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 GPa and ν = 0.3. 14

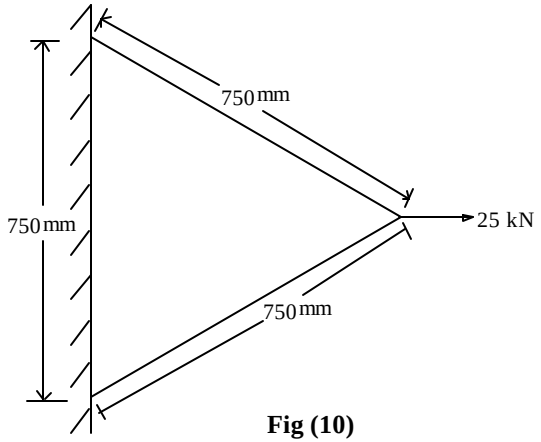

Fig (10)

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 GPa. 8

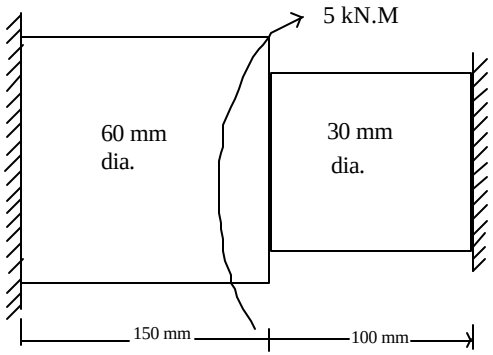

Fig 7(b)

OR

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

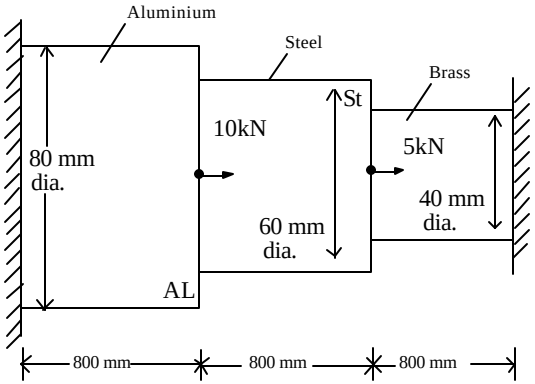

Fig 8

E_{st} = 200 GPa

E_{AL} = 70 GPa

E_{Br} = 105 GPa. 13

9. A truss is shown in fig (9). The cross section area of all elements is 450 mm^2 and E = 2×10^5 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

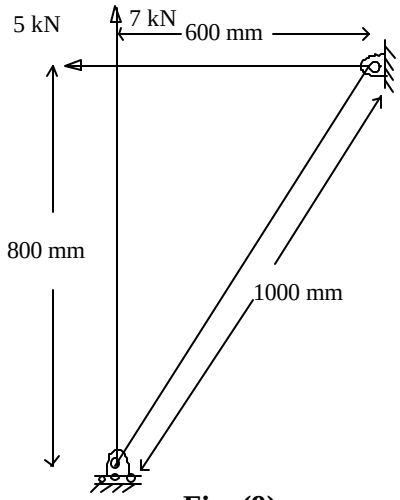

Fig (9)

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 finaly rotated about point (2, 2) in counter clockwise direction by 45^0. 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