

22318

21222

3 Hours / 70 Marks

Seat No.

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15 minutes extra for each hour

- Instructions :**
- (1) All Questions are *compulsory*.
 - (2) Illustrate your answers with neat sketches wherever necessary.
 - (3) Figures to the right indicate full marks.
 - (4) Assume suitable data, if necessary.
 - (5) Mobile Phone, Pager and any other Electronic Communication devices are not permissible in Examination Hall.

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|---|-------------------|
| 1. Attempt any FIVE of the following : | 2 × 5 = 10 |
| <ol style="list-style-type: none">(a) Define graphics pipeline. Give stages of graphics pipeline.(b) Give any two advantages and disadvantages of random-scan.(c) Define augmented reality. Give any two types of it.(d) Define Frame Buffer.(e) Define stroke method. Write its characteristics.(f) Give matrix representation for 2D scaling.(g) List any four properties of homogeneous coordinate system. | |
| 2. Attempt any THREE of the following : | 3 × 4 = 12 |
| <ol style="list-style-type: none">(a) Differentiate between Bitmap graphics and vector based graphics.(b) Explain Even – Odd test method to test whether the point is inside the polygon or not.(c) Derive 2D transformation matrix for rotation with respect to arbitrary point.(d) Explain the concepts window, viewport and window-to-viewport transformation. | |
| 3. Attempt any THREE of the following : | 3 × 4 = 12 |
| <ol style="list-style-type: none">(a) Explain Boundry fill algorithm with pseudo-code.(b) Explain perspective projection with its any one type.(c) Explain any two methods for text clipping.(d) Write a C program to generate Hilbert's curve. | |

4. Attempt any THREE of the following : **3 × 4 = 12**

- (a) Define virtual reality. Explain components of it.
- (b) Consider the line from A(10, 2) to B(6, 8). Use DDA algorithm to rasterize this line.
- (c) A point (6, 4) is rotated anticlockwise by an angle 45° . Find the rotation matrix and resultant point.
- (d) Explain Sutherland – Hodgeman polygon clipping algorithm.
- (e) Explain the process of arc generation using DDA algorithm.

5. Attempt any TWO of the following : **2 × 6 = 12**

- (a) Consider a line from (4, 4) to (12, 9). Use Bresenham's algorithm to rasterize the line.
- (b) Show that transformation matrix for a reflection about the line $y = x$ is equivalent to reflection about x-axis followed by counter clockwise rotation of 90° .
- (c) Find the equation for the Bezier curve, which passes through control points (0, 0) and (-3, 2) and controlled by (6, 4) and (3, 1). Also find points on curve for $t = 0, 0.4, 0.8, 1$.

6. Attempt any TWO of the following : **2 × 6 = 12**

- (a) Derive an expression for decision parameter used in Bresenham's circle algorithm.
 - (b) Apply the shearing transformation to square with A(0, 0), B(1, 0), C(1, 1) and D(0, 1) as given below :
 - (i) shear parameter value of 0.5 relative to the line $Y_{\text{ref}} = -1$.
 - (ii) shear parameter value of 0.5 relative to the line $X_{\text{ref}} = -1$.
 - (c) Clip the line PQ having coordinates P(4, 1) and Q(6, 4) against the clip window having vertices A(3, 2), B(7, 2), C(7, 6) and D(3, 6) using Cohen Sutherland line clipping algorithm.
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