Reg. No.										

MANIPAL INSTITUTE OF TECHNOLOGY

MANIPAL

(A constituent unit of MAHE, Manipal)

V SEMESTER B.TECH (MECHANICAL / I&P ENGINEERING)

END SEMESTER EXAMINATIONS, NOVEMBER 2018

SUBJECT: CAD-CAM [MME 3103]

REVISED CREDIT SYSTEM

Time: 3 Hours MAX. MARKS: 50

Instructions to Candidates:

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

1A. A mechanical component is designed by making use of a synthetic curve (defined by 4 control points) whose start and end points are coincident. The start point has the position vector $[2\ 3\ 0]^T$. The other control points are $[4\ 6\ 0]^T$ and $[8\ 12\ 0]^T$ respectively. Find the equation of the resultant Bezier curve. Compute the coordinates on the curve at its mid-point. **4M**

1B. With a neat sketch, explain how a CAD image is generated on the display terminal using Direct View Storage Technique (DVST). **3M**

1C. Sketch the work volume defined by any three types of industrial robots. **3M**

2A. A synthetic curve parameterized in *u* has the position vectors at its start and end points as $\overrightarrow{p_0} = 2\hat{\imath} + 3\hat{\jmath} + 5\hat{k}$ and $\overrightarrow{p_1} = 6\hat{\imath} + 7\hat{\jmath} + 10\hat{k}$ respectively. The tangent vectors to the curve at these points are given as $\overrightarrow{p_0'} = 1\hat{\imath} + 2\hat{\jmath} + 6\hat{k}$ and $\overrightarrow{p_1'} = -1\hat{\imath} + 2\hat{\jmath} + 4\hat{k}$ respectively. A surface is extruded from this curve along a vector starting at $\overrightarrow{p_0} = 2\hat{\imath} + 3\hat{\jmath} + 5\hat{k}$ and ending at $\overrightarrow{p_2} = 8\hat{\imath} - 6\hat{\jmath} + 1\hat{k}$, where $\hat{\imath}, \hat{\jmath}$ and $\hat{k}$ are the unit vectors along the x, y and z axes. Parameter *v* is considered along the direction of extrusion.

i. Compute the position vector of a point on the synthetic curve at 65% of its length.

ii. Compute the position vector of a point on the extruded surface at 40% length of extrusion corresponding to the point on the curve computed in (i). **4M**

2B. Derive the parametric equation for a 3D surface which is to be linearly swept between two space curves P(u) and Q(u). Take the parameter v along the direction of sweep. **3M**

2C. List different types of FMS layout. With neat sketches explain any two. **3M**

3A. A parallelogram is defined by the points (4, 8), (8, 15), (8, 8) and (12, 15). Reflect the parallelogram about the line Y= (0.3639*X) + 2 and compute the coordinates of the transformed parallelogram. **5M**

3B. Derive an expression for the position vector and tangent vector of a hermite cubic spline curve from fundamentals. **5M**

4A. With an example, explain Adaptive Control Optimization and Adaptive Control Constraints. **4M**

4B. Two ellipses are shown in Figure 1. Two points P and Q are corresponding to the parameter u = 60^0 with respect to the X-axis. Using Recursive equation of the ellipse find the distance (d) between P and Q.

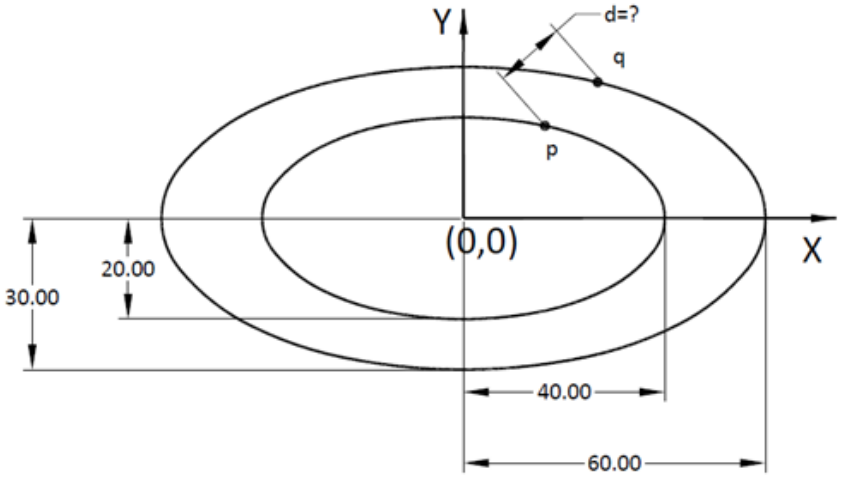

Figure 1 **3M**

4C. Explain any three Local Area Network configurations used in CAD system. **3M**

5A With a flow diagram, analyze how computers helped in improving the conventional design process **4M**

5B Explain any three non-mechanical grippers of industrial robots with neat sketches. **3M**

5C Write a CNC part program to perform the mirroring operation on the component as shown in the Figure 2. Depth of the contour = 1mm. Take cutter diameter = 3 mm. Size of the work piece is 100 mm x 100 mm x10 mm

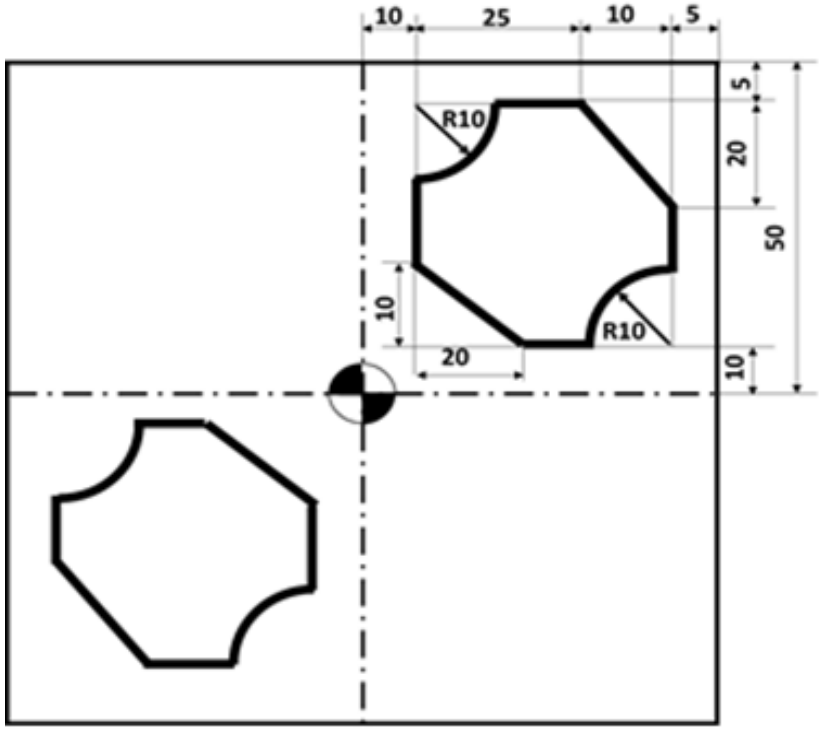

Figure 2 **3M**