Sl. No. of Ques. Paper	: **6193**	**F-5**
Unique Paper Code	: **2341503**	
Name of Paper	: **Computer Graphics**	
Name of Course	: **B.Tech. Computer Science**	
Semester	: **V**	
Duration :	: **3 hours**	
Maximum Marks	: **75**	

(Write your Roll No. on the top immediately on receipt of this question paper.)

The question paper consists of two Sections. Section A is compulsory.
Attempt any four questions from Section B.

SECTION A

1. (a) Consider a raster system with a resolution of 250×250. For a 10×11 screen, find the radius of each pixel.   3

    (b) What is interlacing?   2

2. (a) Differentiate between DDA and Bresenham Line Drawing algorithm.   3

    (b) Discuss any *two* methods to draw a thick primitive.   2

3. (a) Give the structure of Global Edge table used in Polygon filling algorithm.   2

    (b) Prove that two successive scaling operations are commutative.   3

4. (a) Show that the following 2d matrix represents a pure rotation: 3

$$\begin{bmatrix} \dfrac{1-t^2}{1+t^2} & \dfrac{2t^2}{1+t^2} \\[3mm] \dfrac{-2t}{1+t^2} & \dfrac{1-t^2}{1+t^2} \end{bmatrix}$$

    (b) What is the value of Center of Projection w.r.t. parallel and perspective projection?   2

5. (a) Give the 3D rotation matrices for rotation by α, β and γ about X-axis, Y-axis and Z-axis respectively.   3

    (b) Why is depth sort algorithm also known as Painter's algorithm?   2

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6. (a) What are the properties of Bezier curve?   2

   (b) What do you mean by ambient reflection and diffuse reflection?   3

7. (a) What is the difference between Y in CMY and Y in YIQ color models respectively?   2

   (b) How does the frame spacing control the motion simulated in an animation scene?   3

SECTION B

8. (a) Indicate raster positions that would be chosen while scan converting region 1 of an ellipse with major axis as 8 and minor axis as 5. The ellipse is centered at origin.   6

   (b) Briefly explain the working of Liquid Crystal Display.   4

9. (a) Use the Cohen Sutherland algorithm to clip line P1 (70, 20) and P2 (100, 10) against a window lower left hand corner (50, 10) and upper right hand corner (80, 40).   6

   (b) Consider the polygon with vertices A (2, 3), B (8, 3), C (8, 6), D (10, 6), E (10, 9) and F(5, 9). Write steps to fill this polygon using Odd-Parity rule.   4

10. (a) The coordinates of square ABCD are A (0, 0), B (0, 4), C (4, 4), and D (4, 0). Scale it to half the size w.r.t. the fixed point that is the center of the square.   5

    (b) What are rigid body transformations? Determine the conditions under which the generalized 2×2 transformation matrix represents a rigid body transformation.   5

11. (a) Write the 3D transformation matrices for the following:

    (i) Uniform scaling by a factor of 2 w.r.t. the fixed point (1, 1, 2, 1).   3

    (ii) Translation right by 2 units and up by 4 units.   2

    (iii) Rotate about X-axis by 30° followed by rotation about z-axis by 45°   2

    (iv) Two-point perspective projection on $z=0$ plane with Centre of Projection (COP) lying on X-axix as 2·0 and COP lying along y-axis as −1·0.   3

12. (a) Given a sequence of control points p0 (0, 0, 0), p1 (1, 2, 0), p3 (3, 1, 0). Write a formula for the Bezier curve formed from above three points. Use the formula to calculate the point $t = 1/3$ and the tanget at that point. 5

(b) Define morphing. Specify the rules to equalize the set of edges in key frames K and K + 1. 5

13. (a) Differentiate between halftoning and dithering. 4

(b) List the data structures used in Z-buffer algorithm for visible surface determination, along with the description of the values stored in them. 3

(c) Briefly explain the Gourand shading model. 3

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