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

Computer Aided Design

P. Pages : 3 **KNT/KW/16/7474**

Time : Three Hours * 0 8 6 9 * 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 wherever necessary.
10. Illustrate your answers wherever necessary with the help of neat sketches.
11. Use of non programmable calculator is permitted.
12. Use of Design databook is permitted.

1. a) Explain the phases of computer aided design process. **6**

b) Differentiate between Raster scan and Random scan display systems. **7**

OR

2. a) Explain in brief how an ellipse can be generated using parametric equation. **6**

b) Draw the line between end points (10,5) and (15,9) by using Bresenham's line algorithm. **7**

3. a) What do you understand by special transformations? Explain its utility. **5**

b) Triangle ABC vertices A(1,1) B (1,7) C(5,4) is scaled by three units in X – direction and rotated by 30º in the anticlockwise direction keeping point (1,1) fixed. Find the transformation matrix and final position of triangle ABC. **9**

OR

4. a) A triangle having vertices (3,2), (3,6) and (8,4) is reflected about the line having equation y = 3x+4. Find the final position of triangle using 2D transformation. **8**

b) A cube of 10 units is having one of its corner at the origin (0,0,0) and three edges along three principle axes. If the cube is to be rotated about Z-axis by an angle 45º in counter clockwise direction. Calculate the New position of the cube. **6**

5. a) Explain the concept of following modeling technique in brief. **6**
i) Wireframe modeling.
ii) Surface modeling
iii) Solid modeling.

b) State the importance of mating condition in assembly modelling. Enlist various types of mating constraints considered in 2-D and 3-D Assembly modelling. **7**

OR

6. a) Explain the characteristics of B-spline curve. **4**

b) Given $P_0(1,1)$, $P_1(2,3)$, $P_2(4,3)$, $P_3(3,1)$ are the vertices of the Bezier polygon. Determine five points on Bezier curve at t = 0, 0.2, 0.4, 0.6, 0.8, 1. **9**

7. a) Discuss in detail the various steps involved in FEM. **6**

b) Explain in brief the types of element used in FEM. **4**

c) Explain the principle of minimum potential energy. **3**

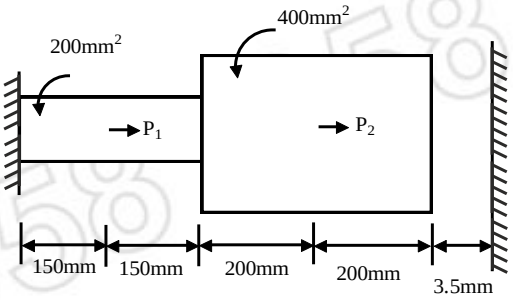
OR

8. For axially loaded member shown in Fig. (8) determine **13**

i) Nodal displacement

ii) Stress in each element

iii) Reaction at fixed end.



Take E = 200 GPa
P_1 = 300 kN
P_2 = 600 kN

Fig. (8)

9. Figure (9) shows three bar truss with pin joints. Given E = 200 Gpa, c/s area of each element = 350 mm^2. Determine (i) Nodal displacement 2) stress in each element 3) Reaction at support. **14**

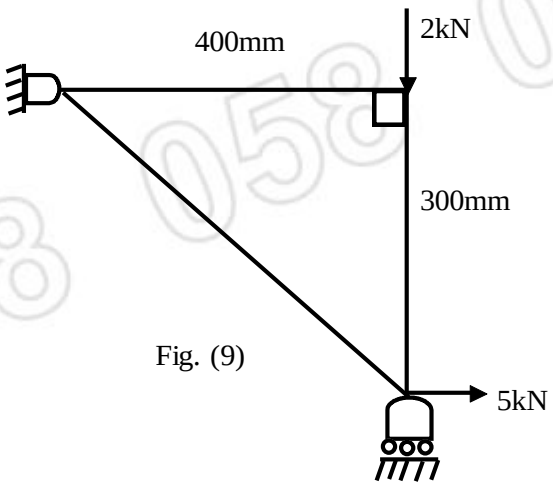


Fig. (9)

OR

10. For triangular plate shown in Fig. (10) determine nodal displacements and element stresses using a one element model **14**
Take E = 70 Gpa, v = 0.25, t = 10 mm. Assume plane stress condition.

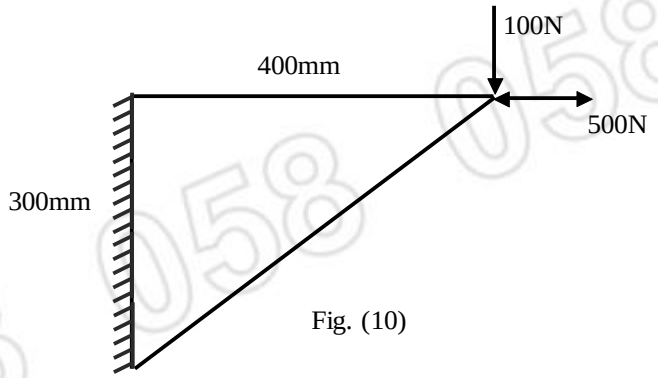


Fig. (10)

11. A shaft is to be used to transmit a torque of 2000 N-m. The required torison stiffness of shaft is 1200 N-m 1degree, while factor of safety based on yield strength in shear is 2. Using maximum shear stress theory design the shaft with the objective of minimizing the weight , out of the following materials. **13**

1) SAE 1030

2) SAE 4140

3) Aluminum 260

4) SAE 1010

OR

12. A simply supported beam having rectangular cross-section and length 950mm is subjected to a load of 8.5 KN acting at the center of the beam. **13**
Design the beam with following specifications;
Factor of safety; N = 1.6 d/b ratio: K = 5
Depth (d) should lie between 15 mm and 150 mm; solve the problem for minimum deflection using following material.

1) SAE 3120 (oil quenched)
2) SAE 1010
3) Aluminum 260

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