VCS 1703 - GRAPHICS AND MULTIMEDIA

ASSIGNMENT - 1

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CSE - A
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$x_{min} = 10$ $x_{max} = 20$ $y_{min} = 4$ $y_{max} = 9$

$P_1 (8, 8)$ $P_2 (16, 4)$

Soln:

$\Delta y = 4 - 8 = 6$

$\Delta x = 16 - 8 = 8$

$r_k = \frac{q_k}{p_k}$

$r_1 = \frac{q_1}{p_1} = \frac{x_1 - x_{wmin}}{-\Delta x} = \frac{8-10}{-8} = \frac{-2}{-8} = \frac{1}{4} = 0.25$

$r_1 = 0.25$

$r_2 = \frac{q_2}{p_2} = \frac{x_{wmax} - x_1}{\Delta x} = \frac{20-8}{8} = \frac{12}{8} = \frac{3}{2} = 1.5$

$r_2 = 1.5$

$r_3 = \frac{q_3}{p_3} = \frac{y_1 - y_{wmin}}{-\Delta y} = \frac{8-4}{-6} = \frac{4}{-6} = \frac{-2}{3} = -0.66$

$r_3 = -0.66$

$r_4 = \frac{q_4}{p_4} = \frac{y_{wmax} - y_1}{\Delta y} = \frac{9-8}{6} = \frac{+1}{6} = +0.166$

$r_4 = 0.166$

The value of r is greater than 1 in 2nd case and less than zero in third case.

So we Reject r_2 & r_3.

$u_{min} = \max(0, r_k)$ for all $p_k < 0$

$= \max(0, 0.25)$

$= 0.25$

$u_{min} = 0.25$

$u_{max} = \min(1, r_k)$ for all $p_k > 0$

$= \min(1, 0.166)$

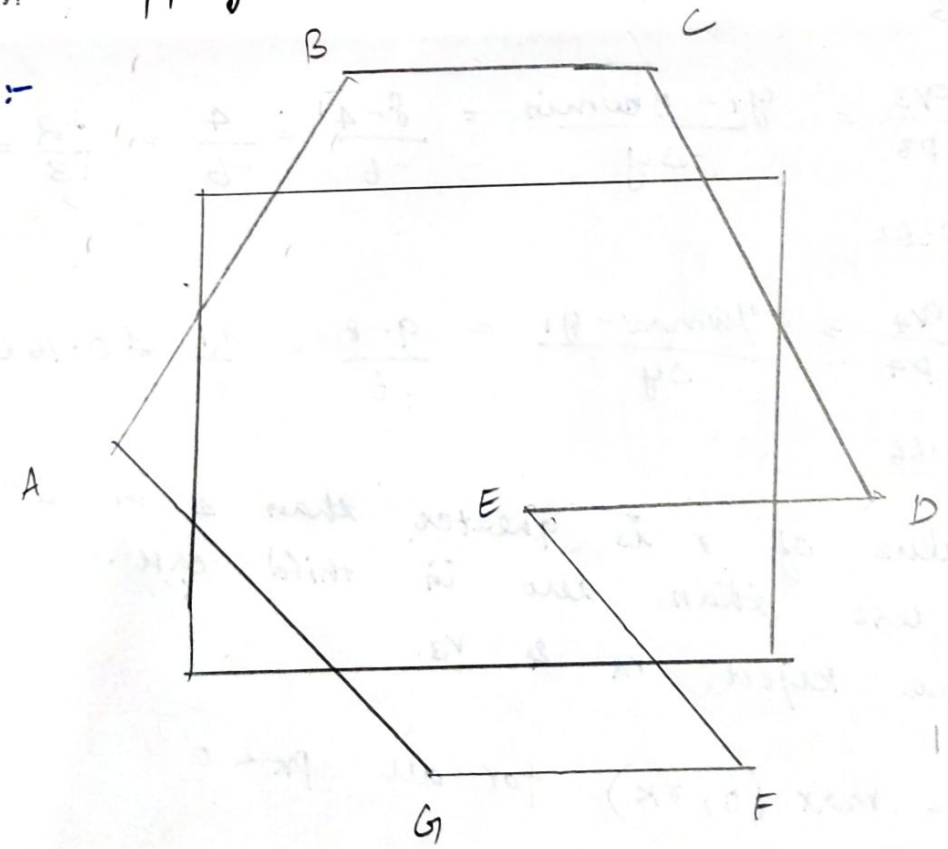
$= 0.166$

Here the condition $u_{min} < u_{max}$ is not satisfied.

Hence the line is rejected and the line connecting the points $P_1(8,8)$ and $P_2(16,14)$ is outside the clipping window.

(2) Polygon clipping Algorithm :-

given :-

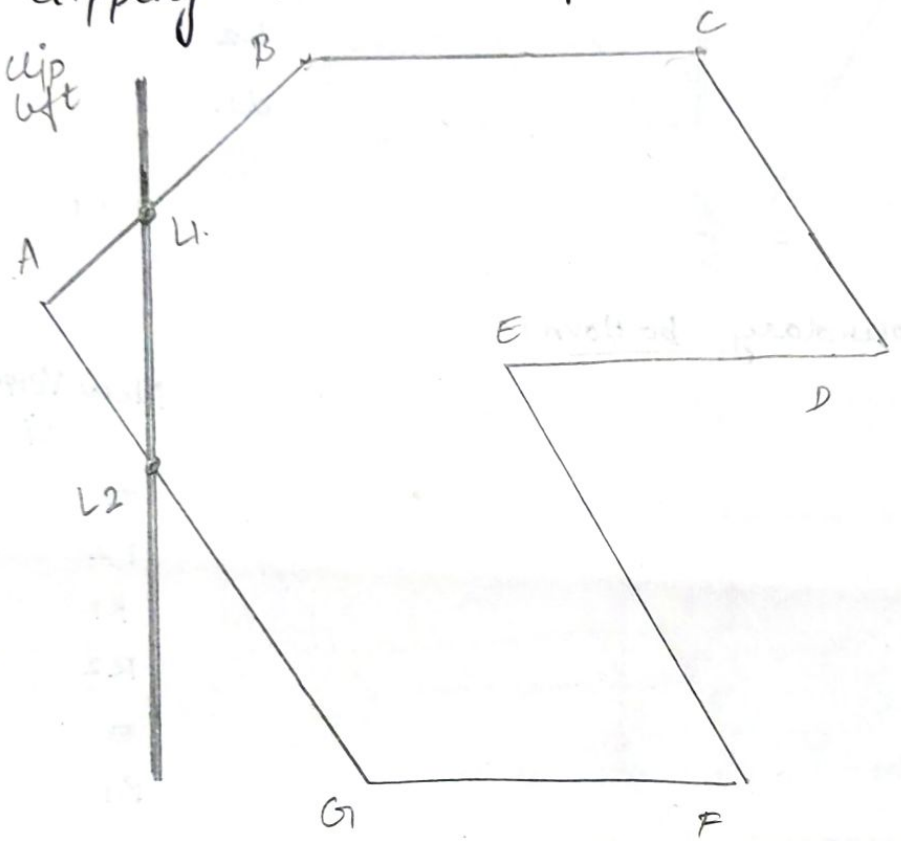


Rules:

If checking an adjacent pair of vertices (P, Q) to make a new vertex list, these are rules to be followed:

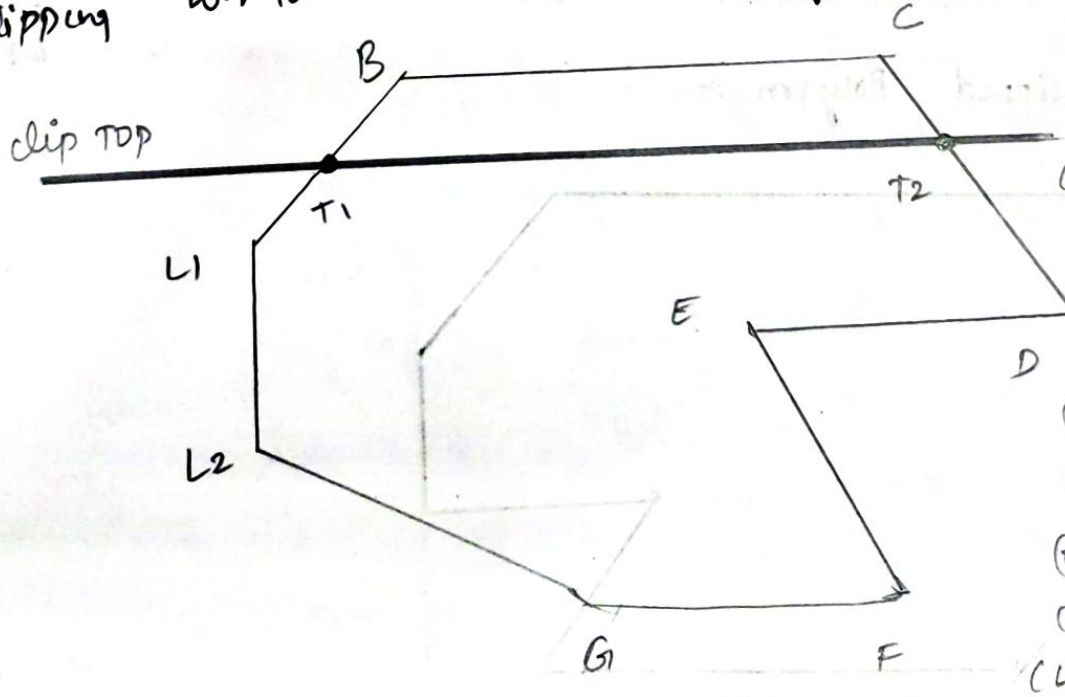
1. If P and Q are in, add Q
2. If P is in and Q is out, add the intersection point only with boundary
3. If both P & Q are out, add nothing.
4. If P is out and Q is in, add intersection with boundary and Q.

ii) Clipping wrt to left Boundary :-



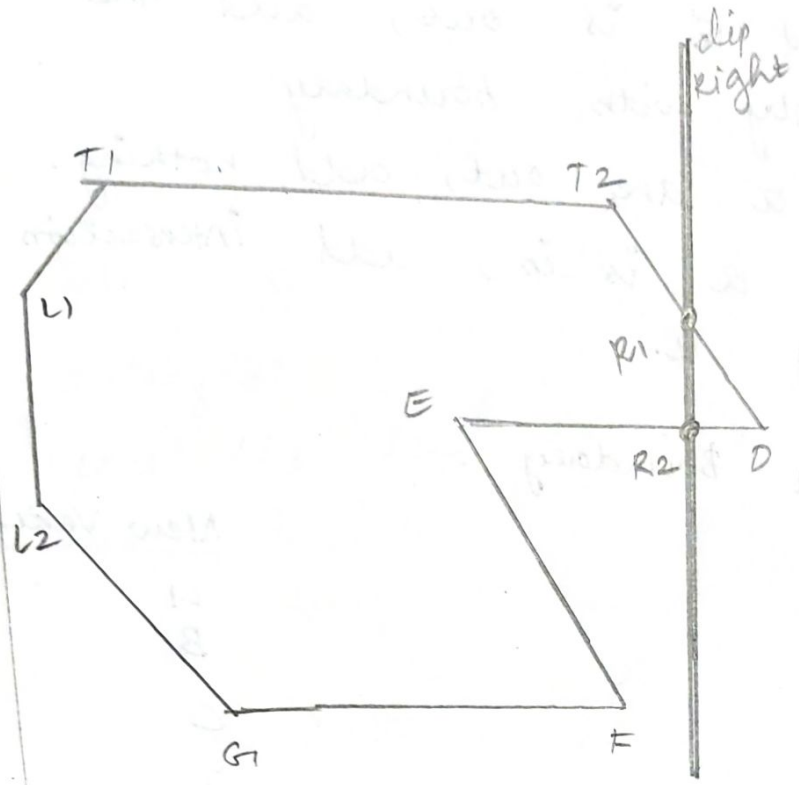
New Vertex list	
(A-B)	L1
	B
(B-C)	C
(C-D)	D
(D-E)	E
(E-F)	F
(F-G1)	G1
(G1-A)	L2

iii) clipping w.r.to the top boundary :-



New vertex list	
(L1-B)	T1
	T2
(B-C)	D
(C-D)	
(D-E)	E
(E-F)	F
(F-G1)	G1
(G1-L2)	L2
(L2-L1)	L1

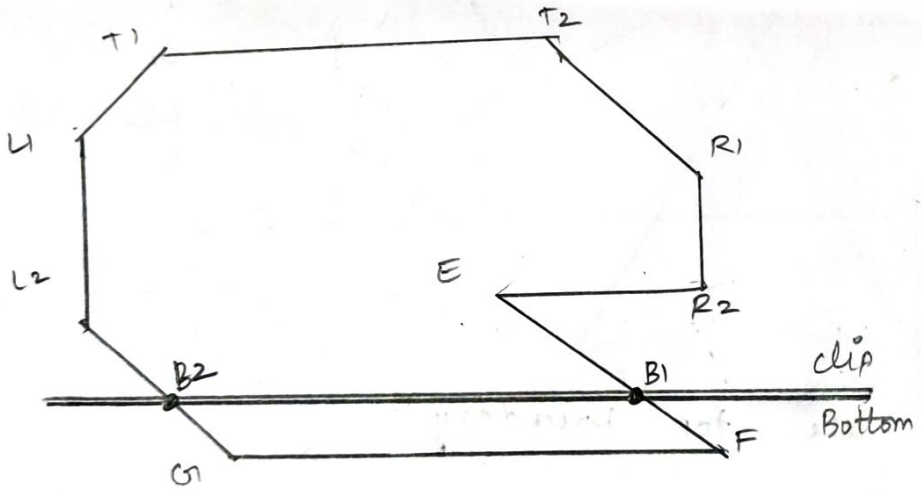
1) Clipping w.r.t boundary Right :-



New Vertex List

(L1 - T1)	T1
(T1 - T2)	T2
(T2 - D)	R1
(D - E)	R2
(E - F)	E
(F - G1)	F
(G1 - L2)	G1
(L2 - L1)	L2

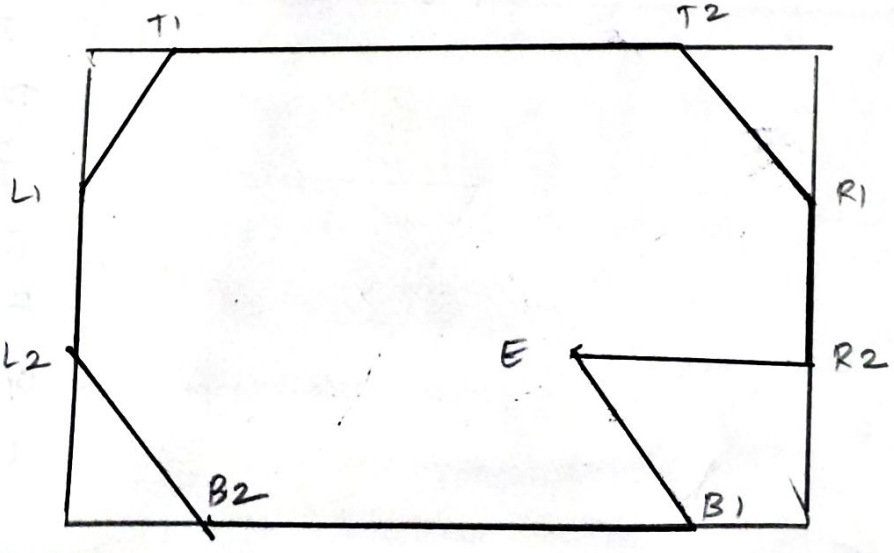
(iv) Clipping w.r.to boundary bottom :-



New Vertex List

(L1 - T1)	T1
(T1 - T2)	T2
(T2 - R1)	R1
(R1 - R2)	R2
(R2 - E)	E
(E - F)	B1
(F - G1)	B2
(G1 - L2)	L2
(L2 - L1)	L1

(v) Final clipped Polygon :-

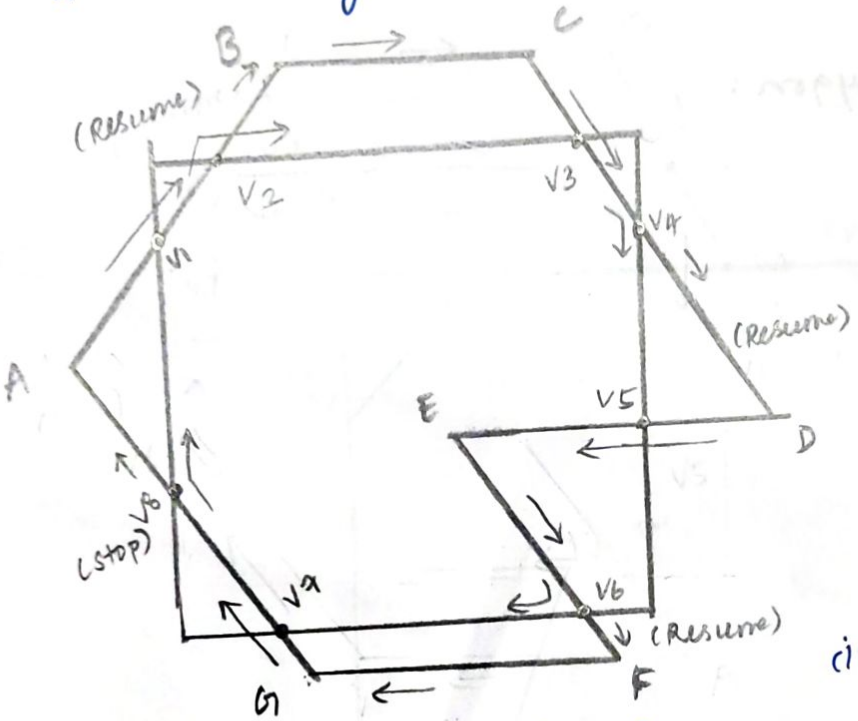


Weiler - Atherton clipping:

For clockwise processing of polygon vertices, the rules are:

(i) For an outside to inside pair of vertices, follow the polygon boundary

(ii) For an inside to outside pair of vertices, follow window boundary in a clockwise direction.



For the given polygon, mark the intersection points of the sides with clipping window as $V_1, V_2, V_3, V_4, V_5, V_6, V_7$ and V_8.

Inside the clipping window,

(i) $V_1 \rightarrow V_2$ is going from outside to inside ⇒ follow the polygon boundary. $(V_1 - V_2)$

(ii) $V_2 \rightarrow B$ is going from inside to outside ⇒ follow the clipping window $(V_2 - V_3)$

(iii) $V_3 \rightarrow V_4$ is going from outside to inside, follow the polygon $(V_3 - V_4)$

(iv) $V_4 \rightarrow D$ is going from inside to outside, follow the window $(V_4 \rightarrow V_5)$

(v) $V_5 \rightarrow E$ is going from outside to inside, follow the polygon $(V_5 - E - V_6)$

(vi) $V_6 \rightarrow F$ is going from inside to outside, follow the window ($V_6 - V_7$)

(vii) $V_7 \rightarrow V_8$ is going from outside to inside, follow the polygon ($V_1 - V_8$)

(viii) $V_8 \rightarrow A$ is going from inside to outside, follow the window ($V_8 \rightarrow V_1$)

(ix) $A \rightarrow A$, stop clipping.

Final dipped polygon: