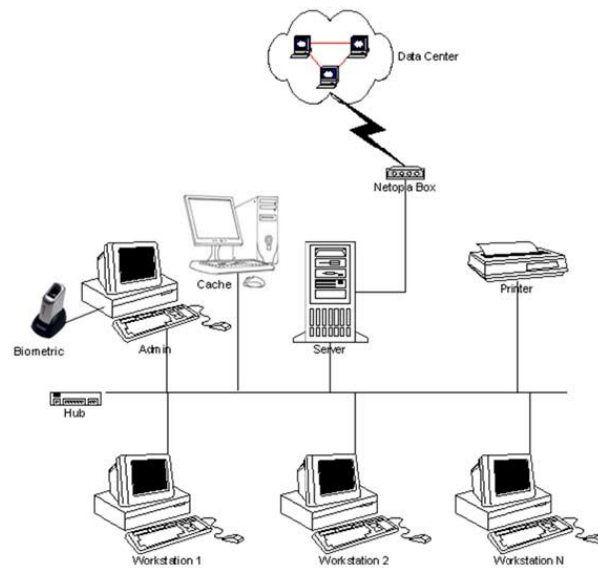
It is proposed to take several steps to ensure that the test administrations are consistent and provide a pleasant experience to the candidates. These testing venues conform to local municipality requirements, and provide adequate parking facilities for candidates. Additionally, measures will include:

- **Ensuring Quality Candidate Services**—The TCAs, proctors and other staff will be trained to be courteous, candidate friendly, disciplined and efficient.
- **Ensuring Test and Environmental Quality**--by regularly checking the cleanliness of all test stations and testing that the quality of the monitors and test delivery output is of acceptable standards by launching demo tests.
- **Ensuring Security**—by certifying TCAs and conducting security audits on a regular basis.
- **Ensuring Consistent Client Policy Adherence**—In the 'Client Practice' manual, (a manual where all exam policies will be documented) we instruct the test centre staff as to what needs to be done in certain situations, so that there is standardization in the conduct of tests all across the country.
- **Deter and Detect Test Fraud**—There will be use of video cameras, their live monitoring and recording, physical proctoring, etc.

Mock Test Area

Mock Test area will be required to offer mock testing experience to the candidates. It will be exactly like the Test Area but with fewer seats. It will not have any physical or electronically connectivity to the Test Area. Candidates using Mock Test Area should have no access to the Test Area.

Test Centre system setup :



Technical Requirements

Hardware requirements

Configuration	Server	Admin Node	Testing Node	Proxy Server
CPU	2GHz or higher	2GHz or higher	2GHz or higher	2GHz or higher
RAM	2 GB (mandatory)	1 GB	1 GB	1 GB
HDD (Minimum)	20 GB	20 GB	20 GB	20 GB
Network	100 Mbps	100 Mbps	100 Mbps	2 * 100 Mbps NIC
Internet	512kbps	512kbps	512kbps	512kbps
Connectivity				
CD-ROM	CD / DVD ROM (Bootable)	CD / DVD ROM (Bootable)	CD / DVD ROM (Bootable)	CD / DVD ROM (Bootable)
Network Cards (NIC)	1 NIC	1 NIC	1 NIC	2 NIC
Monitor	15" Flat Screen / 17" CRT, 24Bit/32Bit color	15" Flat Screen / 17" CRT, 24Bit/32Bit color	15" Flat Screen / 17" CRT (screen resolution 1024 * 768), 24Bit/32Bit color	15" Flat Screen / 17" CRT, 24Bit/32Bit color

Cabling
Printer
Crossover Cables

Standard CAT5/CAT5e/CAT6 Cables to be used
Laser printer
To be provided by the college wherever required

Software Requirements

Software / Application	Server	Admin Node	Testing Node	Proxy Node
Operating System	Windows Server 2003 SP2 Standard Edition (100% patched)	Windows XP SP2 (100% Patched)	Windows XP SP2 (100% Patched)	Windows XP SP2 (100% Patched)
Antivirus	Trend Micro (from IT x.x Media)	Trend Micro (from IT x.x Media)	Trend Micro (from IT x.x Media)	Trend Micro (from IT x.x Media)
CC proxy	No	No	No	Yes
Windows Installer 3.1	Yes	Yes	Yes	Yes
Microsoft Net 2.0 Framework SP1	Yes	Yes	Yes	Yes
MDAC 2.8	Yes	Yes	Yes	Yes
MSXML 4.0 SP2	Yes	Yes	Yes	Yes
Adobe Acrobat Reader 9.0	Yes	Yes	Yes	Yes
Internet Explorer 7.0	Yes	Yes	Yes	Yes

Note: The Windows Operating System software for Server, Admin, Testing and proxy node need to be 32-bit only.

Internet connectivity

- Primary wired Internet Connection with one internet IP / Public IP for each proxy which will be configured on the outside (site facing interface).
- Outbound Internet access to ports (TCP 80, 443, 11001 and 11002). Bi-directional traffic on both firewall and router, allowed for the IP assigned in step 1.
- Backup Internet connection using a wireless / broadband internet provider, with demonstrated bandwidth capability to transmit 30 MB of data within 1 min; must be demonstrated per lab.

Network Configuration

- TCP/IP network
- 100 MBPS Switch
- Server, Admin and Testing Stations has to be on the same VLAN (with same subnet)
- The lab Network should be physically / logically isolated.

DVR Requirements

- Cameras should be placed so that all workstations and workstation numbers can be clearly seen.
- There needs to be audio recording capability and microphones in the test rooms.
- Need to ensure that the audio from these microphones can be heard on playback.

- For sites that have high ceilings (10 feet or higher), the cameras should be mounted to the walls at 10 feet or lower.
- A camera with microphone should be placed so that the Proctor Desks can be clearly seen and heard upon playback.
- A camera with microphone should be placed so that the Biometric Capture station can be clearly seen and heard upon playback.
- A camera with microphone should be placed so that the Server can be clearly seen and heard upon playback.
- Need to program the DVRs so that the lab number, current date and time is evident on playback.
- Signs will need to be placed in the camera's view indicating which lab is being recorded.

Technical staff to install, maintain and support the test centres

Trained workforce is required to install, maintain and support this network. The technical staff will undergo rigorous training.

These dedicated technical engineers will help in troubleshooting any technical issues arising at the test centre for a seamless test delivery. They would further be supported by a dedicated helpdesk network running 24x7. These technicians would also be required to pass a re-certification exam after every one year. This helpdesk network will have adequate number of level 1 and level 2 support engineers for resolving the technical issues.

Test Development

The mandate is to develop an aptitude test that can be applied universally to the wide array of engineering entrance examinations (like AIEEE etc). To do so while also introducing non-cognitive measures into the exam raises the bar still further. The selection methodology employed could very well become the new standard for all undergraduate level entrance examinations.

The test development process consists of several steps as outlined in the chart below and encompasses all aspects of continued exam maintenance. Though every step listed is not necessary, the activities included in the chart explain the types of work. The test development plan will produce a robust item bank with new items that are designed for the unique needs of H.E.T. **Attributes of Raw Intelligence, General Awareness, Aptitude and Comprehension & Communication have to be taken to prepare H.E.T.**

Test Design	Test Definition	Define the purpose, scope, target population, general topics, duration, number of forms, number of items and types of items.
	Job Analysis	Define the tasks, knowledge, and skill important for performing the specified role.
	Test Specifications	Review the importance and determine how many items should be written to each objective.
Item Development	Item Writing	Provide training on item writing to meet the test specifications and amounts listed in the blueprint.
	Technical Item Reviews	Review items for language and technical accuracy
Psychometrics & Test Construction	Item Analysis	Compute statistics that measure item performance.
	Item Selection	Determine which items will be used on final forms and which will be discarded or rewritten.
	Form Assembly	Distribute items across forms so that each form meets the specifications of the blueprint plan and remain equally difficult.
	Standard Setting	Establish the cut score.
In-service Analysis	Maintain Exams	Conduct ongoing analysis of item and test statistics. Revise exams with updates periodically.

While a significant amount of analysis and design work would need to be performed before one is in a position to fully articulate a plan for H.E.T.S, a brief high-level summary of some of the key activities might prove useful to determine the course of action.

Job Task Analysis

Everything will be derived from the job task analysis. It will therefore be critical that we first validate the assumption that there is a core set of attributes and success criteria that can be used as predictors of future performance.

Test Blueprint

The data collected through the job task analysis will serve as the foundation for the test blueprint, which is an inventory of all the test objectives that will be measured by the exam. Each of the agreed upon attributed and other success criteria are converted into test objectives which are assigned various weights based on their frequency, criticality and importance. For example, an aptitude or task

that happens frequently but is neither critical nor particularly important is given a lower weight than an objective that happens infrequently but is highly critical and/or important to the goal of being a successful engineer graduate. The weights, or multipliers, are used to determine how many items should be in the finished test for each of the objectives. An objective that has a weighting of two might be assigned one item, whereas an objective with a weighting of six might be assigned three items. The specific number of items assigned to each weight can be adjusted according to the test design.

Test Design

The number and complexity of the test objectives will help determine the types of test questions, or items that will be used in the exam, the number of items that will be presented in any one test form and the likely length of the exam. The industry standard for a recall item is one minute but items that require analytical thinking skills or higher-order cognitive abilities can require more time.

Pilot Testing

It will be important to validate any assumptions made regarding the test design through pilot testing or, at an absolute minimum, stakeholder reviews. The quality of the test questions, the amount of time required for the exam and many other factors can be verified with a properly constructed and administered pilot test. A critical aspect of the pilot test will be the cohorts selected to participate.

Registration Process

The prospective student should be provided effective and flexible options as it is a critical element in any examination programme. We propose to provide your candidates with multiple options for purchasing of bulletins (with vouchers) and a convenient registration and scheduling process.

Prospective students will be required to buy the application material that will include the official application form and a unique voucher code. Various payment options available for the candidates may include:

- **Payment by cash** – students can pay at various branches of the specified Nationalised Bank or at an Authorized distribution outlet.
- **Payment by demand draft (DD)** – students may send the DD along with a self-addressed envelope of a specific size to a designated postal address or to a regional office. Upon receipt of the request, Bulletin (including the application form and the voucher code) will be sent through courier/registered post.
- **Payment by credit card** – Candidates may visit the website, and would be redirected to an e-commerce site that will feature an option to make the payment using a credit card. Once they fill in the card details and submit the same, a prompt will appear stating that the payment has been authorized. The bulletin, including the voucher, would then be sent to their mailing address.



Call centre support will be provided for answering questions in support of the programme.