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Printed Pages—5

ME—701

(Following Paper ID and Roll No. to be filled in your Answer Book)

PAPER ID : 4020

Roll No.

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B.Tech.

SEVENTH SEMESTER EXAMINATION, 2005-2006

COMPUTER AIDED DESIGN

Time : 3 Hours

Total Marks : 100

- Note :** (i) Attempt **ALL** questions.
(ii) All questions carry equal marks.
(iii) Assume missing data, if any and state assumption mode.
(iv) Be precise in your answer.

1. Attempt **any four** of the following questions : (5x4=20)

- (a) Describe the various design related tasks, which are performed by a modern computer aided design system.
(b) What are the benefits of computer aided design ?
(c) Write a program, in either C or C + + , to find the radius of a circle whose area is equal to a triangle with given sides. Use a function to evaluate the area of the triangle. Call the function through its pointer.
(d) Write a program to evaluate the series :

$$S = x - \frac{x^2}{3!} + \frac{x^5}{5!} - \frac{x^7}{7!} + \dots + (-1)^{n-1} \frac{x^{(2n-1)}}{(2n-1)!}$$

There should be provision for exit after achieving desired accuracy.

- (e) Explain the advantages of using object oriented programming (OOPs). Also, write the importance of OOPs over structured programming.
- (f) Write a program to get inverse of a matrix A , whose element a_{ij} are written in a file named a.dat. Write elements of the inversed matrix in a file named output.dat.

2. Attempt *any four* of the following questions : (5x4=20)

- (a) Explain the operating characteristics and some applications of plasma panels, Liquid crystal displays (LCDs) and digitizers.
- (b) What graphics functions are provided in a general purpose graphics package for creating and manipulating pictures? How a two dimensional scene is modelled in a device co-ordinate?
- (c) Write an algorithm and computer program for scan conversion of a line segment with starting point (x_s, y_s) and end point (x_e, y_e) , using Bresenham's line drawing Algorithm.
- (d) Scan convert a circle whose centre is at (10,20) and radius is 10 units. Write also the algorithm used.
- (e) The pyramid defined by the co-ordinate $A(0,0,0)$, $B(2,0,0)$, $C(0,1,0)$ and $D(0,0,1)$ is rotated 45° about the line L that has the direction $v = \hat{j} + \hat{k}$ and passing through point $C(0,1,0)$. Find co-ordinate of the rotated figure.

- (f) Perform a 60° rotation of triangle with vertices $A(0,0)$, $B(1,1)$, $C(5,2)$
- (i) about the origin
- (ii) about $P(-1, -1)$

3. Attempt *any two* of the following questions : (10x2=20)

- (a) What do you understand by interpolation and approximation splines ? Determine and plot the blending functions for Hermite spline. What are limitations of Hermite spline and how they are removed ?
- (b) Why Bezier splines are highly useful and convenient for curve and surface design ? What are the design techniques using Bezier curves ? Draw a Bezier curve with following control points $(1, 2)$, $(3, 4)$, $(6, -6)$, $(10, 8)$
- (c) Describe constructive solid geometry with suitable examples. How three dimensional objects having translational, rotational, or other symmetry are modeled ? Explain with suitable examples.

4. Attempt *any two* of the following questions : (10x2=20)

- (a) Write an algorithm and a general purpose computer program for design of a journal bearing.
- (b) Write an algorithm, as a guideline for helical spring design. With help of this algorithm design a closed-coil helical spring for a boiler safety valve which is required to blow off steam at the pressure of 1.6 N/mm^2 . The diameter of the valve is 50 mm. The initial compression of the spring is 40 mm and the lift is limited to 21 mm.

- (c) What are the functions of OSNAP command in Auto CAD ? What options are available in this command ? Write method of drawing the figure given in Fig.1 by Auto CAD. Enumerate the sequence of commands that will be used.

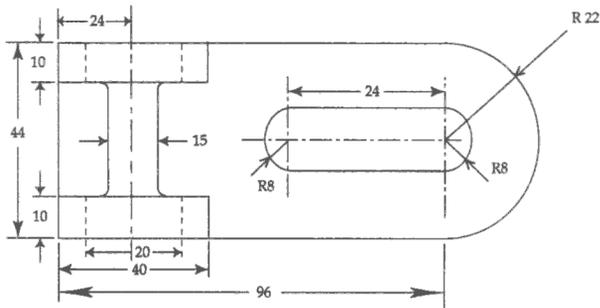


Fig. 1

5. Attempt *any two* of the following questions : (10x2=20)

- (a) A rocket is launched from the ground. Its acceleration measured every 5 seconds is tabulated below. Find the velocity and the position of the rocket at $t = 40$ seconds, using Simpson's rules. Write also the algorithm used.

t	0	5	10	15	20	25	30	35	40
a(t)	40.0	46.25	49.50	52.25	54.35	60.48	62.5	65.3	69.7

- (b) Find the minimum of the function $f(x) = x^3 - 3x^2 - 2x + 4$ within the range of (0,4) and accuracy 0.4. Write also the method used in the form of algorithm that can be used to write a computer program.

- (c) Determine the nodal displacements, element stresses and support reactions for the bar shown in Fig.2 cross-sectional areas are $A_1 = 250 \text{ mm}^2$ and $A_2 = 400 \text{ mm}^2$. Young's modulus $E = 200 \times 10^9 \text{ N/m}^2$

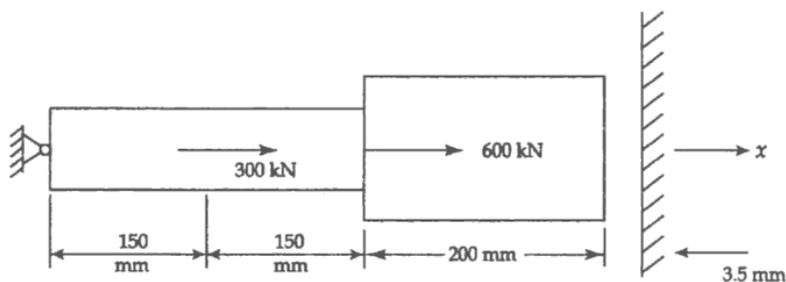


Fig. 2

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