INDIAN SOCIETY FOR TECHNICAL EDUCATION

MAHARASHTRA STATE ENGINEERING DESIGN AWARD
(FOR ENGINEERING DEGREE STUDENTS STUDYING IN MAHARASHTRA STATE)

PROFORMA FOR NOMINATION

Year of Award : 2014

Name of the Nominee (s) with Branch and Semester/ Year of study (not more than TWO Students) :

Correspondence address with Email & Mobile No. :

Name of Guide (s) :

Department and Institution :

Title of the Project :

Brief resume of the Project (not more than 150 words) :

(The detailed project report may please be enclosed).

Place :

Date :

Signature :

Name & Address of Head of Institution :

(Office seal)

MAHARASHTRA STATE ENGINEERING DESIGN AWARD

Year of Award : 2014

RESUME OF THE PROJECT

(Please indicate in the following space the significance of the Project to industry/community, possible applications, applications already made and their impact, how the project work is different from similar work/studies already done by others, how the work can be further improved, possible limitations of the work, etc.)

Date :

Signature :
(Student or Guide)

Name of Student :
or Guide

MAHARASHTRA STATE ENGINEERING DESIGN AWARD

ANNOUNCEMENT

ABOUT THE AWARD

In order to promote and encourage design capabilities among the engineering student community in Maharashtra State, the ISTE has instituted an annual award known as **"Maharashtra State Engineering Design State Award".** These awards are presented every year during the Annual Students Convention of ISTE.

The Awards consists of :

i) A Cash Prize (I Prize Rs.3000/-, II Prize Rs.2000/-)
ii) A Medallion
iii) A Citation

For the competition, the term **"Engineering Design"** is used in a broad sense, not confined to any particular discipline or branch (like civil, mechanical, electrical, chemical, etc.) of engineering. Students are free to choose or identify on their own any design problem in any branch of Engineering. The problem chosen should be relevant to the Indian context and not trivial. The solution to the design problem can be hardware or software oriented. As examples, some design problems are indicated below:

These are only indicative and your design problem need not (confine to this list only)

- Conversion of a three-wheeler (auto rickshaw) as a small family car;
- Redesign of a three-wheeler (auto rickshaw) for more passenger comfort, including all weather comfort;
- Semi-automatic traffic signal for a busy intersection having mixed traffic;
- Methods to reduce traffic accidents;
- Slide Projector for use in rural areas with no electricity;
- Novel burglar alarm and safety device;
- Proper mass transportation system for a metropolitan town like Delhi, Bombay, Calcutta, Bangalore, etc.;
- A novel system for treating and recycling used water;
- A simple desalination system to get enough drinking water for a family;
- A mobile hospital/health care system to visit rural areas;
- Design of robots for specific functions;
- Low cost sanitary system for domestic or rural use;
- Low cost techniques in house construction;
- Design of fuel-efficient choolas for domestic use;
- Novel designs in solar energy use;
- Novel designs in measuring instruments;
- A machine to separate fertile seed from infertile seed;
- A two-stage air-water toy rocket.
- Design of a vehicle for a handicapped person.

ELIGIBILITY

Any student in any branch of engineering/technology, who is on the rolls of the institution at present (studying in Maharashtra State only) or who has completed the course during this year can complete for this award.

ONLY ENGINEERING FIRST DEGREE STUDENTS ARE ELIGIBLE TO COMPETE. Post-graduate course students are not eligible.

HOW TO PROCEED

* Identify a problem or task.
* List out various possible solutions.
* Determine solution constraints.
* Examine technical feasibility based on constraints and other factors and arrive at the best possible solution.
* Make detailed engineering analysis.
* Develop a model and test its performance.
* Write a good report and submit.

Note that a good final year project with some sophistication can be made use of for this competition.

Students can work on a design problem either individually or in a group of not more than TWO STUDENTS. They can also work independently or with the assistance of a faculty member or an adviser. Due weightages will be given to these factors at the time of selection.

In case two students work on a project and get the award, the cash prize will be shared between the two, certificates will be given to both, but the medallion will be given to the leader of the group only.

The design problem chosen should be such as to require about ten weeks of good work. Work should be submitted in the form of a Report, typed on A-4 size sheets, neatly bound. Only One copy of the Report is required. The Report should contain :

Problem identification
Need for a solution
Possible solutions

Constraints and restrictions on the solution (like materials, production processes, manpower, cost, pollution, etc.)

Best solution
Details and analysis

The points mentioned above need not necessarily be covered in the order written. Ability to identify a problem, constraints and restrictions under which solutions are to be obtained, creativity, novelty of the solution presented, etc., are some of the points that will be taken into account during evaluation.

Note: For your guidance, we are also enclosing two examples indicating how to proceed with a design problem. This is meant as a guideline only.

SELECTION PROCEDURE

Selection for the awards will be based on a two-stage process. In the first stage, a few best reports will be identified from among the reports submitted. The students who have submitted these reports will be invited to the Annual Students Convention of the ISTE, where they will be asked to present the reports. They can bring and demonstrate any device or equipment fabricated by them based on the design. The two winners will be identified immediately by a committee of experts and the awards presented to them during the Valedictory Function. The first and second prizes will consist of cash awards (Rs.3000/-, Rs.2000/-), Citations and Medallions. All those whose entries are accepted will receive a certificate of participation.

T.A. FOR STUDENTS/FACULTY MEMBERS

Students invited to present the design at the ISTE Annual Student Convention will be paid SECOND CLASS to-and-fro train fare. Arrangements for their boarding & lodging will also be made.

LAST DATE FOR SUBMISSION

The last date for receiving the nominations with the reports at the office of the Executive Secretary : **August 31, 2014**.

Reports should be sent to :

The Executive Secretary
Indian Society for Technical Education
Shaheed Jeet Singh Marg, New Delhi - 110 016

(THE NAME OF THE AWARD MAY BE SUPERSCRIBED ON THE ENVELOPE)

EXAMPLE 1
(Indicating procedure for design)

A MACHINE TO SEPARATE FERTILE SEED FROM INFERTILE SEED

I. IDENTIFICATION OF THE TASK

To design a machine which would separate fertile seed from in-fertile seed.

II. POSSIBLE SOLUTIONS

The following separation processes are common in Chemical Engineering practice :

i) Screening
ii) Electrostatic separation
iii) Cyclone separation
iv) Gravity separation
v) Magnetic separation
vi) Separation by aspirators.

III. SOLUTION CONSTRAINTS

i) It should be compact, and mobile in order to be able to operate at different locations.
ii) One person should be able to operate it conveniently.
iii) The device should be easily maintainable.
iv) The deck angle is limited to the range between 5^{o} and 15^{o}.
v) The capacity of the motor should be about 0.75 kw.
vi) The air flow rate should be about 0.5 $m^3/_S$.

IV. EXAMINATION OF TECHNICAL FEASIBILITY

The specific feature of the problem under consideration, which dictates the selection of a method from among the possibilities listed above, is that an infertile seed is lighter than a fertile one. The problem therefore boils down to the design of a machine which would detect this weight difference.

The following considerations serve to eliminate a number of alternatives :

i) Since a fertile seed is the same size as an infertile one, screening will be unsuitable.
ii) The dielectric properties of fertile and infertile seeds are not different, and hence electrostatic separation would be inapplicable.
iii) Cyclone separators are effective for fine grains, but not for coarse ones.
iv) Aspirators are suitable only with a mixture of very fine and coarse grains.
v) The seeds in question do not possess any magnetic properties, and hence it is not possible to employ magnetic separation.

The choice therefore narrows down to gravity separation.

V. SOME FEATURES OF THE FINAL SOLUTION (INCORPORATED IN A COMMERCIAL PRODUCT)

The basic mechanism is a vibrating conveyor (for example, employing a four-bar linkage). A flat conveying surface, termed the deck, rests on inclined supports. If these supports are oscillated through a small angle, the deck will rise and fall at the same time that it moves back and forth. Thus, a granular particle resting on the deck will be bounced along the deck, and be conveyed laterally as the deck oscillates. If the deck is porous and air is blown through it, then the air velocity can be adjusted to hold lighter particles in suspension, so that the heavy particles would be conveyed faster than light particles. The problem now is how to take advantage of this difference in particle speed to make the separation. The solution is to make the deck a triangular shape from the feed corner, and then tip and deck about an axis parallel to the direction of conveyance.

VI. ENGINEERING ANALYSIS
QUESTIONS FOR DETAILED ENGINEERING ANALYSIS

i) How much weight of a given material could be separated per hour ?

ii) What should be the optimum amplitude and speed of vibration ?
iii) How big should the deck be, and what kind of porous material should it be made of?
iv) What should be the volumetric flow of air ?
v) Should the fan supplying the air and the oscillating mechanism be driven from the same motor ?
vi) What should be the capacities of the fan and of the motor ?
vii) Of what materials should the different parts be made, and using what processes ?

VII. ANSWERS TO BE OBTAINED FROM EXPERIMENTS

The effect of the following parameters on the efficiency of separation :

i) feed rate of seeds.
ii) air flow rate.
iii) inclination of the deck.
iv) frequency of vibrations of the deck.

It is also necessary to decide on the range over which each of the above variables is varied, and the number of experiments to be conducted to cover all possible combinations of the variables. Thus, if the number of variables is x, and each variable takes y different values, then the total number of experiments to be conducted will be y^x. To facilitate easy analysis, the behaviour of separation efficiency with respect to a known change in one of the variables, keeping all the other variables constant, is plotted. Thus, a family of curves will be obtained, one curve for each combination of the remaining variables. Furthermore, each variable will in turn have a family of curves. This makes the total number of curves to be analyzed equal to $y^{(x-1)}$, for each family of curves. Since there will be x families of curves, the total number of curves amounts to $X.Y^{(X-1)}$. In the present case, since the number of variables has been identified to be 4, the total number of experiments to be conducted will be 256, assuming that 4 points are sufficient to obtain an accurate correlation.

SOURCES

1. R. R. Silaymaker : Mechanical Design and Analysis, Johy Wiley and sons, 1966.
2. Kallianpurkar, b. : Investigations on a Grain Separator, M.Tech. Thesis, IIT Madras, 1978.