

Time Allotted : 3 hrs

Full Marks : 70

*Figures out of the right margin indicate full marks.*

*Candidates are required to answer Group A and any 5 (five) from Group B to E, taking at least one from each group.*

*Candidates are required to give answer in their own words as far as practicable.*

**Group - A  
(Multiple Choice Type Questions)**

1. Choose the correct alternative for the following: **10 × 1 = 10**
- (i) In computer aided drafting practice, an arc is defined by  
 (a) two end points only (b) center and radius  
 (c) radius and one end point (d) two end points and center.
- (ii) In CNC Machine, motion along the axis of spindle or parallel to the axis of spindle is designated by  
 (a) Z-axis (b) X-axis (c) Y-axis (d) none of these.
- (iii) Color raster display uses three electron guns, namely  
 (a) red, green and blue (b) red, green and yellow  
 (c) white, blue and black (d) red, black and white.
- (iv) To do Finite Analysis on a 3-Dimensional object which of the following element is needed?  
 (a) BAR element (b) BEAM Element  
 (c) QUAD element (d) TETRA element.
- (v) In an NC machining operation, the tool has to be moved from point (40,20) to point (100,20) along a circular path with centre at (70,20). Before starting the operation, the tool is at (40,20). The correct G and N codes for this motion are  
 (a) N80 G17 G03 X 100 R30 (b) N80 G17 G03 X 100 R60  
 (c) N80 G17 G02 X 100 R30 (d) N80 G17 G02 X 100 R60.

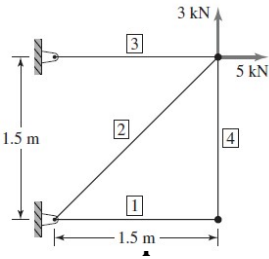
- (vi) In a CNC program block, N002 G02 G91 X 40 Z40.....,G02 and G91 refer to  
 (a) circular interpolation in counter clockwise direction and incremental dimension  
 (b) circular interpolation in counter clockwise direction and absolute dimension  
 (c) circular interpolation in clockwise direction and incremental dimension  
 (d) circular interpolation in clockwise direction and absolute dimension.
- (vii) Parametric equation of a circle with centre at (X<sub>c</sub>,Y<sub>c</sub>) and having radius R is  
 (a)  $x = X_c + R \times u; y = Y_c + R \times u$   
 (b)  $x = X_c + R/u; y = Y_c + R/u$   
 (c)  $x = X_c + R \cos u; y = Y_c + R \times \sin u$   
 (d)  $x = X_c + u; y = Y_c + u$
- (viii) Which one of the following is a parametric CAD software?  
 (a) AutoCAD (b) Z-CAD (c) PTC Creo (d) 3D Max.
- (ix) Which one of the following is an aesthetic curve?  
 (a) Ellipse (b) Cycloid (c) B-Spline (d) Cardioid.
- (x) What is the full form of ATC?  
 (a) Automatic Tool Changer (b) Arbitrary Tool Changer  
 (c) According tool changer (d) Absolute Tool Changer.

**Group - B**

2. (a) Rasterize a line from (10, 16) to (30, 05) in a screen of resolution 640 × 480 pixels and in a drawing limit of (50 × 30) using Integer Bresenham's Algorithm. Represent your answer in a graph paper.
- (b) Discuss in detail about the following graphics standards.  
 (i) PHIGS and (ii) IGES

**8 + 4=12**

3. A Line between the vertices (6, 4) to (20, 20) and (10,4) to (28,8) respectively. Examine mathematically constructing parametric equations of these two line whether they are parallel to each other or perpendicular to each other. If they are neither parallel nor perpendicular to each other, then determine angle between them.



), 08) is to be reflected about the y-axis intercept 12. Then it is to be rotated about its current configuration by 30° clockwise. Determine the end points of the line.

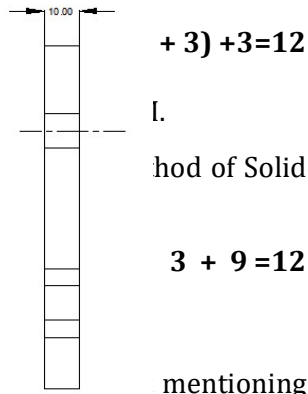
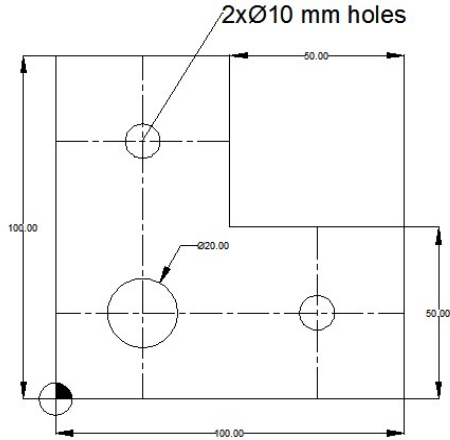
12

4. (a) There are two lines L1 and L2 between vertices (6, 4) to (20, 20) and (10,4) to (28,8) respectively. Examine mathematically constructing parametric equations of these two line whether they are parallel to each other or perpendicular to each other. If they are neither parallel nor perpendicular to each other, then determine angle between them.

(b) Why parametric representation of geometric entities are needed?

5. (a) Mention the advantages of parametric representation of geometric entities.

(b) Write the parametric equations of the line segment.



+ 3) +3=12

i. Method of Solid

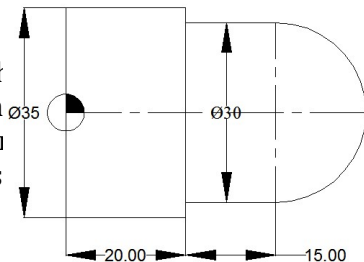
3 + 9 = 12

mentioning the Degree of Freedom

6. (a) Discuss the physical significance of the Degree of Freedom.

(b) Discuss in detail about post processing step in Finite Element Analysis.

7. The plane truss shown in the figure is composed of members having a square cross-section of side 15 mm and modulus of elasticity E = 69 GPa. Determine the displacement at node C using the FEA formulation.



6 + 6 = 12

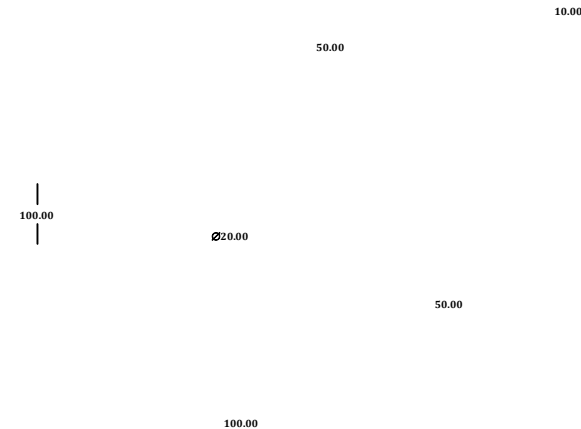
composed of members having a square cross-section of side 15 mm and modulus of elasticity E = 69 GPa. Determine the displacement at node C using the FEA formulation.

8 + 4 = 12

Group - E

8.(a) How CAD, CAM & CIM are related?

(b) Write a CNC program to produce a part shown below from a job having dimension 100 mm x 100 mm having fine edges and uniform thickness. Assume other things if necessary and mention separately. All the dimension are in mm.



4 + 8 = 12

9. (a) Write a CNC program of a turning centre of the figure shown below. Assume all the parameters if necessary. All the dimension are in mm.

(b) How CIM is implemented in a product manufacturing industry?

8 + 4 = 12