



- Notes :
1. All questions carry equal marks.
 2. Due credit will be given to neatness and adequate dimensions.
 3. Assume suitable data wherever necessary.
 4. Diagrams and Chemical equation should be given wherever necessary.
 5. Illustrate your answers wherever necessary with the help of neat sketches.
 6. Use of non programmable calculator is permitted.
 7. Solve Q. 1 or Q. 2, Q. 3 or Q. 4, Q. 5 or Q. 6, Q. 7 or Q.8, Q.9 or Q. 10.

1. a) Explain any four reasons for implementing CAD. 8
- b) What is frame buffer? Explain. 4
- c) What do you understand by Aspect ratio? Explain how it is used to convert ellipse into a circle. 4

OR

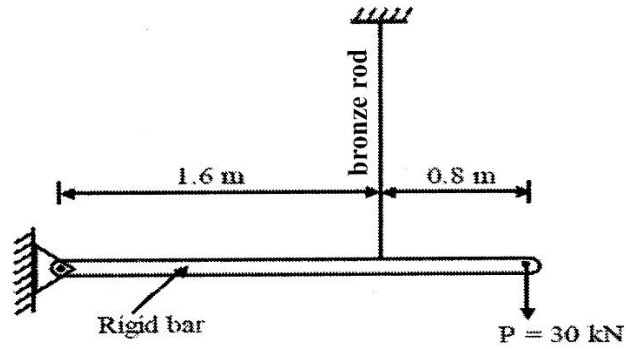
2. a) Write Bresenham's circle generation algorithm. Simulate it for generating a circle of radius 7 with Centre at origin (for first Quadrant). 10
- b) Consider two raster systems with resolutions of 640 x 480 and 1280 x 1024. How many pixels could be accessed per second in each of the systems by a display controller that refreshes the system at a rate of 60 frames per second? What is the access time per pixel in each of the system? 6
3. a) A triangle having vertices at A (2, 1), B(4, 2) and C(3, 6) is to be reflected about its base AB. What are the sequences of steps to be performed? Find final position of triangle, after finding the transformation matrix. 6
- b) Explain in brief properties of Bezier curve. 5
- c) Prove that the multiplication of three dimensional transformations for two successive scaling operations is commutative. 5

OR

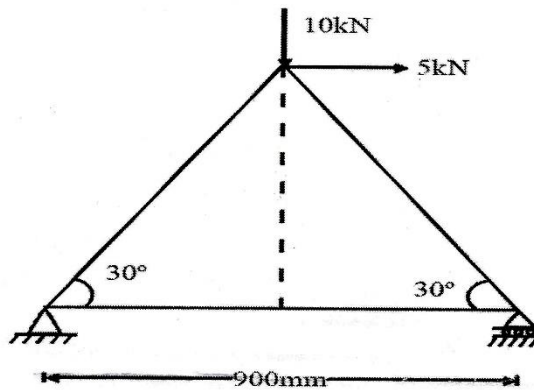
4. A triangle with vertices A(0, 0, 0), B(4, 0, 0) and C(2, 3, 0) is to undergo following transformations. Find transformation matrix and new positions of vertices. 16
 - i) Translation through 4 and 2 units along X and Y directions respectively.
 - ii) Rotation through 90° in counter clockwise direction (in plane X Y) about the new position of point C.
5. a) What do you understand by "post processing" in finite element analysis? 8
- b) Explain in brief the types of element used in FEM along with their characteristics. 8

OR

6. A horizontal rigid bar of negligible mass, hinged at A in fig., is supported by a bronze rod 2m long having cross section area 300mm^2 and $E = 83\text{ GPa}$. Determine displacement at a node at which force of $P = 30\text{kN}$ is applied and Hence find stress in bronze rod (Use MPC) 16

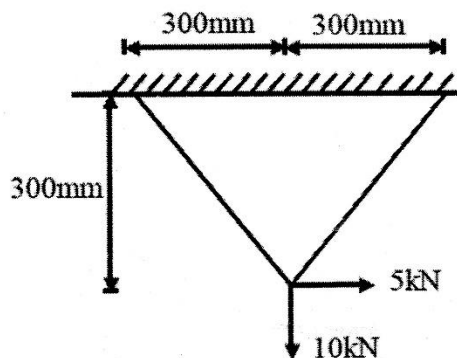


7. For the truss shown in figure, determine the displacement of nodes, stresses in members and reactions at the support cross-sectional area of all members is 400mm^2 and $E = 200 \times 10^9 \text{ N/m}^2$. 16



OR

8. Figure shows a two dimensional plate of thickness 20mm. If load is applied as shown in figure, determine nodal displacements and stresses in the element. Take $E = 200 \text{ GPa}$. And $\nu = 0.3$. 16



9. a) Discuss "Simplex search method for multivariable optimization and also write an algorithm for same. 10

- b) Explain Golden search method for single variable optimization problem. 6

OR

10. a) What do you mean by compatible and in compatible problem in optimum design? Explain. 8

- b) Distinguish between engineering design and optimum design. What are the objectives of optimum design? 8
