Faculty of Engineering & Technology

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

COMPUTER AIDED DESIGN

Sections—A & B

Time—Three Hours] [Maximum Marks—80

INSTRUCTIONS TO CANDIDATES

(1) All questions carry marks as indicated.

(2) Answer **THREE** questions from Section A and **THREE** questions from Section B.

(3) Due credit will be given to neatness and adequate dimensions.

(4) Assume suitable data wherever necessary.

(5) Illustrate your answers wherever necessary with the help of neat sketches.

(6) Use of non-programmable calculator is permitted.

SECTION—A

1. (a) Explain software modules with respect to any Commercial package. 6

   (b) Differentiate between Raster scan and Random scan display system. 5

   (c) Explain Frame buffer. 2

2. (a) Write an algorithm to generate circle using Bresenham's principle. Explain with suitable example and show it on graph paper. 7

(b) A square having end points A(1, 1), B(6, 1), C(6, 6) and D(1, 6) is rotated by 50° in clockwise direction keeping point (6, 1) fixed. Write total transformation matrix. 6

3. (a) A sphere having centre (10, 10, 10) and radius 8 units is translated by 3 units in X direction and 5 units in Z direction. Then it is rotated by 45° in anticlockwise direction about Y axis. Find new centre of sphere. 9

(b) Explain 2D shear transformation. 4

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

(b) What are features of Bezier curve ? 3

(c) A triangle having vertices (3, 5), (3, 7) and (4, 6) is reflected about a line having equation $Y = 0.5X + 3$. Find new position of triangle. 7

5. (a) Explain solid modeling techniques. 6

(b) Differentiate between Constructive solid Geometry and Boundary representation technique. 7

SECTION—B

6. (a) Explain the principle of Minimum potential energy. 3

(b) What do you understand by pre-processing and post-processing in Finite element analysis. 5

(c) A one dimensional linear element is subjected to uniform body force 'f' per unit volume. Derive an expression for nodal body force vector for the element. 5

7. For axially loaded member shown in Fig. 7. Determine (1) Nodal displacement, (2) Stress in each element and (3) Reaction at fixed support.

Given : E = 200 GPa, P = 10 kN

Plate thickness = 10 mm

[Neglecting self weight] 13

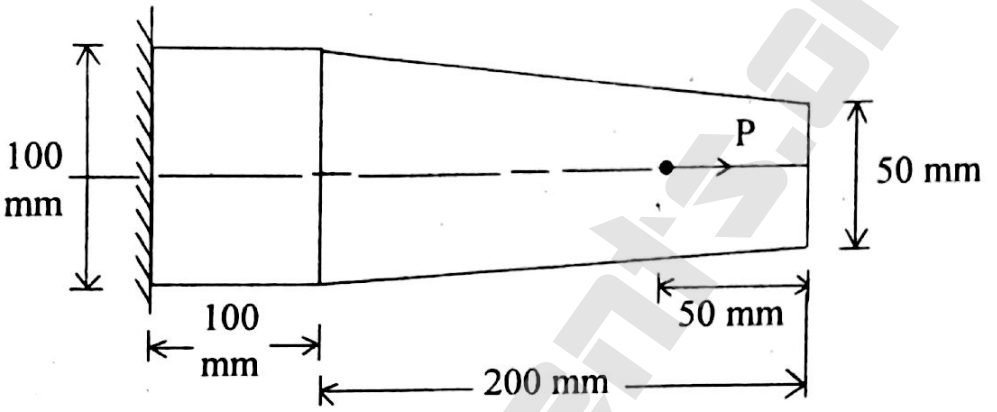


Fig. 7

8. A truss shown in Fig. 8 with cross-section area of all elements equal to 300 mm^2 and Youngs modulus $E = 2 \times 10^5$ MPa. Determine :

(1) Displacement at nodal point

(2) Stresses in each element

(3) Reaction at supports. 13

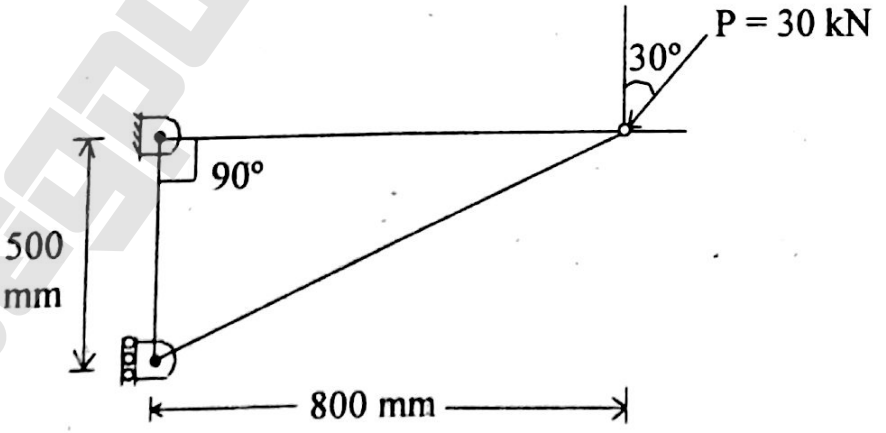


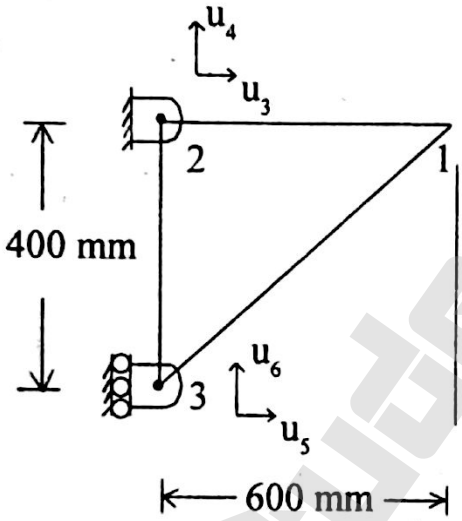
Fig. 8

9. (a) What is plane stress and plain strain condition ? State examples along with the importance of these conditions with respect to FEM. 5

(b) For the plain strain element shown in Fig. 9(b). The nodal displacements, properties of element and geometrical parameters are shown in Fig. 9(b). Use unit thickness of Plate. Determine :

(i) Strain displacement matrix

(ii) Stresses induced in the element. 9



u_1 = 0.005 mm E = 200 GPa

u_2 = 0.002 mm γ = 0.3

u_3 = 0.00 mm t = 1 mm

u_4 = 0.00 mm

u_5 = 0.00 mm

u_6 = 0.004 mm

Fig. 9(b)

10. (a) Explain Golden Search method for single variable optimization problem. 6

(b) Explain Simplex search method for multivariable optimization 7