

Seat
No.

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मासला - 003

Computer Aided Design (1020)

P. Pages : 2

Time : Three Hours

Max. Marks : 100

Instructions to Candidates :

1. Do not write anything on question paper except Seat No.
2. Answersheet should be written with blue ink only. Graph or diagram should be drawn with the same pen being used for writing paper or black HB pencil.
3. Students should note, no supplement will be provided.
4. Answer **any five** questions out of eight questions.
5. Neat diagram must be drawn wherever necessary.
6. Figures to right indicate full marks.
7. Use of electronic pocket calculator is allowed.
8. Assume suitable data, if necessary.

1. a) Explain how computer has proved to be useful in various stages of the design process. 10
b) Explain the graphics display applied in computer monitors. 10
2. a) Write DDA line drawing algorithm. 8
b) What does mapping mean ? What are various application for which mapping is used. 4
c) Find the transformed coordinates when a square [(1,1), (2,1), (1,2) and (2,2)] is rotated by 90° anticlockwise about a line passing through one of its vertex (1,1) and parallel to x-axis ? 8
3. a) Find the parametric equation of a Bezier curve defined by four control points $p_0 = (2,2,0)$; $p_1 = (2,3,0)$; $p_2 = (3,3,0)$ and $p_3 = (3,2,0)$. Also find the points on the curve for $u = 0.25$ and $u=0.5$, explain characteristics of the Bezier curve. 10
b) Find the coordinates of the hermite cubic curve at $u = 0.25$, when curve start from the (0,3) & ends up (4,2) with tangent at the start is defined by angle 45° AND 90° ? 10

4. The profit per acre of a farm is given by $20x_1 + 26x_2 + 4x_1x_2 - 4x_1^2 - 3x_2^2$
 Where X_1 and X_2 denote, respectively, the labor cost and the fertilizer cost.
 Find the values of X_1 and X_2 to maximize the profit. 20

5. a) Write algorithmic steps for parametric design of helical gear. 10
 b) Write algorithmic steps for design of disk brakes. 10

6. a) A rocket is launched from the ground. its acceleration is registered during 80sec and is given in table below. 10

t (sec)	0	10	20	30	40	50	60	70
a (m/sec ²)	30	31.63	33.44	35.47	37.75	40.33	43.25	46.69

Find the velocity and height of rocket at the end of 80 sec.

b) While testing a centrifugal pump of following data is obtained it is assumed to fit the equation $y = a + bx + cx^2$ where x is discharge in liter / sec and y is head in meter of water find the values of constants a , b and c .

X	2	2.5	3	3.5	4	4.5	5	5.5	6
Y	1.8	17.8	17.5	17	15.8	14.8	13.3	11.7	9

7. Consider a situation in which we have an internal temperature, θ_i , and an ambient temperature, θ_a with two resistances between them. An example of such a situation is your body. There is a (nearly) constant internal temperature, there is a thermal resistance between your core and your skin ($at\theta_s$), and there is a thermal resistance between the skin and ambient. We will call the resistance between the internal temperature and the skin temperature R_{is} , and the temperature between skin and ambient R_{sa} .

- a) Draw a thermal model of the system showing all relevant quantities.
- b) Develop a mathematical model (i.e., an energy balance).
- c) Solve for the temperature of the skin if $\theta_i = 37^\circ\text{C}$, $\theta_a = 9^\circ\text{C}$, $R_{is} = 0.75^\circ/\text{W}$; for a patch of skin and $R_{sa} = 2.25^\circ/\text{W}$ for that same patch. 20
