

Total No. of Questions : 12]

SEAT No. :

P858

[Total No. of Pages : 4

[4458] - 431

B.E. (Mechanical) (Semester - I)

CAD/CAM & AUTOMATION

(2008 Course)

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates:

- 1) *Answer any THREE questions from each section.*
- 2) *Answers to the two sections should be written in separate answer books.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Figures to the right indicate full marks.*
- 5) *Assume suitable data, if necessary.*
- 6) *Use of pocket non programmable electronic calculator is allowed.*

SECTION - I

- Q1)** a) Write generalized 2D homogeneous transformation matrix and its forms. [5]
- b) A triangle PQR having co-ordinate points P(10, 15), Q (40,15) and R (30,50). The triangle is to be reflected about arbitrary line $y = 0.4x + 2$. Determine concatenated transformation matrix and new co-ordinate points of the triangle. [8]
- c) What is computer graphics, explain need for mapping of geometric models. [5]

OR

- Q2)** a) Explain different type of co ordinate systems used in computer graphics. [5]
- b) A rectangle ABCD having co-ordinate points A (10,10), B (40,10) C (40,30) and D (10,30). Perform the following operations in sequence:
- i) Mirrored about arbitrary line $y = x$ and
 - ii) Rotate by 30° about arbitrary point 'A'.
- Write concatenated transformation matrix and new co-ordinate points of the rectangle. [8]
- c) Explain the general features of Open GL. [5]

P.T.O.

- Q3)** a) Compare Explicit and Implicit representation of curves and Enlist limitations of parametric representation over non parametric representations. [6]
- b) Given two lines L_1 and L_2 , end points for L_1 are $P_1 (2, 4, 6)$ and $P_2 (5, 6, 2)$ and end points for L_2 are $P_3 (1, 5, -2)$ and $P_4 (2, 8, 1)$. Determine: [10]
- Parametric equations of the lines.
 - Unit vectors in the direction of the lines.
 - Are the two lines parallel / perpendicular?

OR

- Q4)** a) Compare between feature based modeling and B-rep modeling techniques. [6]
- b) Plot the Bezier curve having end points $P_0(2, 2, 0)$ and $P_3 (3, 2, 0)$. The other points are $P_1 (2, 3, 0)$ and $P_2 (3, 3, 0)$. Plot for the value of $u = 0.0, 0.2, 0.4, 0.6, 0.8,$ and 1.0 . [10]
- Q5)** a) Derive an elemental stiffness matrix for two node 1D bar element. [6]
- b) Determine the nodal displacements, stresses in each element and support reactions of the axially loaded bar as shown in figure 1. Take $E = 200$ GPa and $P = 30$ kN. [10]

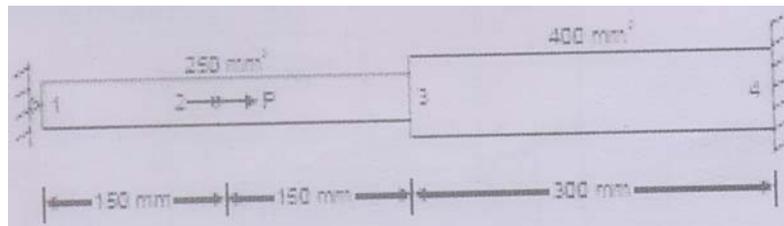


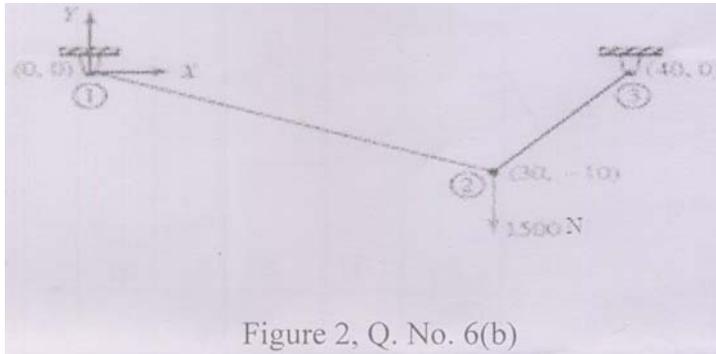
Figure 1, Q. No. 5(b)

OR

- Q6)** a) Explain the assembly of elemental equations and optimal node numbering system. [6]
- b) The plane truss shown in figure 2 subjected to a downward vertical load at node 2. The cross sectional area of both the element is 30 mm^2 and $E = 2.1 \times 10^5 \text{ N/mm}^2$. [10]

Determine:

- i) Nodal displacements.
- ii) Stresses in each element.
- iii) Reaction force at the supports.



SECTION - II

- Q7)** a) Explain the term “Adaptive control system” with suitable example. [6]
b) Write a CNC program in G and M codes for drilling the three holes in part as shown in the Fig3, also write remark for each block. [12]

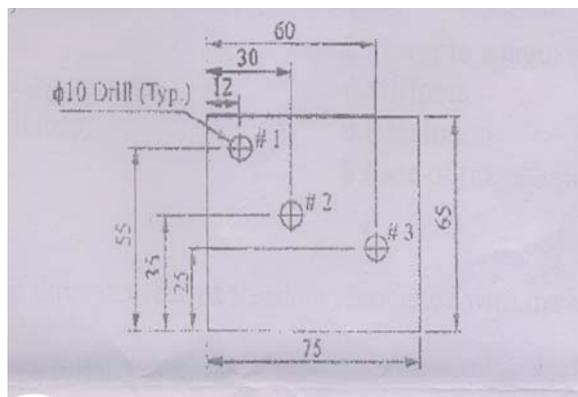
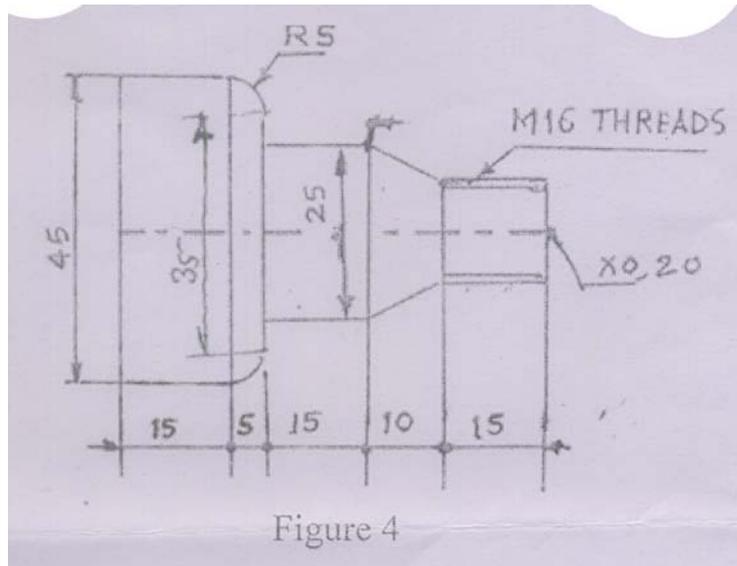


Fig. 3

OR

- Q8)** a) Write a CNC part program for the component as shown in Figure 4. by using G and M codes for Fanuc controller. Use canned cycle for roughing, finishing and threading operations. Raw material size is $\phi 45 \times 60$ mm. Assume suitable machining data for machining of mild steel (feed, speed, coolant etc). [12]



b) Write a short note on CIM. [6]

Q9) a) Define Automation. What are the different strategies in Automation? [8]

b) With neat sketch explain different layouts used in FMS? [8]

OR

Q10) a) Write a short note on Automated guided vehicles. [8]

b) State various work part transfer mechanism. Explain Geneva Mechanism with neat sketch. [8]

Q11) a) Explain the criteria for gripper design. [4]

b) Explain the rules for gripper design. [4]

c) Compare pneumatics, hydraulics and electrical actuators w.r.t. following points. [8]

- | | |
|--------------------------|----------------------------|
| i) Weight. | ii) Power to weight ratio. |
| iii) Operating pressure. | iv) Stiffness. |
| v) Compliance. | vi) Resolution. |
| vii) Cost. | viii) Ease of operation. |

OR

Q12) a) Explain the three degrees of freedom associated with the end effector (wrist) of Industrial Robot. [8]

b) Explain the following terms: [8]

- i) Payload.
- ii) Work envelope.
- iii) Resolution.
- iv) Repeatability.

