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

COMPUTER AIDED DESIGN

Time : Three Hours] [Max. Marks : 80

N. B. : (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) Retain the construction lines.
(5) Illustrate your answers wherever necessary with the help of neat sketches.

SECTION A

1. (a) List the benefits of CAD/CAM Techniques. 5

   (b) What do you mean by Geometric modeling ? 4

   (c) What are the types of graphics input devices ? 2

   (d) List the software used for Geometric modeling and for Analysis. 2

2. (a) Write an algorithm to draw an arc in clockwise sense. Input is centre, radius, start angle zero and end angle 90^0. 5

   (b) What do you mean by concatenation ? 3

   (c) Write DDA algorithm for line. 5

3. (a) Obtain the reflection of a Fig. defined by the coordinates A (– 1, 0), B (0, –1), C (1, 0) and D(0, 2) about the following axis

     (i) $y = 2$, (ii) $x = 2$, (iii) $y = x + 2$. 10

(b) Write a short note on Shear Transformation.

3

4. (a) A triangle having coordinates A (3, 3), B (6, 3) and C (4, 7) is translated by 2 units in X- direction and 3 units in Y - direction. then it is scaled by factor 1.5 units w. r. to point (4, 4). Find the final position of triangle.

9

(b) What is a Bezier Curve ? How is it defined ? Where is it used ?

4

5. (a) How 3D Solid is represented in CSG method ? Explain with suitable example. 4

(b) A cube of length 10 units is having one of its Corner at the origin (0, 0, 0) and three edges along the three principal axes. If the cube is to be rotated about Z - axis" by an angle 45^0 in counter clockwise direction, calculate the new position of cube.

10

SECTION B

6. (a) For the Fig. shown. below find displacement of each node and axial stress.
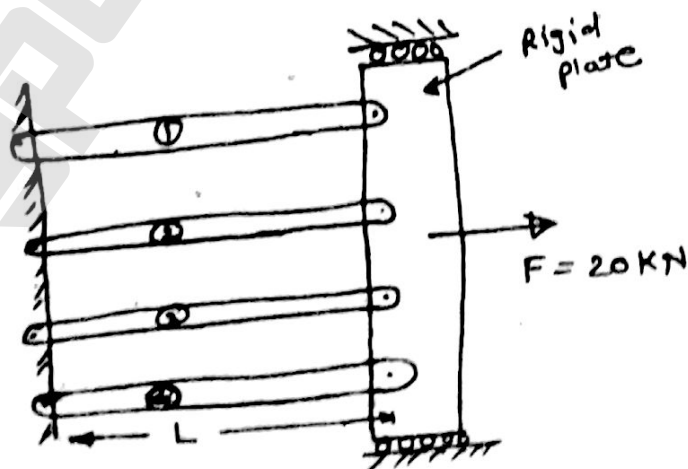Assume E = 210 GPa.

Fig. 6 (a)

Given $L = 2$ m, $A_1 = A_4 = 2 \times 10^{-4}$ m^2 and
$A_2 = A_3 = 4 \times 10^{-4}$ m^2 10

(b) What are the different types of elements used in FEM ? Explain.   3

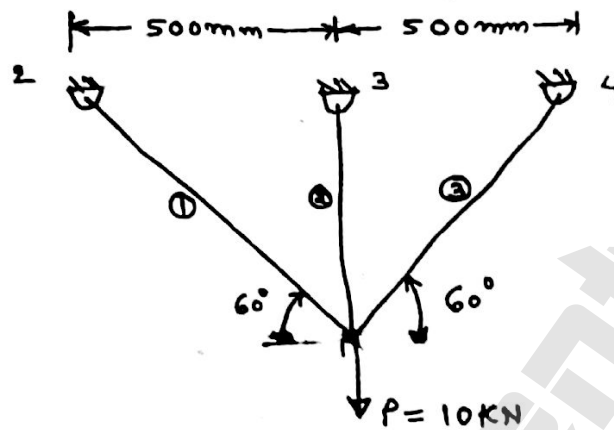7. (a) For the plane truss shown in Fig. 7. Determine displacement at the nodes, stress in members.

Fig. 7

Given cross-sectional area of members are $A_1 = A_3 = 25$ mm^2 and $A_2 = 50$ mm^2. Assume $E = 70$ GPa.   13

8. Determine the maximum shear stress in the solid steel rectangle C/S shaft shown in Fig. 8.

Given, $G_{st} = 70$ GPa

Area (A) $= b \times h$

Polar moment of Inertia

$$(J) = \frac{b\,h\,(b^2 + h^2)}{12}$$

Consider one - D - Element for FEA

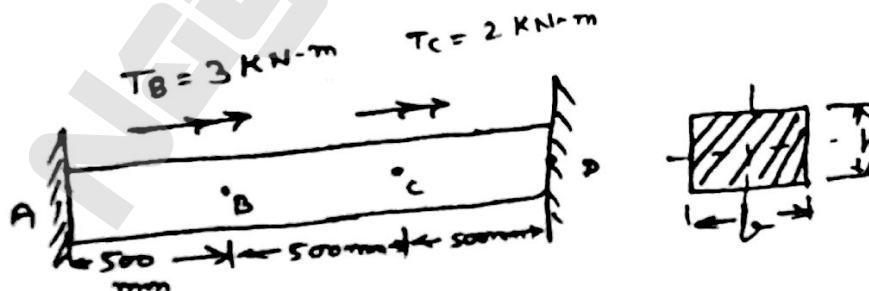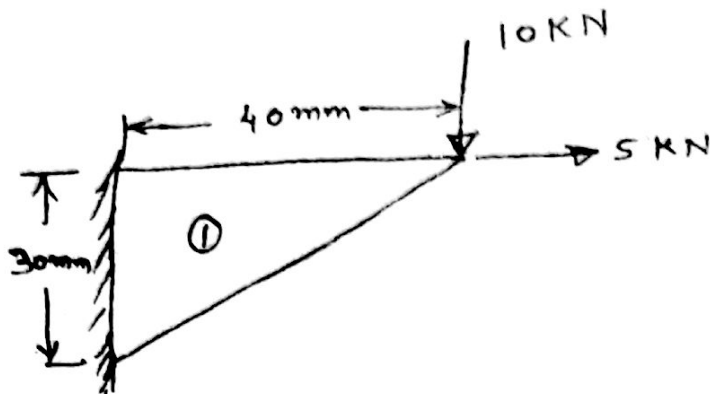
Fig. 8

Assume $b = 20$ mm

$h = 15$ mm   13

9. For a plane stress condition of a CST elements shown in Fig. 9. Determine Element Stiffness matrix and the Principal Stress and the Principal Plane angle (Op).

Assume
E = 200 GPa
t = 10 mm
r = 0.3

Fig. 9

14

10. (a) Explain Simplex Search method for one variable optimization.   6

(b) Explain with suitable example Golden Search method for single variable optimization.   7