

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

P. Pages : 2

Time : Three Hours



**GUG/S/25/14263**

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. Use of slide rule, Logarithmic tables, Steam tables, Mollier's chart, Drawing instruments, Thermodynamic tables for moist air, Psychrometric charts and Refrigeration charts is permitted.
  6. Answer 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 the various steps which are used in Computer Aided Design Process. 8  
b) Explain with examples role of CAD in Engineering Analysis. 4  
c) Differentiate between Raster Scan and Random scan display system. 4

**OR**

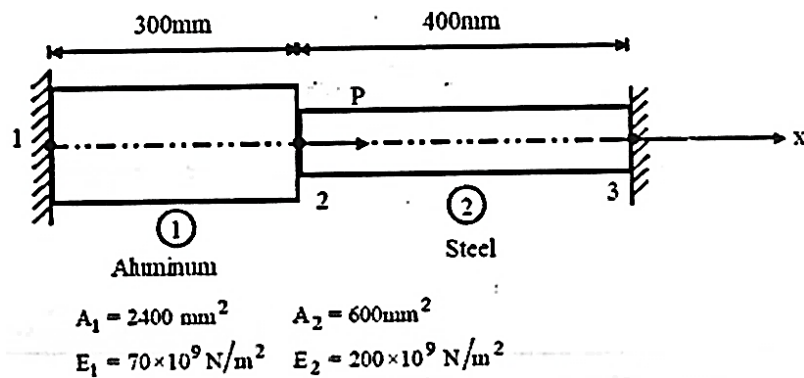
2. a) Write DDA algorithm to draw a straight line having slope between  $\infty$  to  $-1$ . Obtain at least 5 pixel locations for a line between (10,25) to (20,20). 10  
b) Why DDA algorithm to draw a line not preferred over Bresenham's algorithm? 6
3. a) A rectangle ABCD is to be transformed into a square with sides '2' units maintaining the center of square and rectangle as same. Determine the resultant transformation matrix. 6  
A(-1,1); B(3,1); C(3,-5); D(-1,-5)  
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**

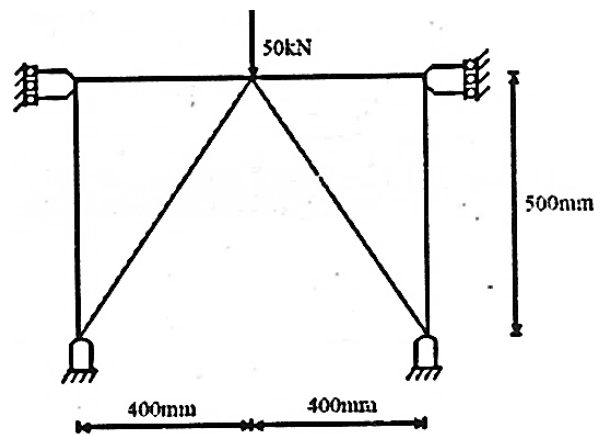
4. a) Triangle having vertices (2, 2), (10,2) & (6, 4) is first translated by 3 units in X-direction & then rotated by  $20^\circ$  clock wise about origin and then scaled by 4 units in Y-direction. Find out final position of triangle about origin. 8  
b) What is windowing and clipping, Explain? 4  
c) What is Bezier Curve? How it is defined. Where it is used? 4
5. a) State principle of Minimum Potential Energy. Further write down an expression for total P.E. for the general elastic body. Explain each term. 8  
b) Explain in brief the types of element used in FEM along with their characteristics. 8

**OR**

6. Consider the bar shown in figure below. An axial load  $P = 200 \times 10^3 \text{ N}$  is applied as shown in figure. Using direct formulation approach, Determine the nodal displacements, elemental stresses and support reactions. 16

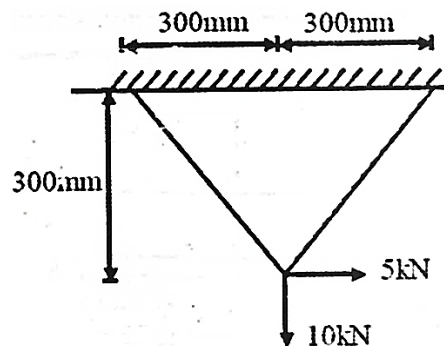


7. For the truss element shown in figure, determine nodal displacement, elemental stresses and support reactions. Cross sectional area of all elements is  $250 \text{ mm}^2$  and  $E = 201 \text{ GPa}$ . 16



OR

8. Figure shows a two dimensional plate of thickness 20 mm. 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

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