## B 2341

B.E./B.Tech. DEGREE EXAMINATION, MAY/JUNE 2007.

Fifth Semester

Mechanical Engineering

ME 335 — COMPUTER AIDED DESIGN

(Common to Mechatronics Engineering)

Time : Three hours                                   Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. What are the benefits of CAD in design evaluation?

2. Write down the advantages which can be gained by the adoption of CAM.

3. How is STEP different from IGES?

4. What is antialiasing?

5. How does an optical mouse function?

6. How do you model an object, which is irregular, like the blade of a propeller type windmill?

7. Mention the range of facilities desired in any general purpose modeling system.

8. A beam is fixed rigidly to a wall at both its ends. It is discretised into three 2-noded elements. Each node has three degrees of freedom. What will be the size of the reduced global stiffness matrix?

9. Sketch a brick element of quadratic type.

10. State the significance of the size of the element on the accuracy of solution.

PART B — (5 × 16 = 80 marks)

11. (a) Explain the various steps for the design process.

Or

(b) Explain 'Morphological approach'. Enumerate the phases of morphology of design and explain them.

12. (a) Derive the relationship for rasterisation of vectors using the principle of Bresenham's algorithm for the linear interpolation for graphics terminals.

15.

Or

(b) (i) What is the need for concatenation of transformations? Explain what care should be taken in such cases. (6)

(ii) Explain the concept of obtaining a reflection about an arbitrary line starting from the plain reflection about an axis. (10)

13. (a) (i) Explain the characteristics of Bezier curves. (6)

(ii) Differentiate between simple, hierarchical and relational data structures. (10)

Or

(b) (i) Explain in detail the limitations found in the general wire frame modeling systems. (10)

(ii) List the different types of surfaces and explain them briefly. (6)

14. (a) (i) Explain B-rep modeling. (10)

(ii) Specify the drafting features that one should consider for a modeling system. (6)

Or

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(b) A vertical plate of thickness 25 mm is tapered with widths of 150 mm and 75 mm at top and bottom ends respectively. The plate is fixed at the top end and subjected to a point load of 500 N at its midpoint in addition to its self-weight. The length of the plate is 500 mm. Take Young's modulus as 200 GPa and density as 7200 kg/m$^3$.

    (i) Model the plate with two spar elements

    (ii) Determine the nodal displacements

    (iii) Evaluate the stresses in each element

    (iv) Determine the reaction forces at the support.

15. (a) Solve the following problem and determine the nodal displacements

$$\begin{bmatrix} 4 & 2 & 1 & 0 \\ 2 & 10 & 2 & 0 \\ 1 & 2 & 4 & 4 \\ 0 & 0 & 4 & 8 \end{bmatrix} \begin{bmatrix} u_1 \\ u_2 \\ u_3 \\ u_4 \end{bmatrix} = \begin{bmatrix} 10 \\ 20 \\ 30 \\ 40 \end{bmatrix}.$$

Or

(b) Describe the procedure of formulating plane stress problems by finite element method.

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