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

Computer Aided Design (CAD)

P. Pages : 3 **NJR/KS/18/4613**

Time : Three Hours * 0 1 0 1 * 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 the phases of computer aided design process and how it helps in conventional design process. **5**

b) Write Bresenham's algorithm for line generation for slope greater than one. **9**

OR

2. a) Write the Bresenham's algorithm to draw circle by deriving the necessary equations using algorithm generate the circle with radius equal to 5 on graph paper. **10**

b) Explain rasterization techniques. **4**

3. a) Explain what is mean by concatenation in transformation. **3**

b) A triangle ABC has its vertices at A(0, 0), B(5, 0) and C(3, 4). It is to be translated by 5 units x-direction and 2 units y-direction, then it is to be rotated in anticlockwise direction about the new position of point 'C' through 90º. Find the new position of triangle. **10**

OR

4. a) What is inverse transformation? Write inverse transformation matrix for translation, scaling and rotation. **5**

b) Find out the final position of line having end points (3, 4) and (8, 7), when it is translated by 4 units in y-direction, then scaled by 2 units in x & y direction and then rotated by 45º in clockwise direction. **8**

5. a) Explain Bezier curve along with its features. **5**

b) Construct the Bezier curve with 4 polygon vertices A(1, 1); B(2, 3); C(4, 3) and D(6, 4). Calculate the co-ordinates of points on the curve corresponding to the parameters : **8**

$t = 0, \frac{1}{4}, \frac{1}{2}, \frac{3}{4}, 1$

OR

6. a) Discuss the assembly modeling in brief. **5**

b) Write short notes on **any two.** **8**

i) CSG technique.

ii) Boundary representation technique.

iii) Wire frame modeling.

7. a) Write various types of element, their number of nodes and number of degrees of freedom of each node. **4**

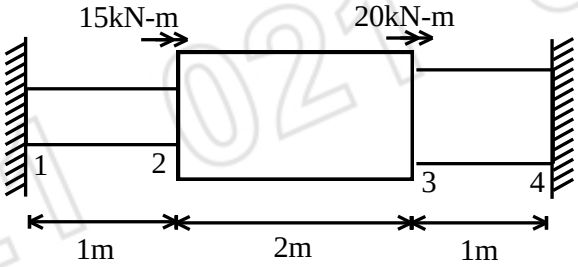
b) The stepped shaft as shown in figure is fully restrained against rotation about its axis. Twisting moments of 15 kN-m and 20 kN-m are applied at the point of changing cross-section. Calculate the rotations at nodes and reaction twisting moments at the ends of the bar. **10**

Take $G = 84\,GN/m^2$

$I_{P_1} = 1.5\times10^7\ mm^4$

$I_{P_2} = 2.5\times10^7\ mm^4$

$I_{P_3} = 2\times10^7\ mm^4$

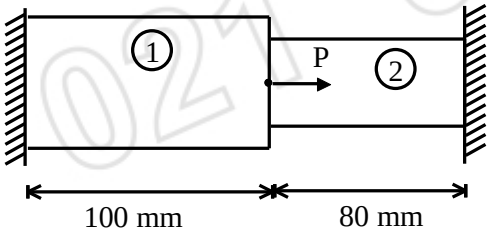


OR

8. a) Write properties of stiffness matrix. **4**

b) A horizontal bar consist of two steps as shown in figure. An axial load P = 10 kN is applied. Calculate **10**

i) Displacement at nodes.
ii) Stresses in each element.
iii) Reactions at the support.



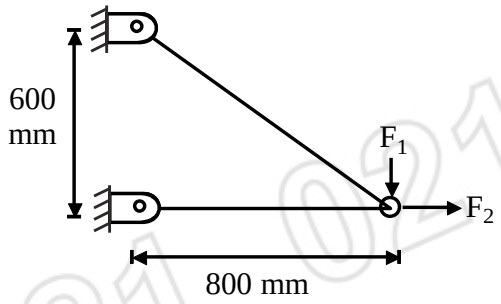
$D_1 = 40\,mm$ $D_2 = 30\,mm$

$E_1 = 200\,GPa$ $E_2 = 70\,GPa$

9. For the pin jointed configuration as shown in figure, subjected to force $F_1 = 50\,kN$ and $F_2 = 20\,kN$. Calculate **13**

i) Nodal displacement.
ii) Reaction at fixed support.

Take $E = 210\,GPa$; $A = 500\,mm^2$.



OR

10. a) Explain preprocessing and postprocessing in detail in finite element method. **8**

b) Derive stiffness matrix for CST element. **5**

11. A tensile bar is to be designed for minimum cost with following conditions : **13**
d > 12 mm ; Load, P = 60 kN
length, l = 500 mm & F.S. = 1.6
The cost of material to be used in design are as below
SAE 1030 – Rs. 18 per kg
SAE 3240 – Rs. 20 per kg
Al. Alloy – Rs. 22 per kg

OR

12. a) Discuss in brief adequate and optimum design. **4**

b) A simply supported beam having length 800 mm is subjected to load 10 kN at the centre. Design the beam for minimum deflection. Take factor of safety = 1.8. The available materials are SAE 1030, SAE 2340 (annealed); SAE 3145 (drawn at 425ºC) and SAE 4340 (cold rolled). **9**

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