

[This question paper contains 6 printed pages.]

Your Roll No.....

Sr. No. of Question Paper : 2212

IC

Unique Paper Code : 32341602

Name of the Paper : Computer Graphics

Name of the Course : B.Sc. (H) Computer Sc.

Semester : VI

Duration : 3 Hours

Maximum Marks : 75

Instructions for Candidates

1. Write your Roll No. on the top immediately on receipt of this question paper.
2. Section A is compulsory.
3. Attempt any **four** questions from Section B.
4. Parts of a question must be answered together.

Section A

1. (a) What is the condition for trivial rejection of a line segment PQ with $P(0,5)$ & $Q(1,5)$ in Cohen Sutherland Line Clipping algorithm using rectangular window defined by vertices $A(0,0)$, $B(1,0)$, $C(1,1)$, and $D(0,1)$. (3)

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- (b) Consider a Bezier Curve with end point P1 and P4 in x direction as 3 and 7 respectively. The two intermediate control points P2 being 5 and P3 being 6 in x direction. What will be the magnitude of starting tangent vector R1 and magnitude of ending tangent vector R4 in x direction? (3)
- (c) Suppose we have a video monitor with a display area that measures 12 inches across and 9.6 inches high. If the resolution is 1280 by 1024 and the aspect ratio is 1:1, what is the diameter of each screen point? (3)
- (d) What should be the pattern of frame spacing in order to simulate
- (i) Negative acceleration in an animation scene?
 - (ii) Positive acceleration in an animation scene?
 - (iii) Constant acceleration in an animation scene? (3)
- (e) Explain why a CMY color model is a subtractive color model. What does C, Y and M in this color model represent? (3)

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- (f) How can you compute the depth value $Z(x,y)$ in z-buffer algorithm. Using incremental calculations find out the depth value $Z(x+1, y)$ and $Z(x, y+1)$. (3)
- (g) Using homogeneous co-ordinates, write the transformation matrix in order to double the size of an object. Use overall scaling. (3)
- (h) What is dithering? What is its advantage over half toning? (3)
- (i) What is anti-aliasing? Give any two techniques to avoid aliasing in a line. (3)
- (j) Consider a rectangle ABCD with A(5,5), B(10,5), C(10,10) and D(5,10). Using Odd parity rule, discuss whether the following horizontal lines of the rectangle will be drawn or not?
- (i) AB
- (ii) CD (3)
- (k) Indicate the next raster positions which will be chosen by Bresenham's line algorithm when scan converting a line from screen co-ordinate (1, 1) to (3, 2). (3)

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- (l) State any two differences between parallel and perspective projection. (2)

Section B

2. (a) Show that a 2D reflection through x axis, followed by a 2D reflection through the line $y=x$, is equivalent to a pure rotation about the origin. (4)
- (b) Using the mid-point circle drawing algorithm, scan convert the first quadrant of a thick circle with centre at (0, 0), radius of 5 units and thickness of 2 units. Give first four raster positions. (6)
3. (a) Derive the specular reflection equation at a surface point using Phong specular reflection model. (4)
- (b) Using Sutherland Hodgeman polygon clipping algorithm, clip the triangle ABC with the vertices as A(10,17), B(13,12), and C(3,8), against a rectangular window P(5,5), Q(15,5), R(15,15), and S(5,15). Give the co-ordinates of the clipped polygons. (6)

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4. (a) Consider a triangle ABC with vertices A(1,0), B(0,1), and C(-1,0). Reflect it about the line $y=x$ followed by counter clockwise rotation of 90° , keeping point B fixed. Give the new co-ordinates of the triangle after transformation. (6)

- (b) A unit square is transformed by 2X2 transformation matrix. The resulting position vectors are as shown below. Give the transformation matrix applied to the unit square?

$$\begin{bmatrix} 0 & 2 & 8 & 6 \\ 0 & 3 & 4 & 1 \end{bmatrix} \quad (4)$$

5. (a) In a chromacity diagram of a RGB color model, define complementary colors and pure colors. (4)

- (b) Differentiate between trimetric and isometric axonometric projections. (3)

- (c) List and explain the data structures used in scan line fill algorithm. (3)

6. (a) Derive the Basis Matrix for parametric cubic Hermite Curves. Also, obtain its blending functions. (5)

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- (b) Explain Warnock's Area Sub Division algorithm for visible surface determination. Does it use edge coherence or area coherence? (5)
7. (a) Specify the rules to equalize the set of edges in key frames 'k' and 'k+1' in an animation scene. Using these rules, transform a triangle into a pentagon. (5)
- (b) Consider a triangle ABC with A(0,0), B(5,0) and C(0,5). Apply single point perspective projection onto $y=0$ plane from centre of projection at $y_c = -2$. Also, state the co-ordinates of the vanishing points. (5)

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