

NTK/KW/15/7561

Faculty of Engineering & Technology
Seventh Semester B.E. (Mech. Engg.) (C.B.S.)
Examination

COMPUTER AIDED DESIGN

Time—Three Hours]

[Maximum Marks—80

INSTRUCTIONS TO CANDIDATES

- (1) All questions carry marks as indicated.
- (2) Solve Question No. **1 OR** Question No. **2**.
- (3) Solve Question No. **3 OR** Question No. **4**.
- (4) Solve Question No. **5 OR** Question No. **6**.
- (5) Solve Question No. **7 OR** Question No. **8**.
- (6) Solve Question No. **9 OR** Question No. **10**.
- (7) Solve Question No. **11 OR** Question No. **12**.
- (8) Assume suitable data wherever necessary.
- (9) Use of non programmable calculator is permitted.
- (10) Use of design data book is permitted.

10. A two dimensional plate of thickness 20 mm is shown in fig(10). Determine the nodal displacement. Take

$E = 200 \text{ GPa}$ and $\nu = 0.3$.

14

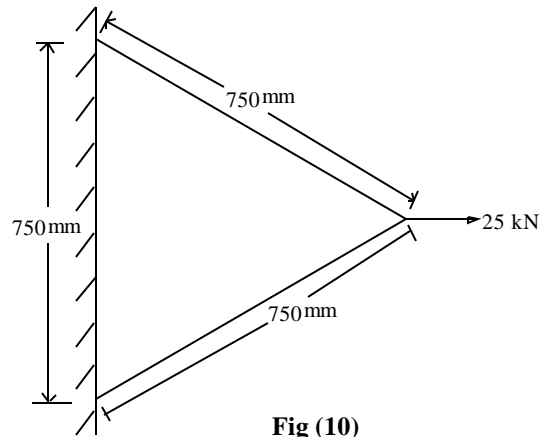


Fig (10)

11. (a) Explain in brief the basic steps in method of optimum design. 5

(b) A simply supported beam of length 1000 mm is subjected to concentrated load of 9kN at midpoint of beam. Optimise (Design) the beam for minimum deflection and take factor of safety = 1.5. The available materials are SAE 1030; SAE 2345 and Ph. Bronze.

9

OR

4. (a) A square having vertices (1, 4); (1, 1) (4, 1) and (4, 4) is reflected about the line having equation $y = 3x + 4$. Find the final position of the square.

8

(b) Explain in brief various types of 3-D transformations with their matrix representations. 5

5. (a) Enlist the properties of bezier curve. The coordinates of four control points of curve is given by $B_0[1.5, 2]$, $B_1[3, 3]$; $B_2[6, 3]$; $B_3[8, 2]$. Find the equation of resulting Bezier curve. Also find the coordinates of point lying on curve at $t = 0, 0.25, 0.5, 0.75, 1$.

9

(b) Define and describe with example any two solid modeling entities or primitives. 4

OR

6. (a) Explain in brief assembly modeling. 5

(b) What do you understand by mating relationship or constraints. Explain in brief various types of mating relations in 2D and 3D used in Assembly Modeling.

8

7. (a) Explain in brief Basic steps of Finite Element Method.

5

- (b) Determine the angle of twist at the step and the maximum shear stress in each section for the stepped circular bar shown in fig 7(b). take $G = 77 \text{ GPa}$.

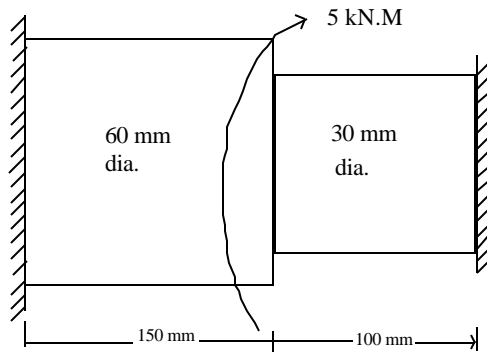


Fig 7(b)

OR

8. A composite shaft is subjected to load as shown in fig (8). Determine displacements and stresses in each section.

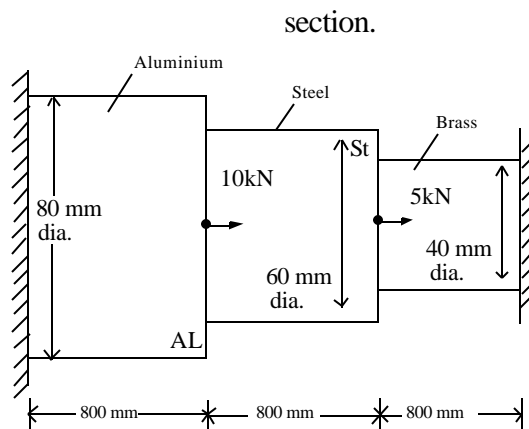


Fig 8

$$E_{st} = 200 \text{ GPa}$$

$$E_{AL} = 70 \text{ GPa}$$

$$E_{Br} = 105 \text{ GPa.}$$

13

9. A truss is shown in fig (9). The cross section area of all elements is 450 mm^2 and $E = 2 \times 10^5 \text{ N/mm}^2$.

- (i) Determine the element stiffness matrix for each element.
- (ii) Assemble the structural stiffness matrix for entire truss
- (iii) Find the nodal displacement.
- (iv) Find the stresses in all elements
- (v) Calculate the reaction force.

14

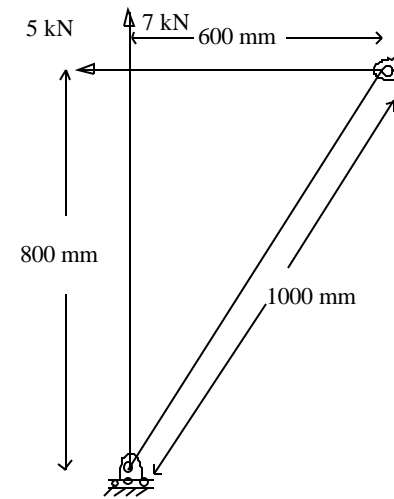


Fig (9)

OR

1. (a) What is a Bit Plane ? How bit planes are used to get different colors. 8
- (b) What is conventional design process ? How this process is modified when we use cad process ? 5

OR

2. (a) Write the Bresenham's circle drawing algorithm in first quadrant. Using the algorithm generate the circle in first quadrant with radius equal to 5 on graph paper. 9
- (b) Explain in brief how circle can be generated by parametric equation. 4
3. (a) A triangle with vertices (3, 6); (7, 6); and (5, 11) is first scaled by 1.5 units about fixed point (4, 7) then translated by 2.5 units in x and y direction respectively and finally rotated about point (2, 2) in counter clockwise direction by 45° . Find final position of triangle. 10
- (b) Explain in brief windowing and clipping. 3

OR

12. Design a circular shaft for minimum torsional deflection, for the following conditions :
 - (i) Length should be between 600 to 900 mm.
 - (ii) Diameter should be between 10 mm and 75 mm.
 - (iii) Factor of safety = 1.5
 - (iv) Twisting moments = 85 kN. meter
 - (v) Available materials :
SAE 1030; SAE 1050; SAE 3140 and Al. Alloy-260. Sketch the variational diagram. 14