

B.E. (Mechanical Engineering) Seventh Semester (C.B.S.)

Computer Aided Design

P. Pages : 3

Time : Three Hours

**NRT/KS/19/3558**

Max. Marks : 80

- Notes :
1. All questions carry marks as indicated.
 2. Solve Question 1 OR Questions No. 2.
 3. Solve Question 3 OR Questions No. 4.
 4. Solve Question 5 OR Questions No. 6.
 5. Solve Question 7 OR Questions No. 8.
 6. Solve Question 9 OR Questions No. 10.
 7. Solve Question 11 OR Questions No. 12.
 8. Due credit will be given to neatness and adequate dimensions.
 9. Illustrate your answers whenever necessary with the help of neat sketches.
 10. Use of non programmable calculator is permitted.
 11. Use of design data book is permissible.

1. a) Explain Role of CAD for Mechanical engineering nowadays in Industry. **4**
- b) Write Bresenham's Mid Point Circle generation algorithm and rasterize a Circle with center at (20,10) and radius 5 units. **9**

OR

2. a) Discuss frame buffer in brief. **4**
- b) Rasterize a line to be drawn from (10,20) to (18,30) using DDA algorithm. Plot the Points on graph paper. **9**
3. a) Why transformation matrix is of order 3x3 in 2-D transformation and 4x4 in 3-D transformation **4**
- b) A triangle is defined by vertices $P_1(0,0)$, $P_2(2,0)$, $P_3(3,2)$ is enlarged thrice in x and y - direction. The vertex P_3 of the enlarged triangle is rotated 30° Counter Clockwise. Find the resultant Points of the triangle and show the transform. **10**

OR

4. a) What is Windowing and clipping? **4**
- b) Find the final position of rectangle define by the coordinates A (1,1), B(4,1), C (4,3) and D (1,3) when it is reflected about line $y = 2x+10$. **10**
5. a) Explain the concept of following modeling techniques with sketch in brief. **5**
- i) Solid modeling
- ii) Surface modeling.
- b) Construct the barrier curve of order 3 and with 4 Polygon Vertices $P_0(1,1)$, $P_1(2,3)$, $P_2(4,3)$ & $P_3(6,4)$. **8**
- Calculate the coordinates of point on the curve corresponding to the Parameter: $t = 0, 0.25, 0.5, 0.75$.

OR

6. a) What is Assembly modeling? Explain the various mating condition used in generation of assembly modeling. 7
- b) Explain the following: 6
- i) Feature based modeling.
- ii) Parametric based modeling.
7. a) Explain the steps carried out in FEM. 4
- b) A stepped shaft as shown in figure (1) is fully restrained against rotation about its axis. Twisting moment of 15 kN-m and 20 kN-m are applied at a point of Changing section. Calculate 10
- i) Angular displacement
- ii) Stresses
- iii) Support reactions, Assume $G = \frac{60 \text{ GN}}{\text{m}^2}$, $J_1 = 2 \times 10^7 \text{ mm}^4$, $J_2 = 3 \times 10^7 \text{ mm}^4$ and $J_3 = 2 \times 10^7 \text{ mm}^4$

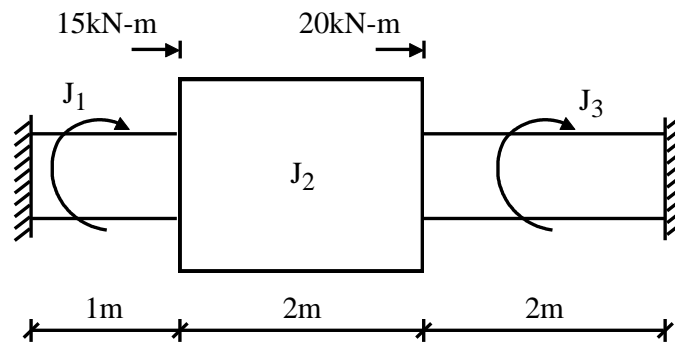


Fig. 1

OR

8. a) Explain principle of minimum potential energy with suitable derivation. 4
- b) Figure (2) shows a uniform thickness plate i.e $t = 10 \text{ mm}$ fixed at both ends with tapering width. Find i) Nodal displacement and stresses in each section 10
- Take $E = 200 \text{ Gpa}$.

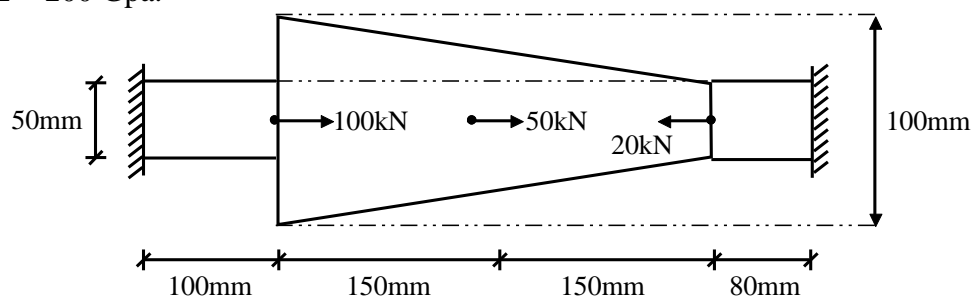
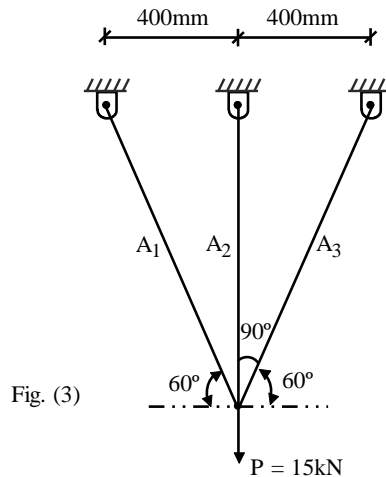


Fig. 2

9. For the truss in the fig (3) having members with cross - sectional areas
 $A_1 = A_3 = 20 \text{ mm}^2$ and $A_2 = 40 \text{ mm}^2$,
 take $E = 70 \text{ GPa}$.
 Calculate the following:
 i) Global stiffness matrix
 ii) Nodal displacement.

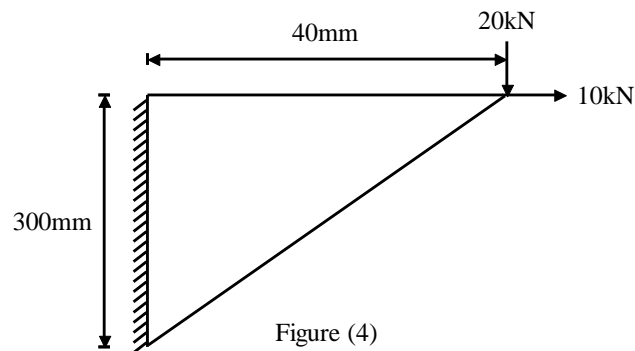
13



OR

10. For a plane stress Condition of a CST element shown in fig (4). Determine the nodal displacement
 Take $E = 200 \text{ GPa}$, $\nu = 0.3$ & thickness $(t) = 10 \text{ mm}$

13



11. a) Discuss in brief Adequate and optimum design.
 b) A circular cantilever beam subjected to load of intensity 3 KN at its free end, the length of beam is 1000 mm, the required factor of safety is 1.6. Design the circular beam for minimum deflection. The material given are SAE 1010, Ph. Bronze and Aluminum alloy.

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8

OR

12. A simple supported beam of rectangular cross Section having distance between support 900 mm^2 is subjected to load of 1 kN at mid point of beam. Design the beam with following specification factor of safety = 1.5, $d/b = 2.5$. Depth should lie between 15 mm to 150 mm. Design the beam for minimum deflection for the material SAE 1030, SAE 3120 (oil quenched) and Aluminum 260.

13
