

Q.1 a. Explain the color generation technique for cathode ray display device.

Answer:

Beam penetration method for random scan method. One electron gun
Shadow mask method for raster scan method. Uses three electron guns one for each color, screens coated with chemicals emitting red, green and blue colors. One shadow mask

b. Give the location of first four pixels of the line joining (0,0) and (5,6), use DDA algorithm.

Answer:

$$(0,0) (5,6)$$

$$dx = 5 - 0 = 5 \quad dy = 6 - 0 = 6$$

$$\text{length} = 6, \quad \Delta x = \frac{5}{6} = .833$$

$$\Delta y = \frac{6}{6} = 1$$

	x	y
(0,0)	0	0
	.833	1
(1,1)	1.666	2
(2,2)	2.499	3
(2,3)		

c. Derive the transformation matrix for reflection of a point along the line inclined at an angle of -45 degrees with positive direction of X-axis.

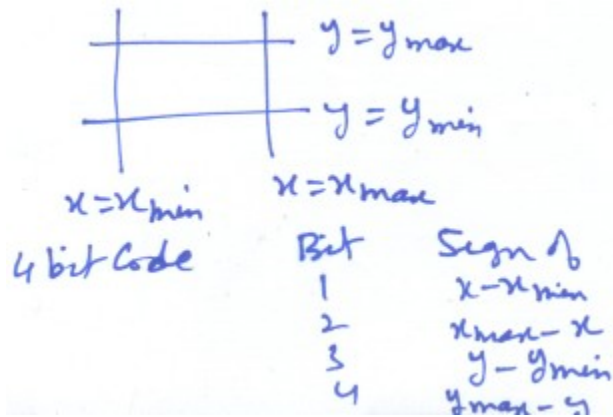
Answer:

$$\frac{1}{\sqrt{2}} \frac{1}{\sqrt{2}} \begin{bmatrix} 1 & 1 \\ -1 & 1 \end{bmatrix} \begin{bmatrix} 1 & 0 \\ 0 & -1 \end{bmatrix} \begin{bmatrix} 1 & -1 \\ 1 & 1 \end{bmatrix}$$

$$= \frac{1}{2} \begin{bmatrix} 0 & -2 \\ -2 & 0 \end{bmatrix} = \begin{bmatrix} 0 & -1 \\ -1 & 0 \end{bmatrix}$$

d. Explain the coding scheme of Cohen Sutherland line clipping algorithm.

Answer:



e. Define parametric and geometric continuity. Differentiate between them with the help of an example.

Answer:

If T_1 and T_2 are tangent vectors to the two curves C_1 and C_2 at their point of intersection. For first order of parametric continuity $T_1 = T_2$ and for geometric continuity $T_1 = k T_2$ $k > 0$.

Consider the curve $f(t)$ $0 \leq t \leq 1$
 $g(2t)$ $0 \leq t \leq \frac{1}{2}$

Now the parametric plots are same for $f(t) + g(2t)$

$$T_1 = f'(t)$$

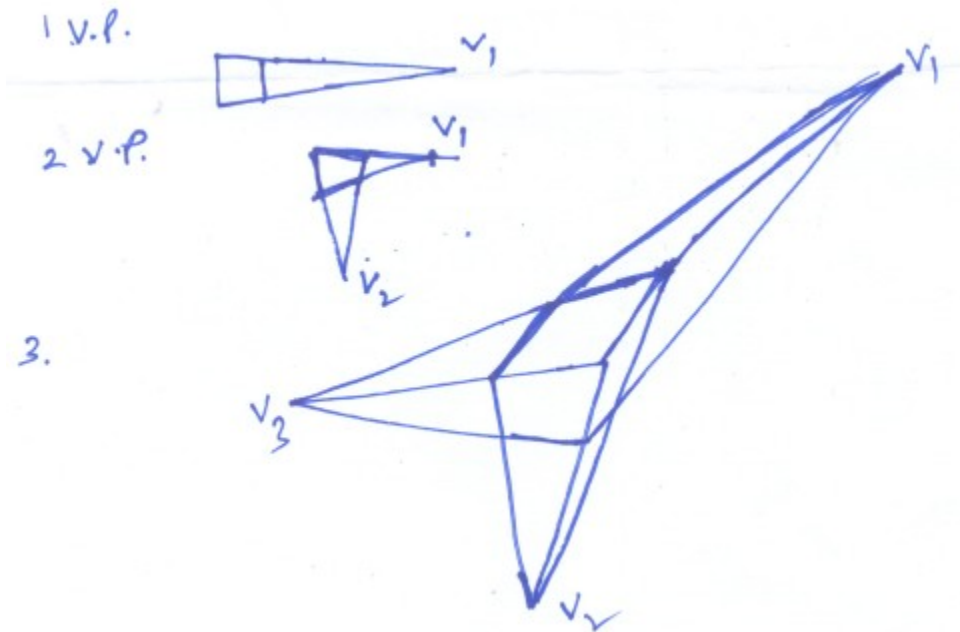
$$T_2 = 2g'(2t)$$

$$T_1 = 2T_2$$

$$T_1 \propto T_2$$

f. Depict diagrammatically one, two and three vanishing points.

Answer:



- g. What are the naming conventions in OpenGL for command name, constant and function. (7×4)

Answer:

< library prefix > < last command >
 < optional argument count >
 < optional argument types >
 prefix gl is used for command name
 GL for constant.

- Q.2 a. Explain the use of computer graphics in engineering and architectural system. (10)

Answer:

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- b. Write Bresenham's circle drawing algorithm in an octant. The centre of the circle is at origin and radius is r. (8)

Answer:

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- Q.3 a. Establish the transformation matrix for scaling of an object in 2D with respect to a fixed point (x_f, y_f) . (6)

Answer:

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- b. Give a method to identify a concave polygon giving an example. How can a concave polygon be split into convex polygons? (6)

Answer:

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- c. Explain scan line polygon fill algorithm. (6)**

Answer:

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- Q.4 a. What is the boundary condition for the Hermite curve? Give the derivation of the blending functions for the Hermite curve. (8)**

Answer:

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- b. Derive the condition for the parametric continuity of first order at the point of intersection of two cubic Bezier curve sections. (4)**

Answer:

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- c. Write two advantages of B-splines over Bezier curve. (3)**

Answer:

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- d. Define uniform periodic B-spline, give an example. (3)**

Answer:

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- Q.5 a. What are the various types of parallel projections? Explain each briefly. (6)**

Answer:

Orthographic parallel projection

Oblique parallel projection

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- b. Identify the various sweep techniques for generating 3D solids. (6)**

Answer:

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- c. Explain forward difference method for displaying curves. (6)**

Answer:

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- Q.6 a. Giving the computation of depth value, explain the depth buffer algorithm for detecting visible surfaces. What is its drawback? How is it removed? (10)**

Answer:

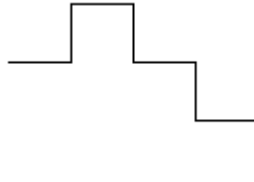
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- b. What is specular reflection? Explain the Phong's specular reflection model in detail. (8)**

Answer:

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- Q.7 a. What is fractal dimension? How is it determined? Calculate the dimension of fractal with generator.



and one segment length = 1/3.

(6)

Answer:

$$\frac{\log 5}{\log 3} = 3 \frac{\log 2}{\log 3}$$

- b. Explain the morphing used in animation.

(6)

Answer:

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- c. Write a short note on OpenGL.

(6)

Answer:

OpenGL is a software interface to graphical hardware consisting of commands used to specify the objects and various operations required to generate interactive 3D applications. It is an API. Two main header files that have to be included while programming in OpenGL is `gl.h` and `glu.h`. `glut.h` can also be used.

TEXT BOOKS

- I. Computer graphics with OpenGL by Hearn and Baker, Third Edition, 2009 (Indian Edition) Pearson Education