Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

M.E –Ist SEMESTER–EXAMINATION – JULY- 2012

Subject code: 710802N **Date: 07/07/2012**

Subject Name: Computer Aided Machine Design

Time: 2:30 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)**	Differentiate clearly between conventional design and computer aided machine design	**07**
	(b)	What is meant by a scan conversion? Explain Bresenham's circle drawing algorithm. Extend the same for an ellipse.	**07**
Q.2	**(a)**	A rectangle ABCD is represented by the vertices A(20,20), B(106.603, 70), C(81.603, 113.301), D(-5, 63.301). The rectangle is rotated by 30° clockwise about the vertex A. Determine the new vertex positions A', B', C', and D'. The transformed rectangle is then to be mirrored about a line joining the diagonal vertices A' and C'. Determine the new vertices of the rectangle.	**07**
	(b)	Explain geometric transformation. Compare point wise and entity based transformation.	**07**
		OR	
	(b)	Write a note on: -Wire frame modeling and surface modeling.	**07**
Q.3	**(a)**	Describe the concept of feature based modeling with significance. Give examples of softwares which incorporate such concept.	**07**
	(b)	Write a computer program for the design of a helical compression spring with all possible end conditions.	**07**
		OR	
Q.3	**(a)**	List representation schemes for solid models .Compare (i) β-rep (ii) Constructive solid geometry (CSG)	**07**
	(b)	Discuss the important features of Pro-Engineer solid modeling software.	**07**
Q.4	**(a)**	Explain B-spline curves giving its characteristics. Show blending functions for any case of your choice.	**07**
	(b)	Explain Bezier's surfaces and Ruled surfaces in brief.	**07**
		OR	
Q.4	**(a)**	The coordinates of the four points are given by: $P_0=[2\ 2\ 0]^T$, $P_1=[2\ 3\ 0]^T$, $P2=[3\ 3\ 0]^T$, $P3=[3\ 2\ 0]^T$. Find the equation of Bezier curve. Also find the points on the curve for u=0, 0.25, 0.5, 0.75 and 1.	**07**
Q.4	**(b)**	What are twist vectors? Why are they needed as input if four boundary curves are given for a bicubic surface?	**07**
Q.5	**(a)**	What do you mean by optimum design of machine elements? Explain this stating various examples	**07**
	(b)	Draw 2-D surface of constraints naming types of constraints and points. Explain design vector, design variable and constraints.	**07**
		OR	

Q.5 **(a)** Explain Johnson's method of optimum design stating basic steps and classification. **07**

(b) In a light weight equipment, a shaft is transmitting a torque of 900Nm and is to have a rigidity of 90Nm/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 following data for the materials: **07**

Material	Density (kg/m3)	Cost (Rs/Nweight)	Yield Strength(MPa)	Shear Modulus(GPa)
M_1	8500	16	130	80
M_2	3000	32	50	26.7
M_3	4800	480	90	40
M_4	2100	32	20	16

Use Formulae: $\frac{Mt}{J} = \frac{\tau_{max}}{r} = \frac{G\theta}{L}$

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