MANIPAL INSTITUTE OF TECHNOLOGY

MANIPAL (A constituent unit of MAHE, Manipal)

## V SEMESTER B.TECH. (MECHANICAL ENGINEERING)

## END SEMESTER ONLINE EXAMINATIONS, JANUARY- FEBRUARY 2021

SUBJECT: CAD-CAM [MME 3151]

## REVISED CREDIT SYSTEM

Time: 3 Hours

MAX. MARKS: 50

## Instructions to Candidates:

- ✤ Answer ALL the questions.
- Draw neat sketches
- Missing data may be suitably assumed.
- **1A.** Differentiate relational database structure and hierarchical database structure 3M in CAD with appropriate diagrams
- **1B.** What is word address format of programming in CNC machines? What are 3M the five important "words" to be included in a block of information in a CNC program so that the program could be read by the control unit?
- **1C.** A unit square undergoes unary transformation. The table below shows the 4M vertices of the square before and after the transformation. Compute the elements of the transformation matrix.

Vertex	Original coordinates	Transformed coordinates
А	(0,0)	(0,0)
В	(1,0)	(6,1)
С	(1,1)	(8,4)
D	(0,1)	(2,3)

- 2A. The lower half of the elliptical curve drawn for an engineering design must be 2M divided into 12 equal parts. Find the coordinates of the division points on the curve for the initial 45<sup>o</sup> of the curve. Take major axis length=8 units and minor axis length=4units.
- **2B.** Suggest an appropriate and most efficient robot configuration which can paint 3M the inner surface of a hemispherical dome efficiently. The diameter of the dome is 30m and its thickness in 0.125m. The gripper also has to be designed which can hold a cylindrical paint spray gun with a nozzle. Draw the sketch of the robot configuration and the gripper, showing all its movements for carrying out the assigned task.
- **2C.** With an appropriate sketch derive the parametric equation for the position 5M vector of a hermite cubic spline curve from fundamentals.
- **3A.** Differentiate flat bed plotter from drum plotter. List different network 2M configurations used in CAD-CAM
- **3B.** Describe different types of coding system structure used in Group 3M Technology

- 3C. The coordinates of the control points of the first Bezier curve are [5 6 1]<sup>T</sup>, 5M [7 7 1]<sup>T</sup>, [9 8 1]<sup>T</sup> and [10 9 1]<sup>T</sup> respectively. The second curve has control points at [2 3 1]<sup>T</sup>, [3 4 5]<sup>T</sup> and [4 5 6]<sup>T</sup>. Compute the coordinates of the mid point on the ruled surface defined by the above curves. Take the domain of the surface in u and v directions as 0 (min) to 1(max)..
- **4A.** Write the most efficient CNC part program for machining the following profile 3M shown in Figure1. Assume suitable square blank geometry. The initial position of the cutting tool is at the center of the blank. Take the thickness of the blank=5mm.



Figure 1

- **4B.** With a flow chart explain how the application of computers has replaced the 3M last four phases of the conventional design process to make it more effective and efficient.
- **4C.** A polygon ABCDE with vertices A(4,3), B(4,8), C(6,10), D(8,8) and E(8,3) is 4M designed. Flip the polygon about an axis at 60 degrees and find the vertices of flipped polygon.
- **5A.** Show that the two successive scaling transformations with reference to any 3M geometry are multiplicative.
- **5B.** List and describe different types of AGV's used in FMS. Highlight the 3M usefulness / application area of each type of AGV.
- **5C.** What are the different quality inspection and testing methods adopted for 4M mechanical engineering components? Describe with an example for each.