Seat No.: _____ *Enrolment No._____*

GUJARAT TECHNOLOGICAL UNIVERSITY

M.E Sem-I Examination January 2010

Subject code: 710802

Subject Name: Computer Aided Machine Design

Date: 07 / 04 / 2010 **Time: 12.00 noon – 02.30 pm**

Instructions: **Total Marks: 60**

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

Q.1 **(a)** Explain different activities of Computer Aided Engineering. Mention scope of Computer Aided Design. **06**

(b) What is meant by a scan conversion? Explain Bresenham's circle drawing algorithm. Extend the same for an ellipse. **06**

Q.2 **(a)** Explain three dimensional modeling in detail. **06**

(b) It is required to rotate a 3D point about any arbitrary line through an angle of 45^0. Write only the transformation matrices and the final form of the transformation. **06**

OR

(b) For a circle defined by $(X-10)^2 + (Y-10)^2 = 25$, determine pixel positions to be illuminated. Display only the first quadrant. **06**

Q.3 **(a)** Explain Bresenham's line drawing algorithm. **06**

(b) A(0,0), B(1,1) & C(5,2) are the vertices of a triangle ABC which is to be rotated at angle of 45^0 about (a) the origin and (b) about a point X(-1,-1).Give transformed coordinates of A,B and C for both the cases. **06**

OR

Q.3 **(a)** Draw a flowchart and write a program to design a hollow shaft. Consider all the possible cases in addition to strength and rigidity based design. **06**

(b) Write a program for the optimum design of a simple tensile bar of diameter 'd' , length 'L' which is subjected to a uniaxial tension P. **06**

Q.4 **(a)** Giving examples of each, explain the methodology for handling cases of normal, redundant and incompatible specifications for optimum design. **06**

(b) Formulate a problem designing shaft for optimizing power transmission capacity. Consider the effect of torque gradient 'K' of the shaft, stress concentration factor and maximum shear stress criterion of failure for shaft material. Assume the following limitations in doing so. **06**

Torque gradient : $K \geq K_{min}$
Diameter : $d \leq d_{max}$.
Length : $L_{min} \leq L \leq L_{max}$

OR

Q.4 **(a)** Explain the Johnson's method of optimum design of machine elements. Clearly describe interdependencies of different parameter groups. **06**

(b) Describe a procedure for the optimum design of a cantilever beam of diameter 'd' and length 'L' which is subjected to a vertical load 'P' and a twisting moment 'T' at its free end. Formulate the problem for maximizing strain energy absorbing capacity. Use different materials for the justification of your answers. **06**

Q.5 **(a)** From an algebraic form of a parametric cubic curve, deduce a generalized expression for Hermite curves. **06**

(b) What are twist vectors? Why are they needed as input if four boundary curves are given for a bicubic surface? **06**

OR

Q.5 **(a)** Explain B-spline curves giving its characteristics. Show blending functions for any case of your choice. **06**

(b) Explain Bezier's surfaces and Ruled surfaces in brief. **06**

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