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

Computer Aided Design

P. Pages : 3 **NRJ/KW/17/4613**

Time : Three Hours * 0 4 8 7 * 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. Assume suitable data whenever necessary.
10. Illustrate your answers whenever necessary with the help of neat sketches.
11. Use of non programmable calculator is permitted.
12. Use of design data book is permissible.

1. a) Explain Computer Aided Design, it's applications and advantages over conventional design. **5**

b) Write DDA line generations algorithm and rasterize a line having end coordinates A (2, 5) and B (6, 10). **8**

OR

2. a) What is Raster Scan Display? Explain the use of frame Buffer with a neat diagram. **5**

b) Write Bresenham's mid-point circle generation algorithm and rasterize a circle with Centre at (30, 20) and radius 9 units. **8**

3. a) What are transformations? Explain 2D Normal transformations using suitable derivations (any one). **5**

b) A rectangle having vertices at A (3, 3) B (7, 3) C (3, 7) D (7, 7) is reflected about a line having equation 'Y = 3x – 5', calculate the coordinates of reflected rectangle. **9**

OR

4. a) What is windowing and clipping? **3**

b) A triangle ABC having vertex coordinates. **11**
A (0, 0, 0, 1)
B (7, 2, 5, 1)
C (2, 3, 1, 1)
- is scaled by 2 units in x-direction, 3 units in y-direction and 3 units in z-direction.
- it is then rotated by 30º (C.W) about y-axis.
- finally it is translated by 3 units in all the directions.

Calculate the coordinates of transformed triangle.

5. a) Explain wireframe modeling and surface modelling with proper illustration. **5**

b) What are the properties of a Bezier curve? Rasterize a Bezier curve having control point coordinates P_0 (3, 3, 0) P_1 (3, 4, 0) P_2 (4, 4, 0) P_3 (5, 2, 0) **8**
When U = 0, 0.25, 0.5, 0.75, 1.

OR

6. a) What is Assembly modeling? Explain generation of assembly sequences. **5**

b) Explain the following. **8**

i) Constructive solid Geometry (C.S.G).
ii) Boundary representation techniques.

7. a) Explain principle of minimum potential Energy with suitable derivation. **4**

b) For the step shaft shown in the fig (1) having following properties. **10**
Modulus of Elasticity 210 GPa.

SECTION	L (mm)	D (mm)
A	400	50
B	300	35

Calculate :

i) Nodal Displacement.
ii) Strain and stress.
iii) Support Reactions.

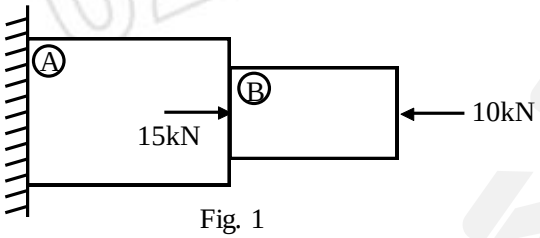

Fig. 1

OR

8. a) Derive and explain shape functions for a two noded 1-D bar member. **4**

b) For a step shaft shown in fig (2) having shear modulus of 180 GPa being subjected to for torques as shown in fig (2). Calculate. **10**

i) Angular displacements.
ii) Shear stress in each section.
iii) Support reactions.

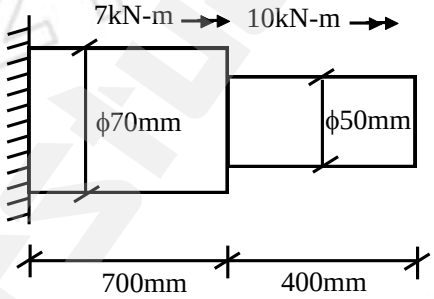

Fig. 2

9. For the truss shown in the fig (3) having members with cross-sectional area 400mm^2 and modulus of elasticity 200 GPa. **13**
Calculate the following.

i) Global stiffness matrix. ii) Nodal displacements.

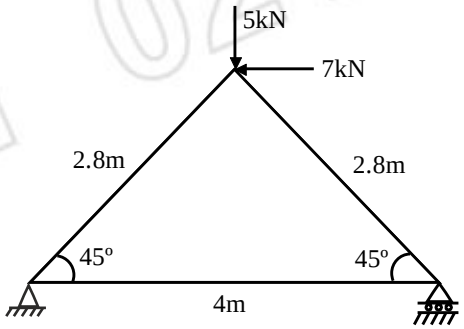

Fig. 3

OR

10. For a CST shown in fig (4) having thickness of 10mm and modulus of elasticity 210 GPa Calculate the following. **13**

i) Nodal displacement.

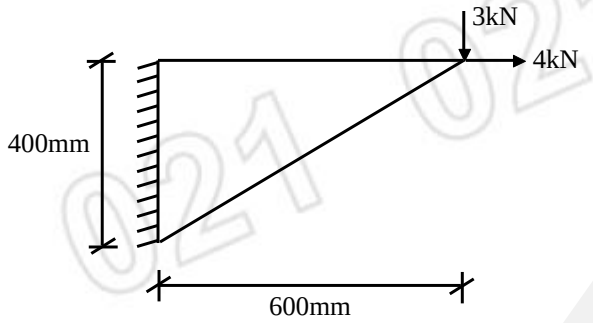

Fig. 4

11. a) Explain optimization and the steps of optimization in detail. **5**

b) A simply supported beam 90cm in length has a concentrated load of 8kN acting at its Centre. With a required factor of safety 1.65, design the beam for minimum deflection. For the following materials; **8**

i) SAE 3220 (Water quenched & drawn at 700ºC).
ii) SAE 2320 (Drawn 550ºC).
iii) SAE 9260.
iv) Muntz metal.

OR

12. A simply supported beam having rectangular Cross-section and length 950mm is subjected to a load of 8.5kN acting at the Centre of the beam. **13**

Design the beam with following specifications;
Factor of safety = 1.6
d/b ratio = k = 5.
Depth (d) should lie between 15mm and 150mm, solve the problem for minimum deflection. Using following material.

i) SAE 3120 (oil quenched). ii) SAE 1010.
iii) Aluminium 260.

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