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 2019

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 square ABCD of 5 units side is placed with the origin at the lower left corner as shown in Figure 1. The square has to be moved by 10 units down the inclined plane. The slope of the inclined plane is also shown in Figure 1. The coordinates of the square are A(0,0), B(5,0), C(5,5), and D(0,5). Find the new coordinates A_1,B_1,C_1 and D_1 after performing the necessary geometrical transformations.

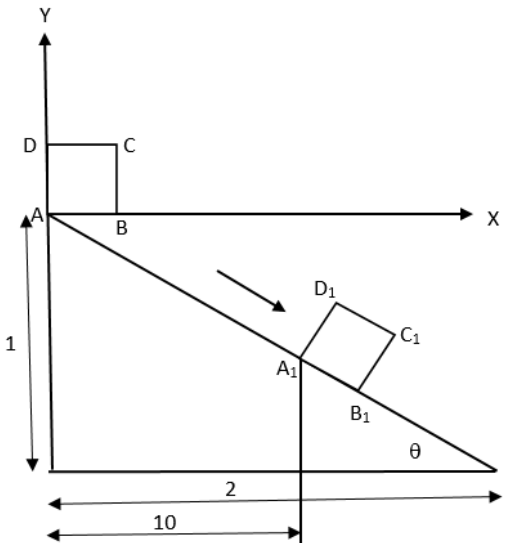

Figure 1 **4M**

1B. Explain the significance of Homogenous coordinate system and Concatenation principle of geometric transformation **3M**

1C. With suitable examples explain how Adaptive Control Constraints and Adaptive Control Optimisation made machines smarter and machining process optimum. **3M**

2A. A third order Bezier curve is defined by four control points. The coordinates of the control points are $P_0=[2\ 2\ 0]^T$ $P_3=[3\ 2\ 0]^T$. Write the equation for the resulting Bezier curve and find the coordinates of P_1 and P_2 if the position vector corresponding to u=0.5 is P(0.5)= $[2.5\ 2.75\ 0]^T$ and u=0.75 is P(0.75)= $[2.86\ 2.56\ 0]^T$ **4M**

2B. A Bezier curve is defined by the position vectors $[3\ 3\ 1]^T$, $[7\ 5\ 1]^T$, $[10\ 5\ 1]^T$ and $[16\ 6\ 1]^T$ is used to generate a tabulated surface. The position vectors at the end points of the generatrix are $[3\ 4\ 1]^T$ and $[3\ 4\ 10]^T$ respectively. Evaluate the co-ordinates of the points on the resultant surface at v=0.45 and u=0.6. **3M**

2C. A design engineer has a new conceptual design of a kinematic link in his mind. Explain how exactly the implementation of CAD system helps to bring his conceptual design into reality

3M

3A. Write a part program to generate contour as shown in the Figure 2 below on a Vertical machining centre. 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.

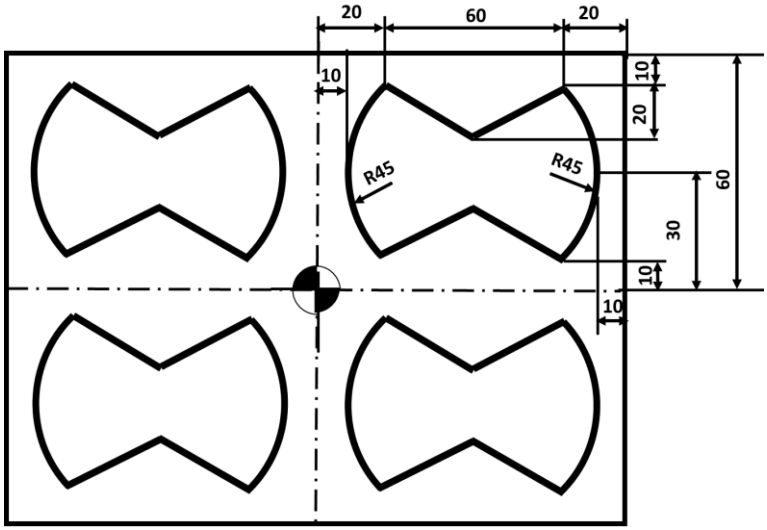

Figure 2

5M

3B. A glass panels manufacturing company is planning to implement industrial robots for handling of non tempered glass panels. It has difficulty in deciding the type of gripper to be attached on the end-effector of robot for handling of those parts. Suggest a suitable gripper for the present case. Also explain its working with a schematic diagram. After manufacturing, the glass panel has to be transferred to packaging section which is located on the other end of same unit using industrial robots only. Suggest and sketch suitable robot configuration showing the required movements.

5M

4A. A cubic spline has position vectors $G_0 = [5\ 6\ 0]^T$, $G_1 = [10\ 9\ 0]^T$ and tangent vectors $G_0' = [2\ 3\ 0]^T$ and $G_1' = [7\ 9\ 0]^T$ respectively. It is revolved around an axis parallel to global Y-axis, measured at a distance of 3 units along global X-axis to generate a surface. Evaluate coordinates of the points on the surface at u=0.5 and $\Phi = \pi/4$.

4M

4B. What are the advantages of C-Rep. (minimum 2 advantages). With appropriate diagrams and using C-rep Solid modelling technique efficiently, show the steps to create the mechanical solid model shown in Figure 3.

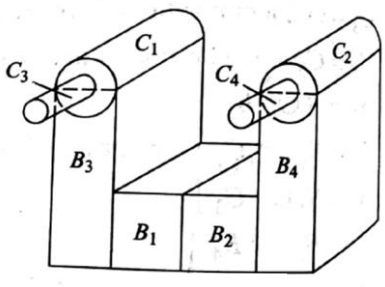

Figure 3

3M

4C. With the aid of line diagrams explain three different types of FMS layouts. **3M**

5A Find the centre point and radius of the circle passing through two points (12, 30) and (40, 60) defining its diameter. Using this generate the points on the circumference of the circle for the 3rd quadrant with an incremental angle of 30^{0} using parametric and recursive equations. **4M**

5B A surface is defined using two bezier curves with the aid of rulings. The position vectors of one of the bezier curve are $[7\ 7\ 0]^T$, $[4\ 9\ 5]^T$, $[10\ 12\ 10]^T$ and $[8\ 8\ 8]^T$. The position vectors of the other Bezier curve are $[3\ 4\ 6]^T$, $[5\ 7\ 7]^T$ and $[7\ 9\ 8]^T$. Compute the coordinates of the point on the ruled surface at u=0.48 and v=0.75. **3M**

5C With relevant sketches explain 3 types of LAN configuration used in CAD system **3M**