

GUJARAT TECHNOLOGICAL UNIVERSITY**BE - SEMESTER-VI (NEW) - EXAMINATION – SUMMER 2016****Subject Code:2162006****Date:13/05/2016****Subject Name: Computer Aided Design for Mechatronics****Time: 10:30 AM to 01:00 PM****Total Marks: 70****Instructions:**

1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.

Q.1 (a) What do you mean by Computer Aided Design (CAD)? Explain Product life cycle in CAD. **07**

(b) Differentiate between Vector display and Raster display. **07**

Q.2 (a) Using mid-point circle drawing algorithm determine coordinates of first five points following the point (0, r) for a circle with radius(r) 12 mm and centre (20, 20). **07**

(b) A line joining points P(20,10) and Q(25,14) is to be drawn using Bresenham's algorithm. Find the coordinates of intermediate pixels starting from point P. also write down the advantage of Bresenham's algorithm. **07**

OR

(b) Draw the flow chart for drawing a straight line between two points on a raster scan display using DDA algorithm. State the advantages and limitations of DDA algorithm. **07**

Q.3 (a) A quadrilateral ABCD has following coordinates: A(5,5), B(10,10), C(12,8), D(8,3). Calculate the new coordinates of the quadrilateral if: **07**

- a) It is translated by 10 units in X direction and 4 units in Y direction.
- b) It is rotated about the origin by 30° counter clockwise.
- c) It is reduced in size using a uniform scaling factor of 0.6
- d) It is reduced with a scaling factor $S_x=0.8$ and $S_y=0.5$

(b) Explain the four most popular graphic standards are GKS, PHIGS, PDES and IGES. Write the full form of these acronyms. **07**

OR

Q.3 (a) A triangle ABC has vertices A (15, 15), B (18,12) and C(15,20). This triangle is to be reflected about a line $Y= 4X+12$. Determine the new coordinates of the vertices. **07**

(b) With neat sketches explain the various Boolean operation used in CSG solid modeling. **07**

Q.4 (a) Prove that: If the first segment of a Bezier curve is formed by P0, P1, P2 and P3 and second segment is formed by P3, P4, P5, P6 and P7, then three points P2, P3 and P4 must be collinear, and satisfy the relationship: **07**

$$(P_3 - P_2) = (4/3)(P_4 - P_3).$$

(b) With neat sketch, explain Hermit cubic spline curve. Find parametric equation for Hermit cubic spline curve. **07**

OR

Q.4 (a) The end point of a Bezier curve are P₀ (1, 3) and P₃ (7, 2). The other control points of the Bezier curve are P₁ (5, 6) and P₂ (6, 0). $u= 0, 0.2, 0.4, 0.6, 0.8$ and 1. **07**

1. Determine the parametric equation of curve.

2. Plot the Bezier curve if the direction of polygon is P₀ – P₁ – P₂ – P₃

(b) State advantage and limitation of wire frame modeling and surface modeling. **07**

- Q.5** (a) What is design optimization? Explain its application in engineering design. **07**
(b) Find the dimensions of a cylindrical tin using the Lagrange multiplier method **07**
with top and bottom made up of sheet metal to maximize its volume such that
the total surface area is equal to $A_0=30\pi \text{ m}^2$.

OR

- Q.5** (a) Classification of optimization problems on various basis. **07**
(b) Write short notes on: **07**
1. Constructive Solid Geometry. (CSG or C-rep)
2. Boundary Representation. (B-rep)
