

**Eighth Semester B. E. (Mech) / Sixth  
Semester B. E. (Mech) (P. T.) Examination**

**COMPUTER AIDED DESIGN**

Time : Three Hours ]

[ Max. Marks : 80

- N. B. :
- (1) Separate answer book must be used for each section.
  - (2) All questions carry marks as indicated.
  - (3) Answer **Three** questions from Section A and **Three** questions from Section B.
  - (4) Assume suitable data wherever necessary.
  - (5) Illustrate your answers wherever necessary with the help of neat sketches.
  - (6) Uses of non programmable calculator is permitted.

**SECTION A**

1. (a) Compare conventional design cycle and CAD. Why CAD is beneficial ? Discuss in detail. 7
- (b) Explain working of raster refresh graphics display. Why is frame buffer used ? 6
2. (a) Derive 2D transformation matrix for rotation through  $\theta$  in ccw. 4
- (b) Compare DDA and Bresenham's line generation algorithms. 3
- (c) Using Bresenham's line algorithm, find the pixel position along the line paths between end points (10, 5) and (15, 9). 6

3. (a) A triangle formed by A (5, 1), B (6, 3) and C (7, 1) is to be reflected about a line  $y=3$ . Find transformation matrix. Find transformed locations of A, B and C.

Plot the line, the original triangle and the transformed triangle on a graph paper. 10

- (b) Write the transformation matrices for each of the following :—

(i) Y-shear

(ii) X-shear

(iii) Reflection about X

(iv) Reflection about Y 4

4. (a) What are analytical and synthetic curves ? Explain with suitable example. 4

(b) What are the features of Bezier curve ? 3

(c) Draw Bezier curve with following control points (1, 2) (3, 4) (6, -6) and (10, 8). Take a step size of 0.2 for  $x(t)$  and  $y(t)$ . 6

5. (a) Differentiate between wireframe and surface modeling. 6

(b) Explain solid modeling techniques :—

(i) CSG technique and.

(ii) Boundry representation technique (B-rep) 7

## SECTION B

6. (a) Plot and explain the quadratic shape functions for bar element. 7

(b) Discuss properties of stiffness matrix. 4

(c) What do you understand by isoparametric formulation? 2

7. Consider the structure shown in fig. Q.7

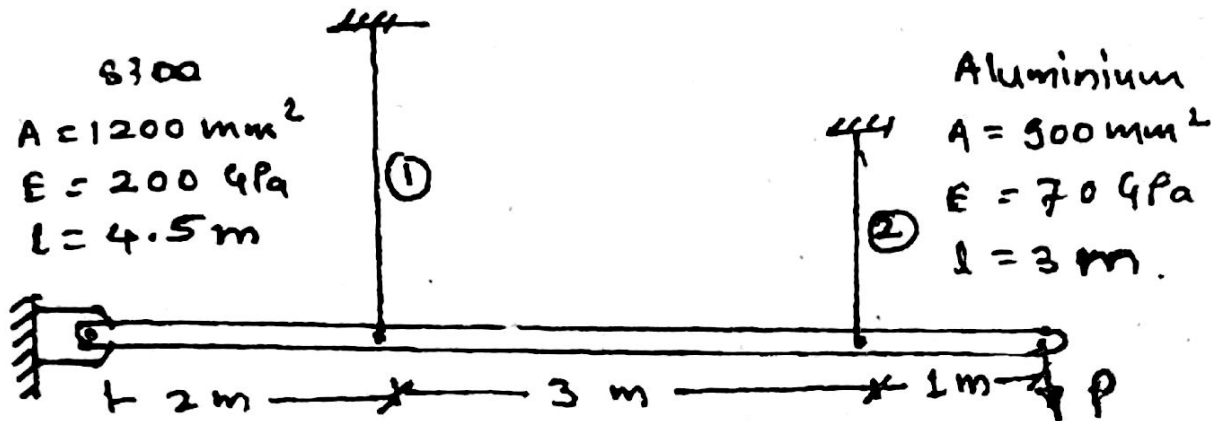


fig. Q. 7

A rigid bar of negligible mass, pinned at one end is supported by steel rod and aluminium rod. A load  $P = 30 \text{ kN}$  is applied as shown. Model the structure using two finite elements. What are the boundary conditions? Find Global Stiffness Matrix, solve for displacements and hence find elemental stresses. 14

8. The members of the truss shown in fig. Q. 8

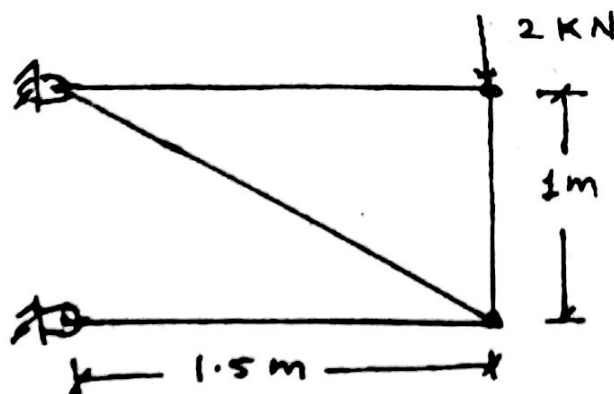
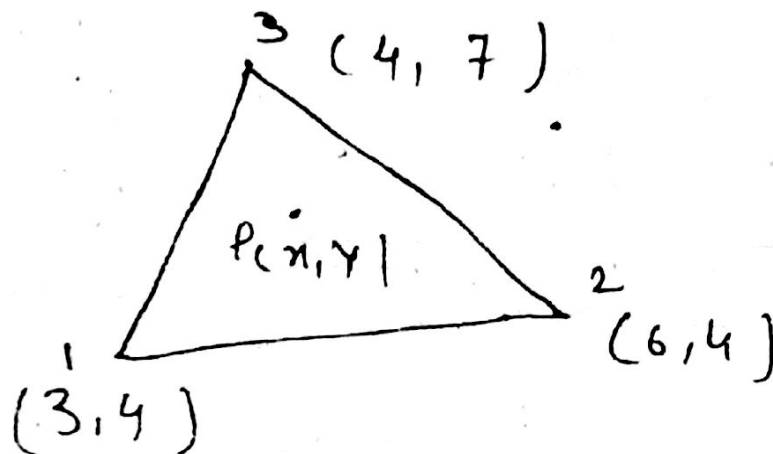


Fig. Q. 8

have c/s area of  $15 \text{ cm}^2$  and are made of aluminium alloy with  $E = 70 \text{ Gpa}$ . Determine deflection of each joint. 13

9. (a) Derive the coordinates at point p. if the shape functions are  $N_1 = 0.25$ ,  $N_2 = 0.3$  and  $N_3 = 0.45$



Find displacement (u, v) at point P if

$$q^T = [0.1 \ 0.2 \ 0.15 \ 0.1 \ 0.1 \ 0.2] \quad 5$$

- (b) Write an algorithm for Golden Search Method. 8

10. Write short notes on (any three) :—

- Simplex method
- Bisection method
- Penalty function method
- Comparison of analytical, FEM and experimental methods. 13