Enrolment

GUJARAT TECHNOLOGICAL UNIVERSITY M. E. - SEMESTER – I • EXAMINATION – WINTER • 2014

Subject code: 710802N Subject Name: Computer Aided Machine Design Time: 10:30 am - 01:00 pm

Date: 02-12-2014

Total Marks: 70

Instructions:

- 1. Attempt all questions.
- 2. Make suitable assumptions wherever necessary.
- 3. Figures to the right indicate full mark.
- Q.1 (a) Explain different activities of Computer Aided Engineering. Mention scope 07 of Computer Aided Design and mention limitations in implementing the same.
 - (b) A \triangle ABC has coordinates A(15,15), B(18,12) and C(15,20). Determine the **07** new vertex positions if the triangle is
 - (i) Rotated by 90° clock-wise about vertex A
 - (ii) If it is mirrored about a line y = 4x + 12
- Q.2 (a) What is Homogenous Coordinate System? State its importance and write 07 the basic transformation matrix in homogenous coordinate system.
 - (b) What is meant by scan conversion? Explain Bresenham's algorithm for scan 07 converting a circle.

OR

- (b) Write an algorithm and a C program to scan convert a line with slope 07 m < 1 using Bresenhnam's algorithm.
- Q.3 (a) State and explain various properties of Bezier curves.
 - (b) Sate and explain in detail various types of geometric models. Cleary state 07 advantages and limitations of each of them.

OR

- Q.3 (a) Explain ruled surface, tabulated surface and surface of revolution in detail. 07
 - (b) The coordinates of four control points relative to a current WCS are given 07 by $B_0[2 \ 2 \ 0]^T$, $B_1[2 \ 3 \ 0]^T$, $B_2[3 \ 3 \ 0]^T$, $B_3[3 \ 2 \ 0]^T$. Find the equation of the resulting Beizer curve. Also find points on the curve for U = 0, 1/4, 1/2, 3/4, 1.
- Q.4 (a) List various CAD softwares available in the market. Discuss the points to 07 be considered for purchasing CAD software. How will you compare capabilities of two CAD softwares.
 - (b) Prepare an algorithm and write a C program for the design of a shaft. 07 OR
- Q.4 (a) List major CAD softwares available in the market. List and explain major 07 solid modeling facilities available in Pro/E software.
- Q.4 (b) Prepare an algorithm and write a C program for the design of a helical 07 spring.
- Q.5 (a) Explain Johnson's method of optimum design stating basic steps and 07 classification.

07

(b) A spur gear drive is to be designed for a minimum weight (neglect weight of other parts except gear). Input shaft speed is 350 rpm and output shaft speeds requirement are 500, 350, 250 rpm respectively. Input has a cluster of three gears which can match with a particular gear on the output shaft by shifting the lever to get desired speed. The distance between any two gears fitted on output shaft should be at least twice the width of the gear. The power to be transmitted by the pair should be at least 1 KW. The restriction on the number of teeth is minimum 16 and maximum 100. The transmission ratio of gear width to its module should be between 10 to 12. Assuming that all gears has the same modules, formulate the optimization problem to find the module and number of teeth on various gears.

OR

- Q.5 (a) Write short notes on
 - (i) B-rep
 - (ii) Constructive solid geometry
 - (b) Design a tensile bar of length 200 mm to carry a tensile load of 5 KN for 07 minimum cost, out of the following materials using Johnson's method.

Material	Mass Density	Material Cost	Yield Strength
	(kg/m^3)	(Rs / N Weight)	(MPa)
Steel	7500	16	130
Aluminum Alloy	3000	32	50
Titanium Alloy	4800	480	90
Magnesium Alloy	2100	32	20

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