

CAD / CAM
(MECH 3264)

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) The following is not a graphics standard
(a) GKS (b) IGBS (c) UNIX (d) PHIGS
- (ii) The initial decision parameter for Bresenham's generalized line drawing algorithm is
(a) $3\Delta y - \Delta x$ (b) $2\Delta x - \Delta y$ (c) $3\Delta x - \Delta y$ (d) $2\Delta y - 3\Delta x$
Here, Δx and Δy are absolute difference between final and initial coordinates of x and y respectively.
- (iii) 3×3 homogeneous transformation matrix for translation of an object to right by 2 units and down by 3 units is
(a) $\begin{bmatrix} 1 & 3 & 0 \\ 0 & 1 & 0 \\ 2 & 0 & 1 \end{bmatrix}$ (b) $\begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 2 & 3 & 1 \end{bmatrix}$
(c) $\begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 2 & -3 & 1 \end{bmatrix}$ (d) $\begin{bmatrix} 1 & 0 & 0 \\ 0 & 3 & 0 \\ 0 & 0 & 1 \end{bmatrix}$
- (iv) Which of the following is not an analytical entity?
(a) Line (b) Circle (c) Spline (d) Parabola.
- (v) In the following geometric primitives, which is not a solid entity of CSG modelling:
(a) Box (b) Cone (c) Cylinder (d) Circle
- (vi) Stiffness matrix of a BAR element in global coordinate system used for Truss is a:
(a) 3×3 matrix (b) 4×4 Matrix
(c) 2×2 matrix (d) Single column matrix.
- (vii) Which one among the following is correct regarding stiffness matrix of a BEAM element? All the symbols and notations carry their usual meaning.
(a) $\frac{AE}{3L} [4 \times 4]$ (b) $\frac{EI}{L} [4 \times 4]$ (c) $\frac{EI}{L^3} [4 \times 4]$ (d) $\frac{AE}{L^2} [4 \times 4]$

- (viii) In part programming, interpolation is used for obtaining _____ trajectory.
(a) helicoidal (b) pentagonal (c) triangular (d) zig-zag.
- (ix) Which of the following is not an advantage of CNC machines?
(a) Higher flexibility (b) Improved quality
(c) Reduced scrap rate (d) Improved strength of the components.
- (x) The device, fed to the control unit of NC machine tool which sends the position command signals to sideway transmission elements of the machine, is known as
(a) controller (b) tape (c) feedback unit (d) encoder.

Group – B

2. (a) Briefly discuss the difference between 'DDA' and 'Bresenham' algorithm for line drawing.
- (b) Rasterize a line from (0,0) to (-7, 4)mm on a display which is mapped to approximately (680 × 550mm). The resolution of the screen is 1020 × 780 pixels. Calculate the intermediate pixel positions of this rasterization and represent them schematically drawing a suitable pixel matrix.

3 + (7 + 2) = 12

3. A triangle PQR has vertices at P (0, 0), Q (4, 0) and R (2, 3) as shown in Fig.1. It is to be translated by 4 units in X direction and 2 units in Y direction, then it is to be rotated in anti-clockwise direction about new position of point R through 90°. Find the new position of the triangle and represent it schematically before and after transformation.

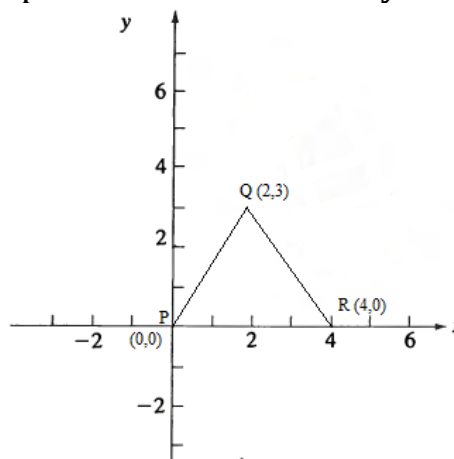


Fig.1

12

Group – C

4. Line L1 is passing through the points P1 (1, 7) and P2 (7, 2) and line L2 through P3 (1, 2) and P4 (6,8). Find the parametric equations for the lines. Also determine: (a) whether two lines are parallel or perpendicular, (b) the point of intersection of the two lines.
5. (a) How many types of surface generating methods are available in CAD?

(4 + 4 + 4) = 12

(b) Write in detail about the B-rep solid generation method in details.

3 + 9 = 12

Group - D

6. For the truss in following Fig.2, a horizontal load of 10 kN is applied in x-direction at node 2.

Also consider $E = 207 \text{ GPa}$ and $A = 960 \text{ mm}^2$ for each member. Find out Global Stiffness matrix for this truss problem and write down the final FEA formulation.

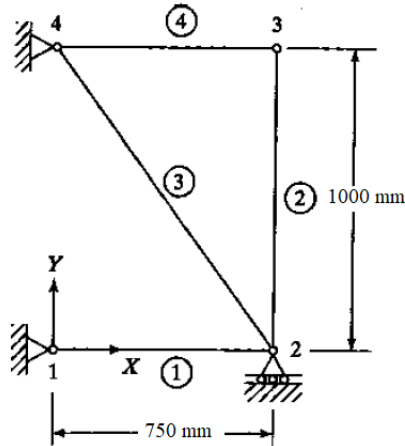


Fig.2

(9 + 3) = 12

7. Describe in detail about 'Pre-Processing' and 'Post-Processing' procedures in FEM.

(8 + 4) = 12

Group - E

8. (a) Explain the process of 'stereo lithography'.
 (b) Write a CNC program for the following Fig.3. All the dimension are in mm. Assume required parameters if necessary.

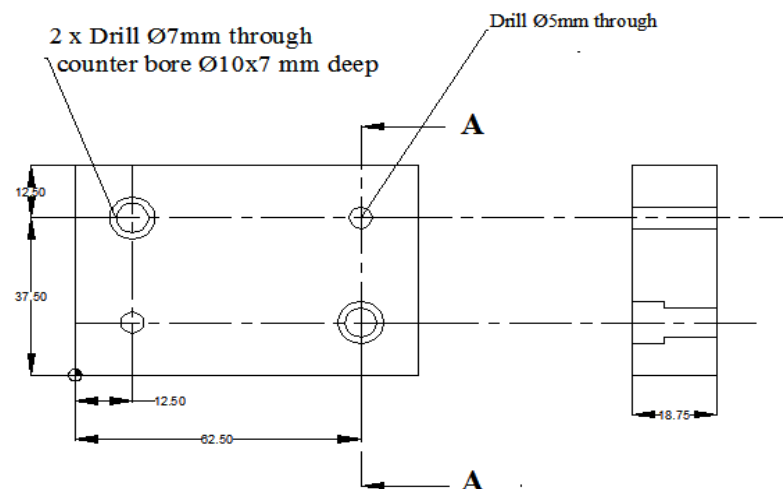


Fig.3

6 + 6 = 12

9. (a) Explain the applications of CAM in 'Manufacturing Planning'.

- (b) Write a CNC program of a turning centre of the Fig.4 shown below. Assume required parameters if necessary. All the dimension are in mm.

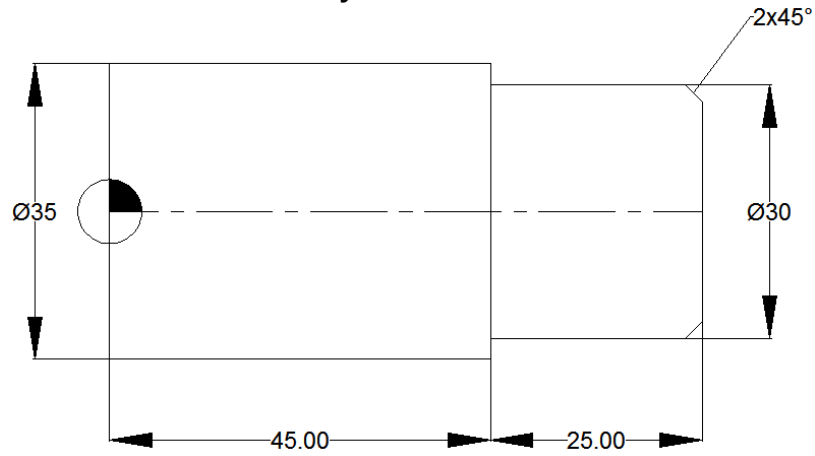


Fig.4

6 + 6 = 12

Department & Section	Submission Link
ME	https://classroom.google.com/c/MzY5NDkyNjc3MTU0/a/MzY5NDkyNjc3MjI0/details