Exam Date & Time: 08-Dec-2023 (02:30 PM - 05:30 PM)

MANIPAL ACADEMY OF HIGHER EDUCATION

FIFTH SEMESTER B.TECH END SEMESTER EXAMINATIONS, DEC 2023

CAD-CAM [MME 3151]

Marks: 50 **Duration: 180 mins.**

A

Answer all the questions.

Instructions to Candidates: Answer ALL questions Missing data may be suitably assumed

1) A) A ruled surface is defined by two Bezier curves. One curve has control points $[3\ 5\ 6]^T$, $[6\ 4\ 8]^T$, and $[9\ 2\ 9]^T$. The other curve has control points $[2\ 9\ 5]^T$, $[5\ 6\ 1]^T$, and $[9\ 3\ 3]^T$. Assume the origin of the ruled surface parameters at the lower left corner of the surface, compute the coordinates of the point on the surface at v=0.690 and u=0.340. (5)

B) With the help of an example, explain the monocode system of coding structure used in GT. (3)

C) How 3D geometric modelling with booleon operation differs from 3D geometric modelling using boundary representation (2)

2) A) Write a part program on a Vertical Machining Centre, to generate a contour profile as shown in Figure 1. Size of the work piece given is 200 mm x 120 mm x10 mm. Depth of the contour = 3mm. Take cutter diameter = 3 mm. Depth of cut in each pass is limited to 1mm. (4)

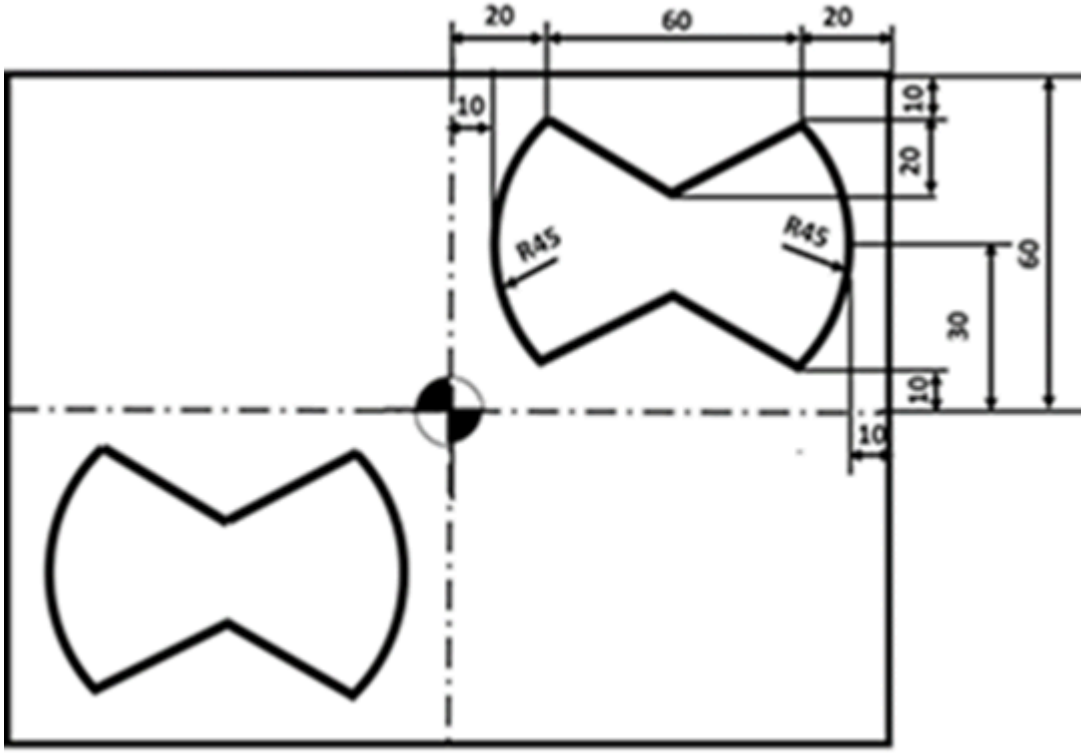

Figure 1

B) Explain how Adaptive Control Optimization can be applied with reference to machining of metals and alloys. (3)

C) With an appropriate sketch and from basic parametric equations, derive the recursive equations for an ellipse whose major and minor axes are parallel to global X axis and Y axis respectively (3)

3) Which types of flexibility must be satisfied by an Automated Manufacturing System with reference to FMS. (4)

A)

B) How non-contact method of inspection and testing is beneficial compared to contact method. List the instruments used for both. (3)

C) By applying properties of the Bezier curve, prove that the sum of Bernstein polynomials is always unity for any degree of the Bezier curve. (3)

4) A third order Bezier curve is defined by four control points. The coordinates of the control points are $P_0=[2\ 2\ 0]^T$ $P_3=[13\ 2\ 0]^T$. Write the equation for the resulting Bezier curve and find the coordinates of the control points P_1 and P_2 if the position vector corresponding to u=0.3, which is $P(0.3)= [5.83\ 4.33\ 0]^T$ and u=0.6, which is $P(0.6)= [8.55\ 4.16\ 0]^T$

A) (4)

B) With an example and appropriate diagrams, explain the three data structures used in CAD. (3)

C) (3)

How work cell control and Interlocks control the functioning of Industrial robots? Give an example.

5) A) A scaling factor of 3.5 is applied in the X direction while no scaling factor is applied in the Y direction to a line whose end points coordinates are (4, 5) and (-16, 9). Then the line is subsequently rotated through an angle of +50 degrees. All the transformation operations take place about the midpoint of the line. Determine the necessary transformation matrix for these sequential operations and find the new coordinates of the end points of the transformed line. (5)

B) Explain different types of continuities with reference to synthetic curves. (3)

C) With a flow / block diagram, differentiate the functioning of open loop CNC machines and closed loop CNC machines (2)

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