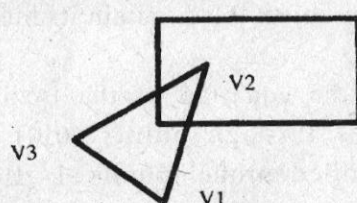(ii) Consider any 3D object, Write the transformations matrices to rotate it about y-axis by $\theta = -30°$, about x-axis by $\alpha = 45°$ and projected onto $z = 0$ plane from center of projection at $z_c = 2.5$. What will be the value of vanishing point? (5)

6. (i) 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)

(ii) Draw the four stages of the Sutherland-Hodgeman clipping algorithm as the polygon shown below is clipped by the right, top, left, and bottom clip rectangle edges. (5)

7. (i) List and explain the data structures used in Scan line Polygon filling algorithm. (3)

(ii) Discuss the architecture of raster display system with integrated display processor. (4)

(iii) Compute a 4×4 3D transformation matrix to rotate the triangle ABC having coordinates A(0, 0, 0), B(1, 1, 2) and C(1, 1, 3) by 90° about X-axis keeping B fixed. (3)

(3000)

[This question paper contains 4 printed pages.]

Your Roll No...............

Instructions for Candidates

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

2. The question paper consists of two sections.

3. **Section-A** is compulsory.

4. Attempt any **four** questions from **Section B.**
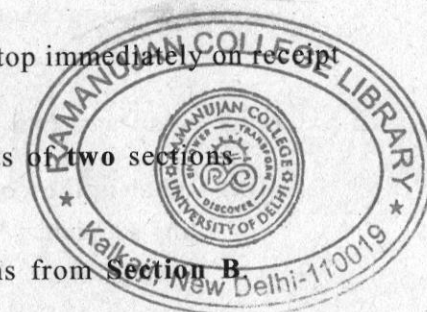
Section A

1. (i) Prove that two scaling transformations are commutative. (2)

(ii) How long would it take to load a 640×480 frame buffer with 12-bit per pixel if 10^5 bits can be transferred per second? (3)

P.T.O.

(iii) Derive 2D transformation that rotates a point by $\theta°$ about the origin. Write matrix representation for rotation. (3)

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

(v) Describe briefly the steps involved in design of animation sequence. (3)

(vi) What is RGB color model? (2)

(vii) Scan convert the first three coordinates of a line segment $P(1,1)$ and $Q(8,5)$ using Bresenham's mid-point line algorithm. (3)

(viii) State any two properties of Bezier curve. (2)

(ix) What is the condition for trivial rejection of a line segment LM with $L(0,5)$ & $M(1,5)$ 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)

(x) Name two techniques to generate color in a CRT. (2)

(xi) Magnify the triangle with vertices $A(0,0)$, $B(1,1)$ and $C(5,2)$ to twice its size keeping $C(5,2)$ fixed. (3)

(xii) Define resolution and persistence. (2)

(xiii) What are the three steps to fill a span in Scanline Polygon filling algorithm? (3)

(xiv) What is morphing? (2)

Section B

2. (i) Scan convert the first octant of a circle using midpoint circle algorithm whose radius = 8 and Centre is (0,0). (6)

(ii) Obtain the reflection of triangle ABC with vertices $A(0,1)$, $B(1,2)$ and $C(2,0)$ about the line $y = -x$. Use homogeneous coordinates. (4)

3. (i) Derive the Basis matrix for parametric cubic Bezier curve. Also, obtain its blending functions. (5)

(ii) Find the equation of the Bezier curve which passes through points $(0,0)$ and $(4,2)$ and controlled through points $(14,10)$ and $(4,0)$. (5)

4. (i) What do you mean by hidden surface removal? Explain depth buffer algorithm for visible surface determination. (6)

(ii) What is dithering? What are its advantages over halftoning? (4)

5. (i) Describe Phong interpolation shading method what are the merits and demerits of this method? (5)