

B.E. Mechanical Engineering (MODEL CURRICULUM) Semester-VII
PCC-ME-402 - Computer Aided Design

P. Pages : 2

Time : Three Hours



GUG/W/22/14263

Max. Marks : 80

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- Notes :
1. Due credit will be given to neatness and adequate dimensions.
 2. Assume suitable data wherever necessary.
 3. Illustrate your answers wherever necessary with the help of neat sketches.
 4. 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 & calculator is permitted.
 5. Q. No. 1 or 2, Q. No 3 or 4, Q. No 5 or 6, Q. No 7 or 8, Q. No 9 or 10.

1. a) Define CAD: What are the advantages of CAD over conventional Design Cycle? Explain. 8
b) What is frame buffer? Explain. 4
c) Differentiate between Raster scan and Random scan display system. 4

OR

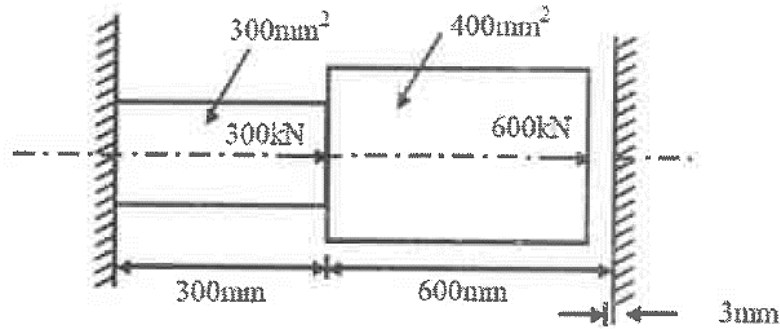
2. a) Why DDA algorithm to draw a line not preferred over Bresenham's algorithm? 8
b) Explain graphics application and programming software modules with reference to any commercially available CAD software. 8
3. a) Determine a 3×3 homogenous transformation matrix to change a square into rectangle with scaling factor $s_x = 1$, $s_y = 1.5$ and rotating the rectangle by 90° anticlockwise, maintaining the centre of rectangle at centre of original square. 6
b) Explain in brief properties of Bezier curve. 5
c) Prove that the multiplication of three dimensional transformation 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 XY) 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 type of element used in FEM along with their characteristics. 8

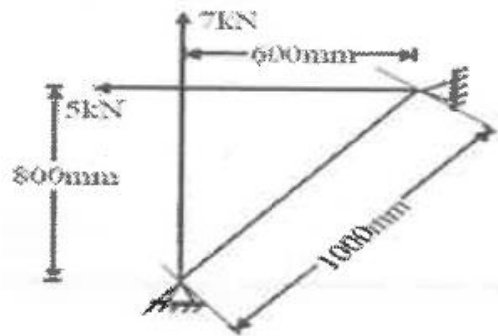
OR

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



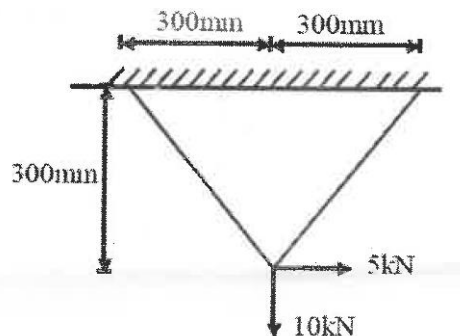
7. A truss, shown in fig. The cross section area of all elements is 450 mm^2 and $E = 2 \times 10^5 \text{ N/mm}^2$ 16

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



9. Design a circular bar for minimum weight. It is subjected to axial tensile force of 45 kN. Factor of safety on yield point strength is $N = 1.8$, length of bar is 600 mm. Diameter of bar to lie between 10 mm to 40 mm. The available material are steel SAE1020, Steel SAE 2320, AL alloy SAE 38 and yellow brass. 16

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
