

GANPAT UNIVERSITY

B. Tech. VII Sem. Mechanical Engineering

Regular Examination November- December-2013

2ME704 - COMPUTER AIDED DESIGN

Time: 3 Hours

Total Marks: 70

Instruction:

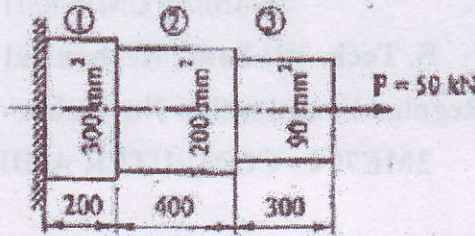
1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.

Section - I

- Q-1 12
- (a) Write a Matlab program for 2D rotation with suitable example.
 - (b) Find out the new vertices position of a triangle ABC having co-ordinate A(0,0), B(4,0) and C(2,3), if it perform the following operations (i) Translation through 4 and 2 units along X and Y directions respectively. (ii) Rotation through 90° in counterclockwise direction about the new position of point C.
 - (c) Prove that a uniform scaling and a rotation form a commutative pair of operations, but that in general scaling and rotation are not commutative.
- OR
- Q-1 12
- (a) The coordinates of the triangle are P(50,20), Q(110,20) and R(80,60). Determine the coordinates of the vertices for the new reflected triangle, if it is to be reflected about a line $y = -x$.
 - (b) Show that the transformation matrix for a reflection about the line $y = x$ is equivalent to reflection relative to the X-axis, followed by anticlockwise rotation of 90° .
 - (c) Write a Matlab program for 2D scaling with suitable example.
- Q-2 4
- (a) Discuss Bresenham's Circle algorithm with suitable example
 - (b) Write a C program of DDA algorithm for draw a line form point (1, 0) to (10, 3).
 - (c) Define scan conversion and aspect ratio.
- OR
- Q-2 4
- (a) Write Bresenham's algorithm for generation of line having slope $m > 1$.
 - (b) Write a C program for drawing half circle by using Mid-point algorithm.
 - (c) Define computer graphics and resolution.
- Q-3 12
- Attempt any three.
- (a) Write a short note on Raster scan.
 - (b) What is homogeneous coordinates system? Write the matrix transformation in homogenous form for all 2D operation.
 - (c) Explain the transformation matrix required to generate the orthographic view of given object in the viewing plane.
 - (d) Explain any two output device use in CAD system.

Q-4

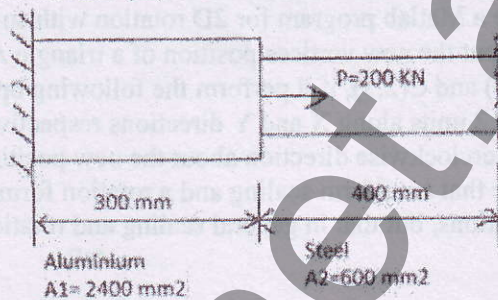
- (a) An axial stepped bar as shown in figure is subjected to an axial pull of 50 kN. If the material of the bar is uniform and has a modulus of elasticity as 200 GPa. Determine the displacement and stresses of each of the section. Also find the reaction.



- (b) Explain 2-D and 3-D elements used in finite element analysis.
- OR

Q-4

- (a) A stepped bimetallic bar made of Aluminium ($E = 70 \times 10^3 \text{ N/mm}^2$) and steel ($E = 200 \times 10^3 \text{ N/mm}^2$) is subjected to an axial load of 200 kN, as shown in the figure. Using finite element method, determine (i) the nodal displacements (ii) the stresses in each material and (iii) the reaction forces at the supports.



- (b) Explain the various steps required to solve mechanical problem using finite element analysis.

Q-5

- (a) Temperature at Node 1 is 100°C and at Node 2 is 40°C . The length of the element is 200 mm. Evaluate the shape function associated with Node 1 and Node 2. Calculate the temperature at point P situated at 150 mm from Node 1. Assume a linear shape function.
- (b) Write difference between wireframe modelling and solid modeling.
- (c) Generate a Bezier curve having endpoint $P_0 (1, 3)$ and $P_3 (7, 2)$. The other control point are $P_1 (5, 6)$ and $P_2 (6, 0)$. Plot for values for $u = 0, 0.1, 0.2, 0.3, 0.4$ and 0.5 if the characteristic polygon is drawn in the sequence $P_0-P_1-P_2-P_3$.

OR

Q-5

- (a) Explain surface modeling.
- (b) The displacement at Node 1 is 2 mm and at Node 2 is -1 mm. The length of the element is 180 mm. Evaluate the shape function associated with Node 1 and Node 2. Calculate the displacement at point P situated at 100 mm from Node 1. Assume a linear shape function.
- (c) Plot the hermite cubic curve having endpoint $P_0 (1, 3)$ and $P_3 (7, 2)$. The tangent vector for end P_0 is defined by a line joining P_0 and another point $P_2 (10, 8)$, whereas the tangent vector for end P_1 is defined by a line joining P_1 and another point $P_3 (6, 0)$.

Q-6

- Attempt any three.
- (a) What is feature based modelling? Discuss various steps involved in creation of models using features.
- (b) Write short note on constructive solid geometry.
- (c) Explain Elimination approach for FEA.
- (d) What are the functions and phases of FEA software?