Eighth Semester B. E. Mech And 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 answer wherever necessary with the help of neat sketches.
(6) Use of non programable calculator is permitted.

SECTION A

1. (a) Explain in brief the various CAD module. 7

   (b) Explain in brief basic functional capabilities required in any CAD package like geometry generator, size generator and geometry modifier. 6

2. (a) Explain the Bresenham's circle drawing algorithm in Ist quadrant. Also show the pixel movement for circle with radius equal to 3 unit for Ist quadrant on graph paper. 8

   (b) Explain in brief various types of shear transformation with example. 5

3. (a) Reflect the triangle ΔABC about the line $3x-4y+8=0$ The position vector of the coordinate ABC is given as A [4, 1]; B[5, 2]; C [4, 3]. 8

(b) A circle with radius r = 8cm, centre [11, 9] is to be converted into an ellipse with major axis a = 11 cm and minor axis b=9 cm. Find the total transformation matrix. 5

4. (a) Given a bezier curve with 4 control point B_0 [1, 0], B_1[3, 3]; B_2[6, 3], B_3 [8, 1] determine any five points lying on the curve. Also draw the rough sketch of curve. 10

(b) Give a 3 x 3 homogeneous coordimate transformation matrix for following translation.

(i) Translate the image up 2 units.

(ii) Move the image down 2/3 units and left 4 units. 4

5. (a) A homogenous coordinate [3, 2, 1, 1] is translated in the x, y, z directions by –2, –2, –2 respectively; followed sucessively by a 45^0 rotation about y axis and 60^0 rotation about x–axis. Find the final position of homegeneous coordinate. 9

(b) Differentiate between surface and solid modelling. 4

SECTION B

6. (a) Explain in brief the various types a of elements with their salient features. 4

(b) Explain in brief the basic steps of FEM. 5

(c) What is shape function ? What are its prerequisites ? 4

7. For the component shown in fig [7], determine

(i) Nodal displacement [Neglect self weight]

(ii) Stresses in element

(iii) Reaction

$E = 2 \times 10^5 MPa$

$P_1 = 10kN$

$P_2 = 8\ kN$

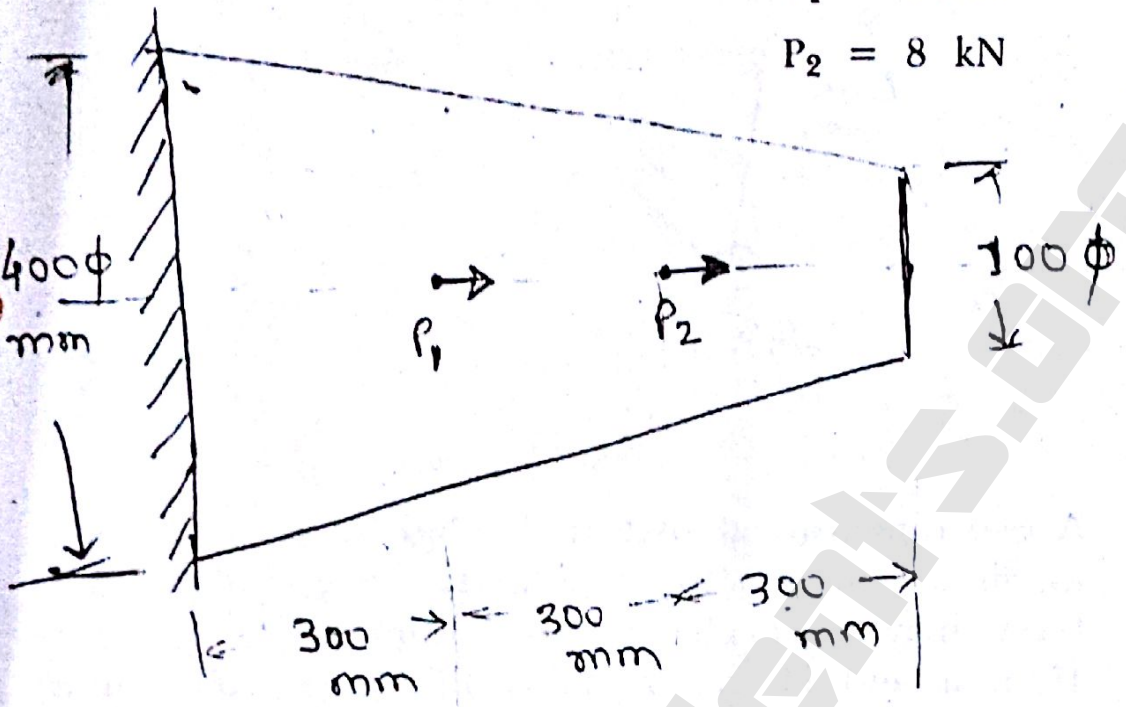

Fig. 7 13

8. A truss shown in fig [8] with cross section area of all elements equal to 250 mm^2 and Youngs modulus $E = 2 \times 10^5$ MPa

   (i) Determine the element stiffness matrix for each element.

   (ii) Assemble the structural [global] stiffness matrix for entire truss.

   (iii) Using elimination method find nodal displacement.

   (iv) Find the stresses in all element.

   (v) Calculate the reaction force.

Fig. on Page No 4

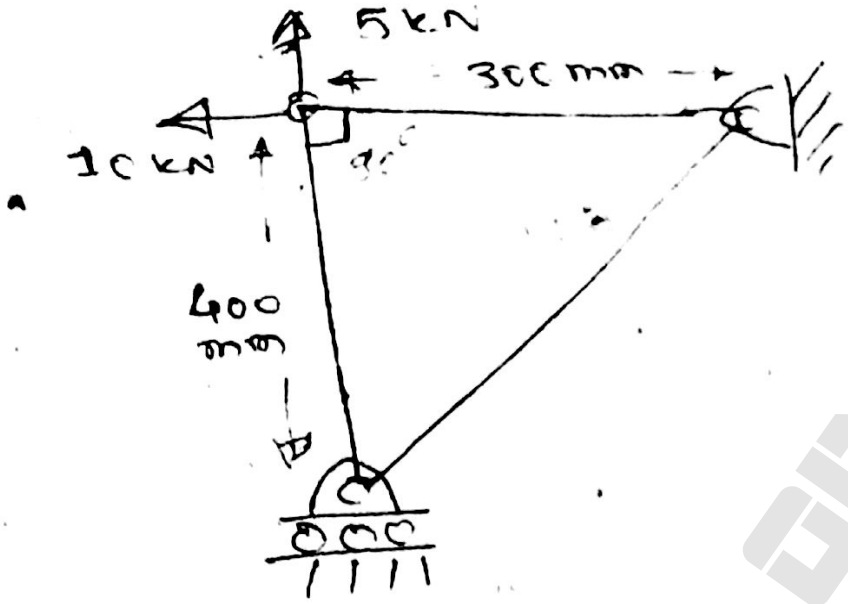

Fig [8] 13

9. A two dimensional plate is loaded by a 10 kN force as shown in fig [9]. The body force and fraction force may be neglected. The thickness of plate is 15 mm and elastic modulus $E = 2 \times 10^5$ N/mm^2 and Poisson ratio $\mu = 0.3$
Determine are nodal displacements using plane stress conditio

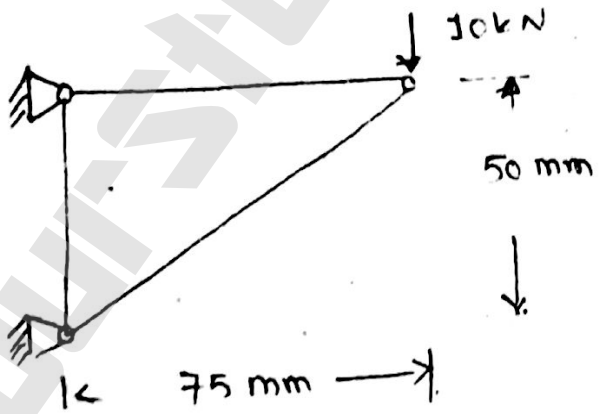

Fig. 9 13

10. Write short notes (any **three**) :—
(i) Bi section Method.
(ii) Simplex Search Method.
(iii) Penalty Function Method.
(iv) Golden Search Method. 14