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SL.NO:CAA 203568

SRI SIVASUBRAMANIYA NADAR COLLEGE OF ENGINEERING

(An Autonomous Institution, Affiliated to Anna University, Chennai)
Rajiv Gandhi Salai (OMR), Kalavakkam - 603 110

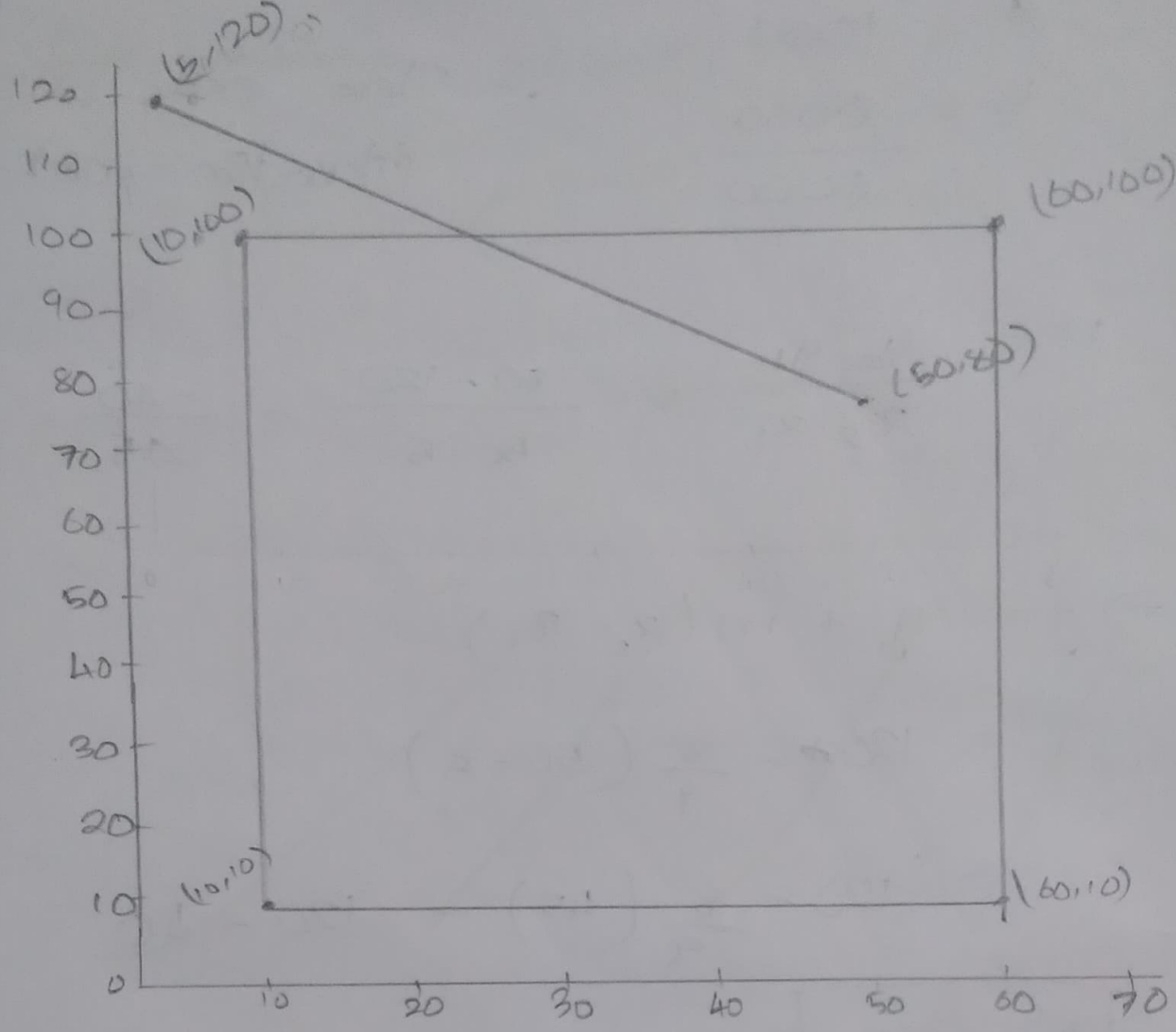
THEORY EXAMINATIONS

Register Number	205001085		
Name of the Student	Sabarivasan . V		
Degree and Branch	BE CSE	Semester	VII
Subject Code and Name	UCS1703 Graphics and Multimedia		
Assessment Test No.	II	Date	13/10/2023

Details of Marks Obtained									
Part A		Part B				Part C			
Question No.	Marks	Question No.	(a) Marks	(b) Marks	Total Marks	Question No.	(a) Marks	(b) Marks	Total Marks
1	0	7			4	10			7
2	0								
3	2	8			5	11			
4	2					12			2
5	2	9			4	13			
6	1								
Total (A)	7	Total (B)			13	Total (C)			9
Grand Total (A+B+C)	29				Marks (In Words)				
Signature of the Faculty									

PART-C

(12)



Binary codes

1001	1000	1010
0001	0000	0010
0101	0100	0100

$A = 1001$

$B = 0060$

0000

$\therefore$ There exists an intersecting point.

$$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{80 - 120}{50 - 5} = \frac{-40}{45} = \frac{-8}{9} //$$

$$\Rightarrow y' = y_1 + m(x_2 - x_1)$$

$$= 120 - \frac{8}{9}(50 - 5)$$

$$= 120 - \frac{8}{9}(45) = 120 - 40$$

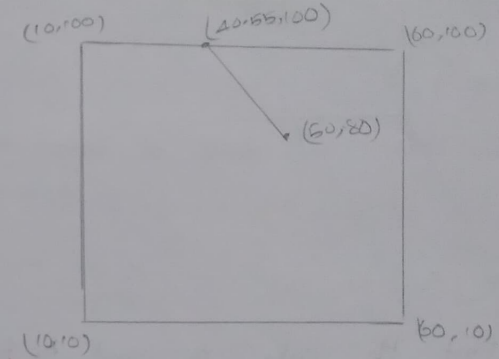
$$\boxed{y' = 80}$$

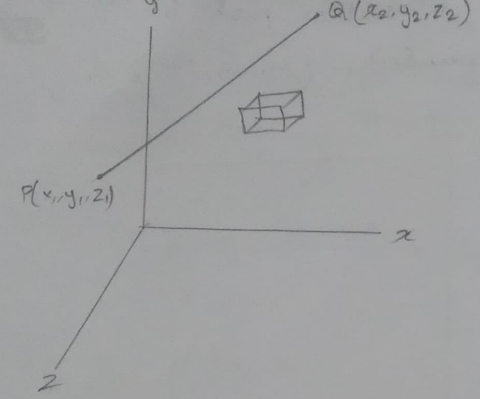
$$\Rightarrow x' = x_1 + m(y_2 - y_1)$$

$$= 5 - \frac{8}{9}(-40) = 5 + 35.55$$

$$\boxed{x' = 40.55}$$

$\therefore$ The intersection point is ~~(40.55, 80)~~. $(40.55, 100)$ //

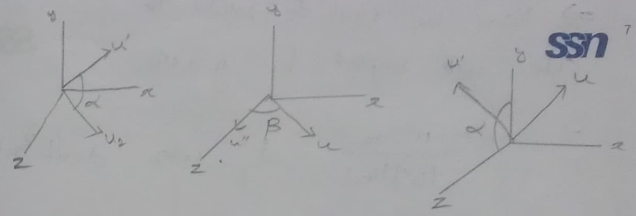




⇒ First the cube is need to be translated to be placed at the origin.

$$T(-x,-y,-z) = \begin{bmatrix} 1 & 0 & 0 & -x \\ 0 & 1 & 0 & -y \\ 0 & 0 & 1 & -z \\ 0 & 0 & 0 & 1 \end{bmatrix}$$

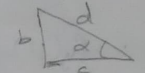
⇒ After translation, the cube is need to be rotated with respect to the principle axes.



⇒ We need to rotate the cube with respect to x-axis.

what is u, u', & u''

$$\Rightarrow \cos\alpha = \frac{u' \cdot u_2}{|u'||u_2|} = \frac{c}{d}$$



where $d = \sqrt{b^2+c^2}$

$$\Rightarrow u' \times u_2 = |u'||u_2|\sin\alpha = u \times b$$

$$\Rightarrow b = d\sin\alpha$$

$$\therefore \sin\alpha = b/d$$

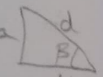
$$\therefore R_x(\alpha) = \begin{bmatrix} 1 & 0 & 0 & 0 \\ 0 & \cos\alpha & -\sin\alpha & 0 \\ 0 & \sin\alpha & \cos\alpha & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix} = \begin{bmatrix} 1 & 0 & 0 & 0 \\ 0 & c/d & -b/d & 0 \\ 0 & b/d & c/d & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}$$

⇒ Now we need to rotate the cube with respect to y-axis.

→ $\cos\beta = \frac{u'' \cdot u_2}{|u''||u_2|} = d$, where $d = \sqrt{L^2_{z2}}$

→ $u'' \times u_2 = |u''||u_2| \sin\beta = u_y(-\beta)$

→ $\sin\beta = -\alpha$



$$\therefore R_y(\beta) = \begin{bmatrix} \cos\alpha & 0 & -\sin\alpha & 0 \\ 0 & 1 & 0 & 0 \\ \sin\alpha & 0 & \cos\alpha & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}$$

$$= \begin{bmatrix} d & 0 & -a & 0 \\ 0 & 1 & 0 & 0 \\ -a & 0 & d & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix} //$$

⇒ Now rotate the cube with respect to z-axis by θ.

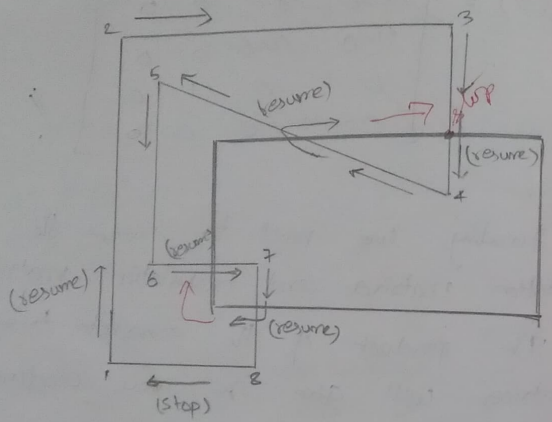
$$R_z(\theta) = \begin{bmatrix} \cos\theta & \sin\theta & 0 & 0 \\ \sin\theta & \cos\theta & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 0 \end{bmatrix} //$$

⇒ Finally we need to inverse the rotation matrices and translation matrices.

⇒ The product of the composite transformation matrices will give the new coordinates for the cube.

$$R(\theta) = \vec{T}(x,y,z)\, R_x(-\alpha)\, R_y(-\beta)\, R_z(\theta)\, R_y(\beta)\, R_x(\alpha)\, T(-x,-y,-z)$$

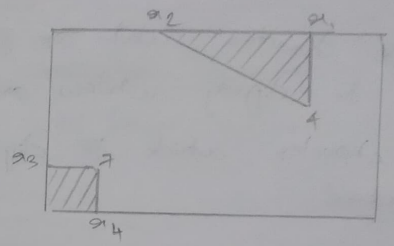
(7) Weiler - Atherton polygon clipping



⇒ While going from outside - inside, traverse via the polygon

⇒ While going from inside - outside, traverse via the window.

Final window



(8) Text clipping:

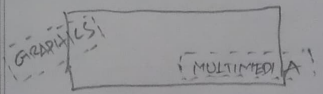
(i) All - None Text clipping

⇒ The texts are surrounded with boundaries.

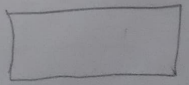
⇒ If the boundaries are within the clipping window, no changes are happened.

⇒ If the boundaries are partially or completely outside, remove the text.

Before clipping



After clipping

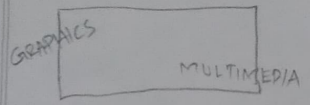


(ii) All None Characters Clipping

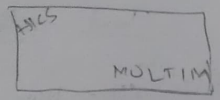
⇒ The characters which are present inside the clipping window are present.

⇒ The characters outside the clipping window is removed.

Before clipping



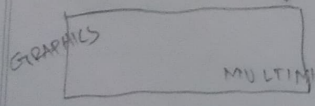
After clipping



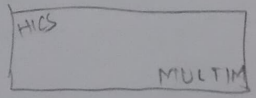
(iii) Characters Component Clipping

⇒ The characters are considered as components and the components which are present in the clipping window are present.

Before clipping



After clipping



(9) Reflection in 3D space

⇒ For reflection happening using xy plane matrix will be,

~~R = I~~

~~R(z) =~~

$$R(xy) = \begin{bmatrix} 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & -1 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix} \begin{bmatrix} x \\ y \\ z \\ 1 \end{bmatrix}$$

Similarly for yz plane reflection,

$$R(yz) = \begin{bmatrix} -1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix} \begin{bmatrix} x \\ y \\ z \\ 1 \end{bmatrix}$$

$$R(zx) = \begin{bmatrix} 1 & 0 & 0 & 0 \\ 0 & -1 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix} \begin{bmatrix} x \\ y \\ z \\ 1 \end{bmatrix}$$

(1) Exterior clipping

It is defined as the clipping happens from the exterior side. In order words.

(2) Sutherland-Hodgeman Polygon Clipping

(i) P is outside and Q is inside
→ save Q (Intersect and Q)

(ii) P is inside and Q is outside.
→ save PQ'

(iii) Both P and Q are outside
→ no changes.

(iv) Both P and Q are inside.
→ save Q.

(3)

$$\frac{x_v - x_{vmin}}{x_{vmax} - x_{vmin}} = \frac{x_w - x_{wmin}}{x_{wmax} - x_{wmin}}$$

W.K.T,

$$\frac{y_v - y_{vmin}}{y_{vmax} - y_{vmin}} = \frac{y_w - y_{wmin}}{y_{wmax} - y_{wmin}}$$

$$\Rightarrow x_v = x_{vmin} + (x_{vmax} - x_{vmin})\left(\frac{x_w - x_{wmin}}{x_{wmax} - x_{wmin}}\right)$$

$$x_v = x_{vmin} + (x_w - x_{wmin})\, s_x$$

where s_x is scaling factor

$$s_x = \left(\frac{x_{vmax} - x_{vmin}}{x_{wmax} - x_{wmin}}\right)$$

W.K.T,

$$y_v = y_{vmin} + (y_w - y_{wmin})\, s_y$$

where $s_y = \left(\frac{y_{vmax} - y_{vmin}}{y_{wmax} - y_{wmin}}\right)$

(4) Type of 3D object

↳ Blobby 3D object

Characteristics

(i) Changes shape based on environment

(ii) Changes its shape when in motion or contact with other objects

(5)

~~T(a,b,c) =~~

$$P' = \begin{bmatrix} 1 & 0 & 0 & a \\ 0 & 1 & 0 & b \\ 0 & 0 & 1 & c \\ 0 & 0 & 0 & 1 \end{bmatrix} \begin{bmatrix} x \\ y \\ z \\ 1 \end{bmatrix}$$

(6) 3D Display methods

(1) Parallel display method

Eg:. Clipping windows

(2) Depth cueing

Eg: Image analysis.

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(1) Exterior clipping

It is defined as clipping is done by exterior surface boundaries

Eg: Multiple windows placed on the above the other.