Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

M. E. IST Semester–Remedial Examination – July- 2011

Subject Name: Computer Aided Machine Design

Subject code: 710802N

Date:08/07/2011 **Time: 10:30 am – 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)** Explain 3D rotation, shear and reflection transformations. **07**

(b) A square has vertices A(1, 1), B(2, 1), C(2, 2), and D(1, 2). Calculate the coordinates of the vertices when the rectangle is rotated about B through an angle $\pi/4$. **07**

Q.2 **(a)** Describe the concept of feature based modeling with significance. Give examples of softwares which incorporate such concept. **07**

(b) Explain Bresenham's circle drawing algorithm. Extend the same for an ellipse. **07**

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(b) For a circle defined by $(X-12)^2 + (Y-12)^2 = 36$, determine pixel positions to be illuminated by displaying only the first quadrant. **07**

Q.3 **(a)** Explain B-spline curves giving characteristics. **06**

(b) Explain Bezier's surfaces along with the related blending functions in detail. **08**

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Q.3 **(a)** Give at least four examples of single and multi-objective optimization problems. **06**

(b) Explain clearly the difference between cubic spline and normalized cubic spline with examples. **08**

Q.4 **(a)** What are twist vectors? Why are they needed as input if four boundary curves are given for a bicubic surface? **05**

(b) Explain Bresenham's line drawing algorithm. **09**

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Q.4 **(a)** Describe ruled and tabulated surfaces in brief. **08**

(b) A hollow transmission shaft of length 500 mm is used to transmit a torque of 2 kN-m. The permissible angle of twist is 1^0. The density and modulus of rigidity of the shaft material can be taken as 8000 kg/m^3 and 80 GPa respectively. Design the shaft for minimum mass. Take shock and fatigue factor in torsion as 1.5 and allowable shear stress for the shaft as 140 MPa. Upper and lower limit of the shaft for outside and inside diameter is 80 mm and 40 mm respectively. **06**

Q.5 **(a)** From an algebraic form of a parametric cubic curve, deduce a generalized expression for Hermite curves. **07**

(b) Write a computer program for the design of a helical compression spring with all possible end conditions. Mention clearly the input and output parameters. **07**

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Q.5 **(a)** Draw a flowchart and write a computer program for the design of a flanged coupling. State all possible specified inputs and worked out parameters. **06**

(b) Write primary, subsidiary and limit equations for the optimum design of a shaft subjected to twisting moment and bending moment. Get the material selection factor for minimum weight. **08**

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