Reg. No.



# MANIPAL INSTITUTE OF TECHNOLOGY

V SEMESTER B.TECH. (Mechanical / I&P Engineering) END SEMESTER MAKE-UP EXAMINATIONS, DECEMBER 2017

## SUBJECT: CAD-CAM (MME-3103)

#### **REVISED CREDIT SYSTEM**

#### Time: 3 Hours

MAX. MARKS: 50

### Instructions to Candidates:

- ✤ Answer ALL the questions.
- Draw neat sketches using PENCIL only
- ✤ Missing data may be suitably assumed.

1A.	With a block diagram explain how the conventional designing of the mechanical	
	components were done using Shigley's design process.	4 marks
1B.	With neat sketches explain the 3 methods of solid model generation using	
	sweep representation.	3 marks
<b>1C.</b>	With a neat sketch, derive the recursive equations of a parabola from its	
	parametric equations. The parabola is symmetrical about X axis	3 marks
2A.	Derive an expression for the position and tangent vector of a hermite cubic	
	spline curve in the parametric form by applying appropriate boundary	
	conditions	4 marks
2B.	Explain any three LAN configuration used in CAD-CAM to interlink the database.	3 marks
2C.	Using parametric relationship, find the coordinates of points on the	
	circumference for the $2^{nd}$ quadrant of an origin centered circle with radius $8$	
	units. Take $\Delta u=30^{\circ}$	3 marks
3A.	A ruled surface is defined by 2 bezier curves. One curve has control points	
	$P_0=[3 \ 4 \ 6]^T$ , $P_1=[5 \ 7 \ 7]^T$ , $P_2=[9 \ 8 \ 9]^T$ and $P_4=[7 \ 9 \ 8]^T$ . The other curve has	
	$P_0=[2 \ 3 \ 1]^T$ , $P_1=[4 \ 5 \ 2]^T$ , $P_2=[7 \ 7 \ 3]^T$ and $P_3=[9 \ 8 \ 4]^T$ as its control points.	
	Compute the coordinates of the point on the curve for u=0.4 and v=0.6.	5 marks
3B.	A line is defined by Y= (tan $40^{\circ}$ )X – 3. A triangle with the vertices (5, -5), (7, -5)	
	and (6,-6) is to be reflected about the line by using the 2D geometric	
	transformations sequentially. Compute the coordinates of the reflected triangle.	5 marks
4A.	Derive the equation of tangents at the first and last point for the Bezier curve	
	defined by 5 control points.	4 marks

- **4B.** A hermite cubic spline curve is designed by considering the position vectors  $P_0 = [1 \ 3 \ 0]^T$ ,  $P_1 = [5 \ 6 \ 0]^T$  and tangent vectors  $P_0' = [6 \ 1 \ 0]^T$  and  $P_1' = [7 \ 5 \ 0]^T$ respectively. Compute the X and Y coordinates on the curve for u = 0.75 3 marks
- **4C.** Explain any three robot configuration with neat sketches.
- **5A.** Explain Adaptive Control Optimization and Adaptive Control Constraints. 4 marks
- **5B.** Explain any three types of FMS layout with neat sketches.
- **5C.** Write a CNC part program to generate the profile shown in Figure 5c on mild steel work piece. Assume suitable length and diameter for the work piece. Initial position of the cutting tool and the axis is shown in Figure 5c.



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3 marks

3 marks

3 marks