Faculty of Engineering & Technology

Eighth Semester B.E. (Mech.)/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) Assume suitable data wherever necessary.

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

(5) Use of Design data book and Calculator (non-programmable) is permitted.

SECTION—A

1. (a) Explain graphics, application and programming software module with reference to any commercial available CAD software.   8

   (b) What is Frame Buffer ? Explain.   5

2. (a) Write Bresenham's Algorithm for a straight line and draw a line from (10, 10) to (15, 15). Plot the points on graph paper. 9

(b) Explain the concept of homogeneous coordinates in graphic transformation. 4

3. (a) Fig. 1 shows a circle with radius r = 50 mm. Centre 'A' [10, 10] is to be converted into an ellipse with major axis a = 90 mm and minor axis b = 60 mm. Find the total transformation matrix. 9
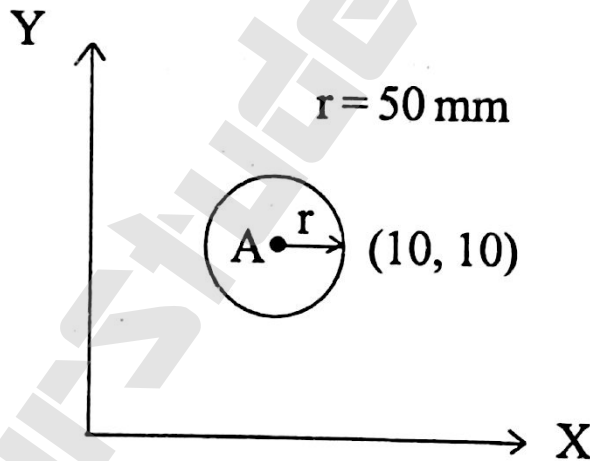

Fig. 1, Q. 3(a)

(b) What do you understand by Aspect ratio ? Explain how it used convert ellipse into circle. 4

4. (a) A triangle having vertices (2, 3), (6, 3) and (4, 8) is reflected about the line having equation

ZAY—2754   2   (Contd.)

$y = 3x + 4$. Find the final position of the triangle using 2-D transformation. 8

(b) What is Bezier curve ? How it is defined ? Where it is used ? 6

5. (a) Explain the concept of following modelling technique in brief :

    (i) Geometric Modelling

    (ii) Solid Modelling

    (iii) Wire Frame Modelling. 9

(b) Explain in brief shear transformation. 4

SECTION—B

6. (a) What are the various steps involved in FEM ?

    7

(b) Explain in brief the types of element used in FEM alongwith their characteristics. 6

7. Figure 2 shows a thin plate having uniform thickness $t = 25$ mm. Modulus of elasticity $E = 2 \times 10^5$ N/mm². In addition to self weight it is subjected to two point loads as shown. The density $\rho = 7.86 \times 10^{-6}$ gm/mm³.

Model the plate with two one-dimensional elements and determine Stresses in each member.   13
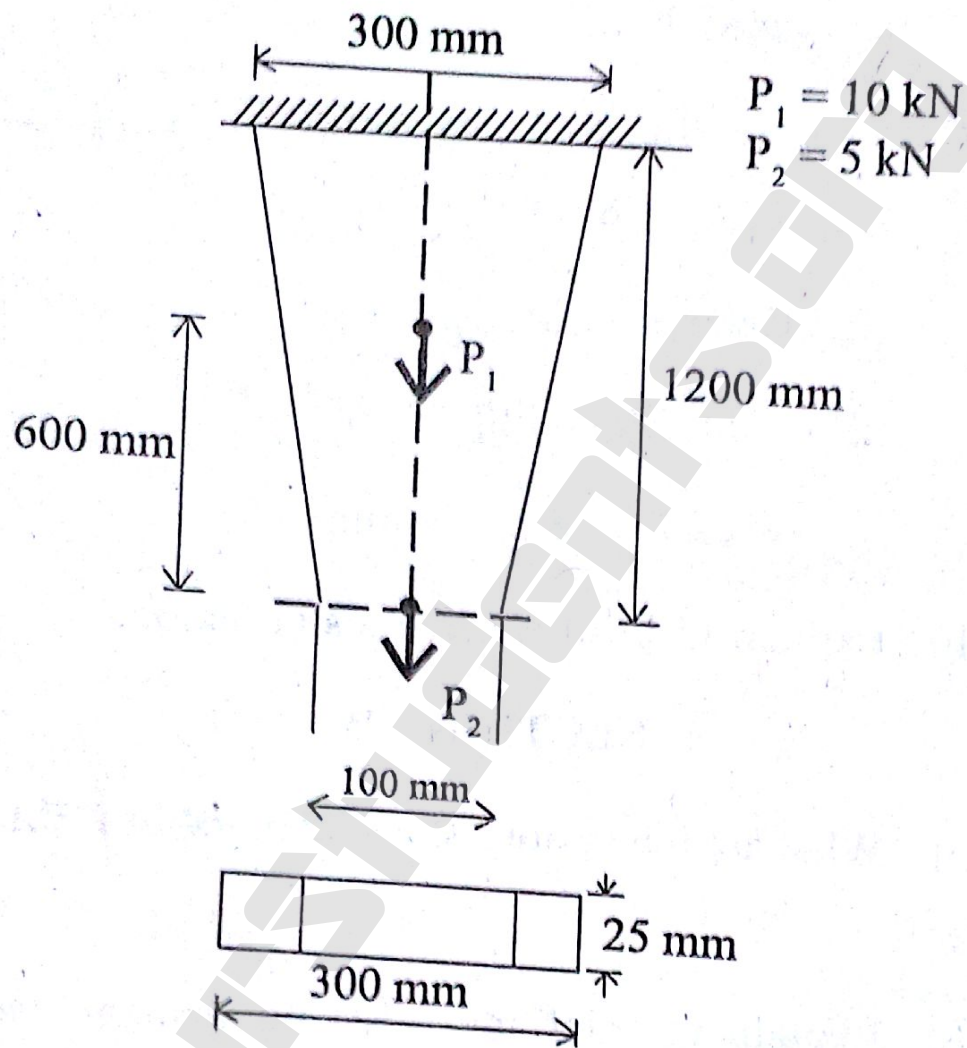

300 mm

$P_1 = 10$ kN
$P_2 = 5$ kN

P_1

600 mm

1200 mm

P_2

100 mm

25 mm

300 mm

Fig. 2, Q. 7

8. For a pin joined truss shown in Fig. 3, treating each member as 1-D linear element, determine :

   (i)   Stiffness matrix of each element

   (ii) Assembled global stiffness matrix

(iii) Displacement at nodes

(iv) Stresses in each member.   13

7 kN

10 kN

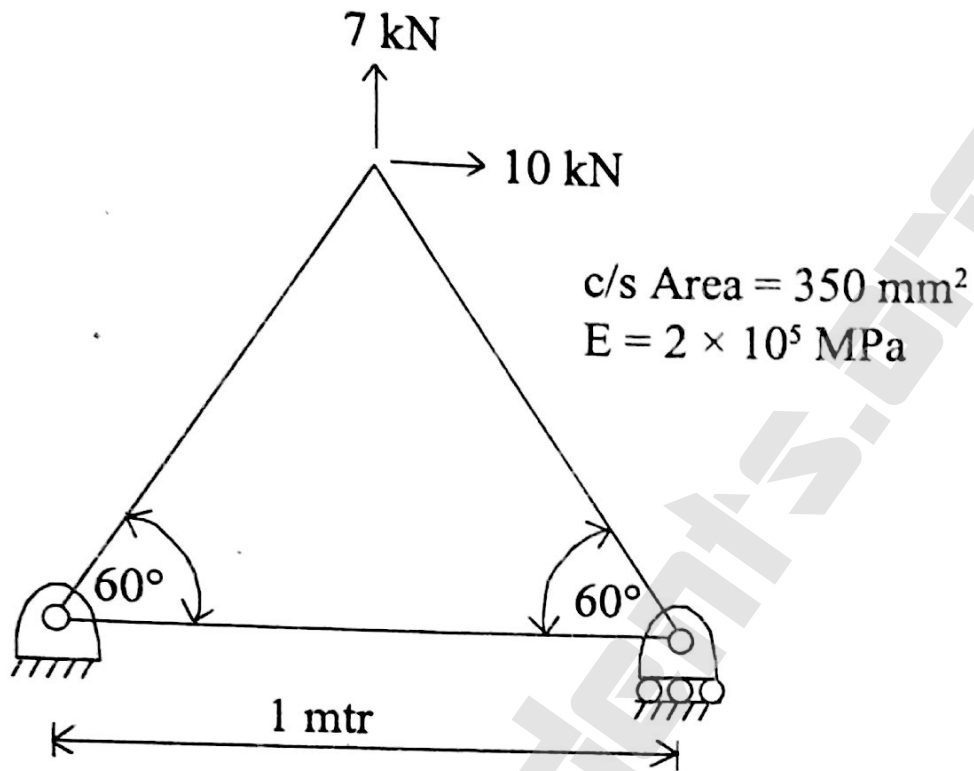c/s Area = 350 mm²
E = 2 × 10⁵ MPa

60°   60°

1 mtr

Fig. 3, Q. 8

9. Fig. 4 shows a two dimensional plate of thickness
    20 mm. If load P = 10 kN is applied as shown in fig.
    determine the nodal displacement.   13

250 mm

A   B

E = 2 × 10⁵ MPa
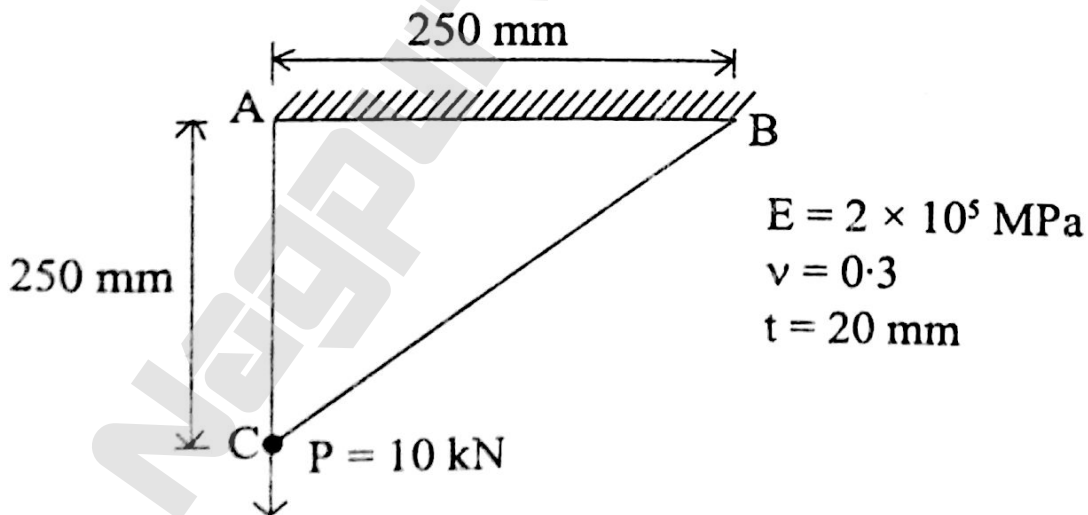v = 0·3
t = 20 mm

250 mm

C   P = 10 kN

Fig. 4, Q. 9

10. (a) Explain Simplex Search Method for multivariable optimization. Also write the algorithm for the same. 7

(b) Explain with suitable example Bisection Method for single variable optimization. 7