

B.E. Mechanical Engineering (Model Curriculum) Semester-VII  
**PCC-ME-402 - Computer Aided Design**

P. Pages : 2

Time : Three Hours



**GUG/W/23/14263**

Max. Marks : 80

- 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. Illustrate your answers wherever necessary with the help of neat sketches.
  5. Solve : Q. 1 or 2, Q. 3 or 4, Q. 5 or 6, Q. 7 or 8, Q. 9 or 10.

1. a) Explain any four reasons for implementing CAD. 8
- b) What are desirable features of line drawing algorithms? 4
- c) What do you understand by Aspect ratio? Explain how it is used to convert ellipse into a circle. 4

**OR**

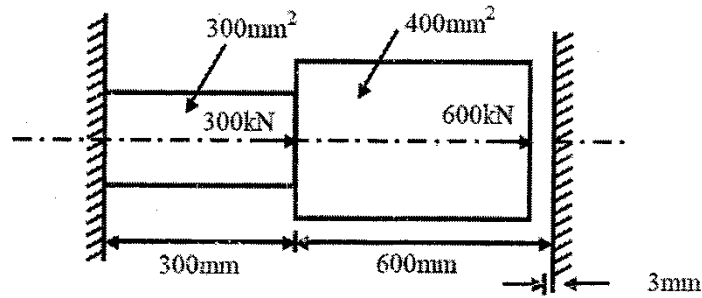
2. a) Write Bresenham's circle generation algorithm. Simulate it for generating a circle of radius 7 with Centre at origin (for first Quadrant) 10
- b) Consider two raster systems with resolutions of 640 by 480 and 1280 by 1024. How many pixels could be accessed per second in each of these systems by 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. 10
- b) Explain 3-D transformation routines with standard transformation matrix for each. 6

**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 total transformation matrix and resultant positions of vertices. Also plot the sequential transformation of triangle at each transformation step on graph paper. 16
  - i) Translation through 4 unit 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 are the various steps involved in FEM? 8
- b) Evaluate the shape functions N1, N2, N3 at the interior point P for the triangular element bounded by nodes 1(2, 4), 2(7, 9) and 3(5, 11). The co-ordinates of P are P(5, 9). 8

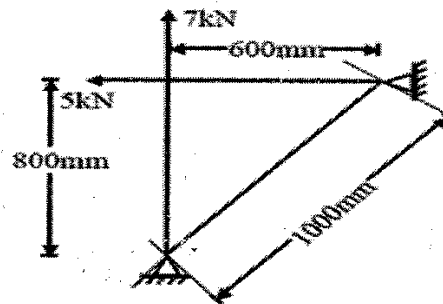
**OR**

6. Consider the two bars shown in fig. If the deformation of the right end is not to exceed 3mm, find nodal displacement, element stresses and support reactions. Take  $E = 200 \text{ GPa}$ . 16



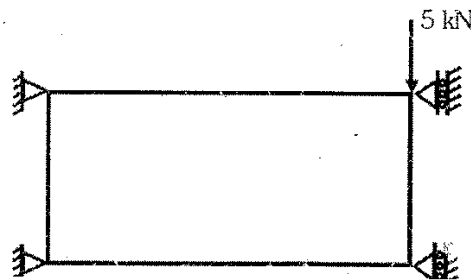
7. A truss shown in Fig. The cross section area of all elements is  $450 \text{ mm}^2$  and  $E = 2 \times 10^5 \text{ N/mm}^2$ . 16

- Determine element stiffness matrix for each element.
- Assemble the structural stiffness matrix for entire truss.
- Find nodal displacement.
- Find stresses in all elements.
- Calculate the reaction force.



OR

8. A rectangular plate having 10mm thickness shown in figure is subjected in-plane point load as shown. If  $E = 200 \text{ GPa}$  and  $\nu = 0.3$ , Determine the nodal displacement, stress and strain field. 16



9. Write short notes on: 16
- Bisection method
  - Golden Search Method
  - Shape functions for LBE
  - Rasterization

OR

10. Design a circular bar for minimum weight. It is subjected to axial tensile force of 55kN. Factor of safety on yield point strength is  $N = 1.8$ , length of bar is 800mm. Diameter of bar to lie between 10mm to 40mm. The available material are steel SAE1020, steel SAE 2320, AL alloy SAE 38 and yellow brass. 16

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