Reg. No.



AANIPAL INSTITUTE OF TECHNOLOGY

V SEMESTER B.TECH. (Mechanical / I&P Engineering) END SEMESTER EXAMINATIONS, NOVEMBER 2017

SUBJECT: CAD-CAM (MME-3103)

REVISED CREDIT SYSTEM (17/11/2017)

Time: 3 Hours

MAX. MARKS: 50

Instructions to Candidates:

✤ Answer ALL the questions.

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- Draw neat sketches using PENCIL only
- Missing data may be suitably assumed.
- 1A. Define CAD. With an appropriate block diagram explain how the conventional designing of the mechanical components improved with the help of computers. 4 marks
- **1B.** How 3D solid models with boolean operation differs from 3D solid models with 3 marks boundary representation.
- 1C. A rectangle with vertices (1,2), (3,2), (3,6) and (1,6) undergoes rotational transformation by 40° about the point (2,4). Determine the elements of the 3 marks transformation matrix and new coordinates of the rectangle.
- **2A.** A 3D surface is generated by revolving a bezier curve defined by the position vectors $P_0=[5 \ 7 \ 0]^T$, $P_1=[9 \ 11 \ 0]^T$ and $P_2=[7 \ 9 \ 0]^T$ respectively. The axis of revolution is located at a distance of 3 units along global X axis and parallel to 4 marks Y axis. Evaluate the coordinates of the point on the revolved 3D surface at u=0.65 and v= $\pi/4$.
- 2B. List any two uses of registers in CAD-CAM. List all the LAN configuration used in CAD-CAM. Suggest and draw a network configuration that can be used to share the database in a work space without a server.
- **2C.** Using parametric relationship, find the coordinates of points on the circumference for the 3^{rd} quadrant of an origin centered ellipse with major diameter of 24 units and minor diameter of 18 units. Take $\Delta u=30^{\circ}$ 3 marks
- 3A. Derive an expression for the tangent vector of a hermite cubic spline curve in the parametric form by applying appropriate boundary conditions5 marks

- 3B. In the equation of the line Y= mx + c, the slope of the line is 1.732 and the Y intercept is (0, 2). The vertices of a triangle are given by homogenous coordinates A(2 4 1), B(4 6 1) and C(2 6 1). Find the transformation matrices that will reflect the triangle about the line. Also find the new coordinates of the triangle.
- **4A.** Prove that for a Bezier curve of degree 4, the sum of all the Bernstein functions associated with the control points is equal to unity.
- **4B.** A Bezier curve is designed by considering the position vectors P_0 , P_1 , P_2 and P_3 sequentially. The endpoint position vectors of the curve are (1 3 0) and (7 5 0) respectively. The other control points are defined by the position vectors (5 6 0) and (6 1 0) sequentially. Compute the coordinates for u = 0.65 if the characteristic polygon is drawn in the sequence $P_0 \rightarrow P_1 \rightarrow P_2 \rightarrow P_3$. 3 marks
- 4C. Explain how the robot activities are coordinated and sequentially controlled?Explain with an example.3 marks
- **5A.** Explain Adaptive Control Optimization and Adaptive Control Constraints with respect to machining.
- **5B.** Explain any three types of FMS layout with neat sketches.
- 5C. The contour shown in Figure 5c is has to be cut in the 1st quadrant of the work piece. Write a CNC part program using subprogram concept to perform the mirroring operation to get the mirror image of the contour in the 3rd quadrant. Take the depth of the contour = 1mm. Take milling cutter of 10mm diameter.



3 marks

4 marks

4 marks

3 marks

Figure 5c.