

**GUJARAT TECHNOLOGICAL UNIVERSITY****M. E. - SEMESTER – II • EXAMINATION – SUMMER • 2014****Subject code: 1722805****Date: 25-06-2014****Subject Name: Computer Aided Design for Machine Component****Time: 02:30 pm - 05:00 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)** Draw the flow chart and write Bresenham's algorithm for generation of circle. **05**  
**(b)** Reflect the diamond shaped polygon whose vertices are **09**  
 A (-1, 0), B (0, -2), C (1, 0) and D (0, 2) about,  
 (i) the horizontal line  $y = 2$   
 (ii) the vertical line  $x = 2$   
 (iii) the line  $y = x + 2$ .

- Q.2 (a)** What is the significance of homogeneous coordinates in geometric transformations? **07**  
**(b)** Distinguish Between Conventional Design and Computer Aided Design system with CAD architecture. **07**

**OR**

- (b)** What do you understand by composite transformations? Discuss with suitable examples. **07**

- Q.3 (a)** Describe in detail the structure of an IGES file. **07**  
**(b)** What do you mean by 2D and 3D wireframe modeling? Differentiate between wireframe modeling and solid modeling technique for CAD. **07**

**OR**

- Q.3 (a)** Differentiate between CSG and B-rep. **07**  
**(b)** Briefly discuss about B-spline curve and Bezier curve. **07**

- Q.4 (a)** State and explain the various properties of Bezier curves. **04**  
**(b)** Given  $B_0 [0,0]$ ,  $B_1 [1,3]$ ,  $B_2 [2,3]$ ,  $B_3 [4,1]$  and  $B_4 [3,0]$  the vertices of a Bezier polygon. Determine five points on the Bezier curve. Obtain the equation for a Bezier curve in the following matrix form for the above case. **10**  
 $P(t) = [T] [N] [G]$

**OR**

- Q.4 (a)** Explain clearly the difference between parametric and non parametric curves. **04**  
**Q.4 (b)** Considering the four two-dimensional position vectors  $P_1 [0 \ 0]$ ,  $P_2 [1 \ 1]$ ,  $P_3 [2 \ -1]$  and  $P_4 [3 \ 0]$  with tangent vectors  $P_1^0 [1 \ 1]$  and  $P_2^0 [1 \ 1]$ . Determine the piecewise cubic spline curve through them. Calculate intermediate points at  $t = 1/3, 2/3$  for each segment. **10**

- Q.5 (a)** Explain Johnson's method of optimum design stating basic steps and classification. **06**  
**(b)** Prepare an algorithm and write a C program for the design of helical spring. **08**

**OR**

- Q.5 (a)** Discuss the followings with respect to optimization: **06**  
 (i) Design variable (ii) Constraints (iii) Objective function

- (b) In light weight equipment, a shaft is transmitting a torque of 900 N.m and is to have a rigidity of 90 N.m/degree. Assume a factor of safety of 1.5 based on yield stress. Design the shaft with minimum weight. What will be the change in design for minimum cost? Assume maximum shear stress theory of failure. Use the following data for the materials: **08**

Material	Mass Density (kg/m <sup>3</sup> )	Material Cost (Rs./ N Weight)	Yield Strength (MPa)	Shear Modulus (GPa)
Steel	8500	16	130	80
Al. alloy	3000	32	50	26.7
Titanium Alloy	4800	480	90	40
Magnesium Alloy	2100	32	20	16

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