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

(4) Assume suitable data wherever necessary.

(5) Use of non programmable calculator is permitted.

SECTION—A

1. (a) Explain the software system in CAD.   7

     (b) Explain the working of raster scan graphic terminal in detail. What is the role of Frame Buffers in it ?

            6

2. (a) Consider two raster systems with resolutions of 800×600 and 1280 by 1024. How many pixels could be accessed per second in each of these systems by display controller that has the refresh rate of 60 hz ? What is the access time per pixel in each case ? Also find time to scan a line. 5

(b) Find the pixel positions that would be grown to plot a line $y = 3x + 5$ between $(0, 5)$ and $(3, 14)$. Plot the pixel on graph paper.   8

3. (a) A triangle shown in fig. Q. 3a is to be reflected about the line $y = -x + 10$. Find the transformation matrix and the new vertices of triangle.   8
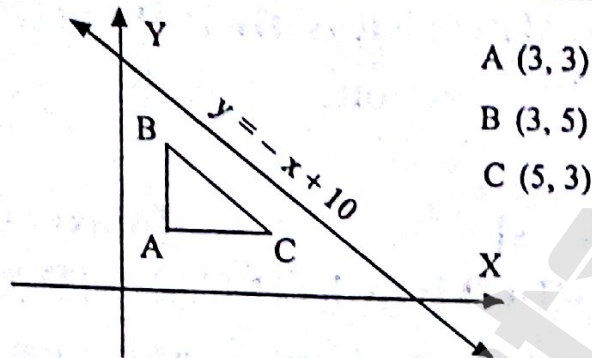

A (3, 3)
B (3, 5)
C (5, 3)

Fig. Q. 3a

(b) A circle of radius 5 cm with centre at $A(5, 8)$ is to be converted into ellipse with major axis $r_1 = 8$ cm and minor axis $r_2 = 5$ cm. Find the transformation matrix.   6

4. (a) What are Homogeneous Co-ordinates ? Justify their need.   4

(b) A cone with its base in X, Y plane and centre of base circle at $(0, 0)$ has radius of 5 and axis along z axis of height 10 is rotated about a line A passing through $L(0, 0, 0)$, $A (20, 10, 10)$ by $45°$ clockwise. What are the co-ordinates of vertex of cone before and after transformation ? Explain step by step concatenation of all transformation matrixes.   9

5. (a) What are Analytical and Synthetic Curves ? Explain.   4

(b) What are features of Bezier Curve ?   4

(c) Compare different Solid Modelling Techniques.   5

SECTION—B

6. (a) What is the significance of shape functions ? Write and plot shape functions for quadratic shape function.

   5

   (b) Derive the strain-displacement matrix B for linear bar element having the shape functions :

   $$N_1 = \frac{1-r_1}{2} \text{ and } N_2 = \frac{1+r_1}{2}$$

   Also explain the meaning of isoparametric elements.

   8

7. For the component shown in fig. (7), treating as one dimensional element, determine nodal displacement, stresses in all element and reactions :   13
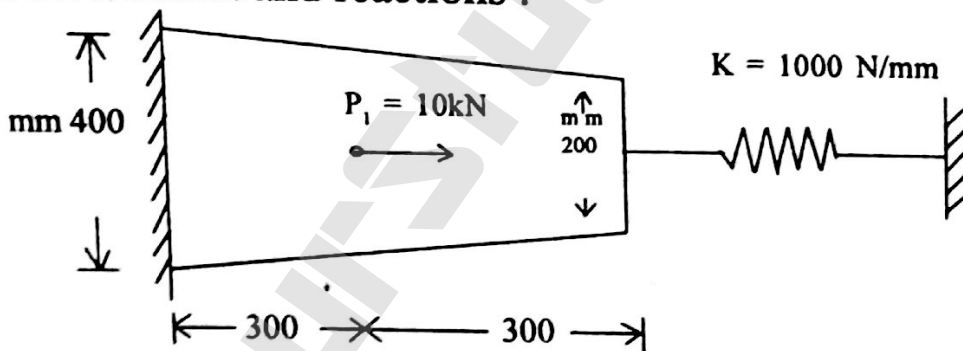
Est. = 200 Gpa

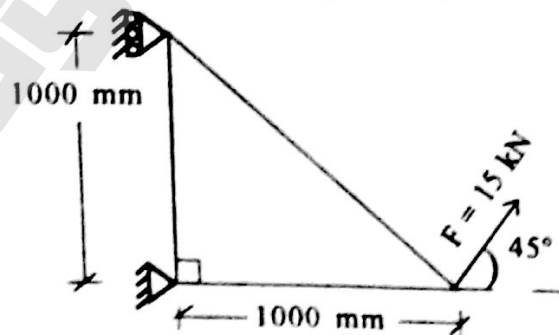8. For the truss shown in figure Q. 8 :

Fig. Q. 8

Contd.

Find deflection of each node, stress in each of the elements and reactions at support. Area of c/s for each bar is 200 mm^2. Take E = 200 Gpa.   13

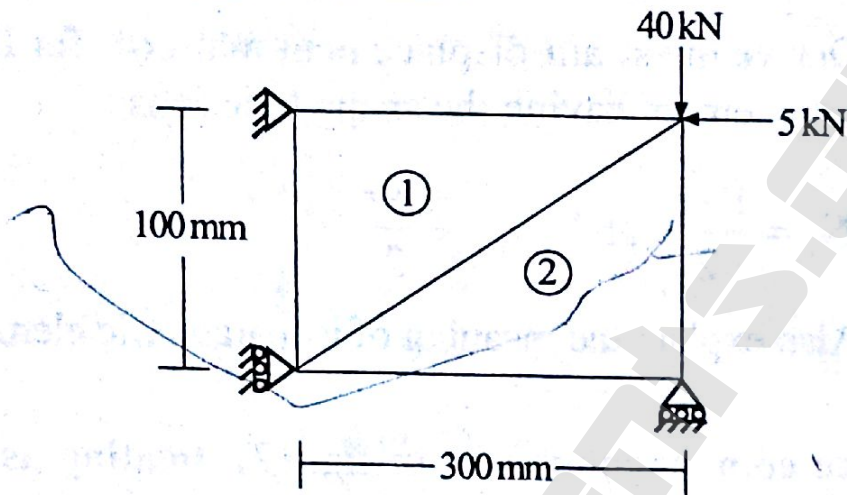9. For the two dimensional element shown in fig.Q.9, assemble Global Stiffness Matrix :

Fig. Q. 9

Take E = 200 Gpa, thickness of plate = 20 mm and Poisson's ratio $v = 0.3$.   13

10. Write short notes on (any **THREE**) :
    (a) Bisection Method
    (b) Simplex Method
    (c) Advantages of CAD
    (d) Properties of Stiffness Matrix.   14