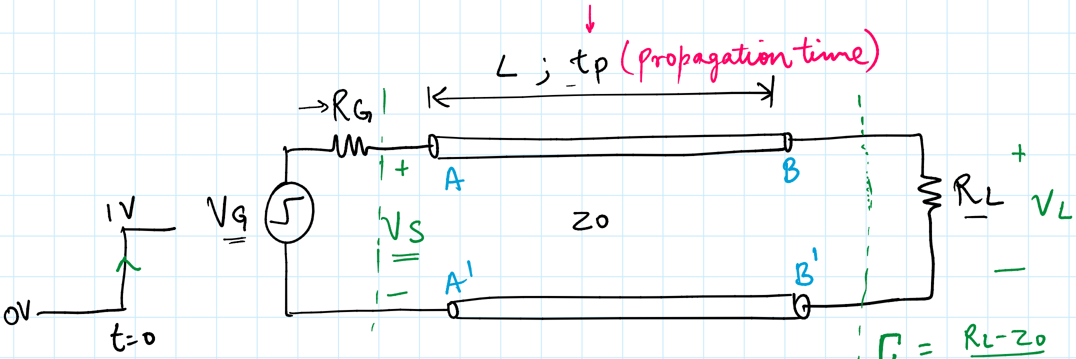
Lec-6

Wednesday, January 22, 2020 8:45 AM

HW-1 Due Tomorrow.



$\Gamma_L = \dfrac{R_L - Z_0}{R_L + Z_0}$; $\dfrac{Z_L - Z_0}{Z_L + Z_0}$

Γ_G or $\Gamma_S = \dfrac{R_G - Z_0}{R_G + Z_0}$

V_L at time $t = \infty$ $\longrightarrow$ $V_G \cdot \dfrac{R_L}{R_L + R_G}$

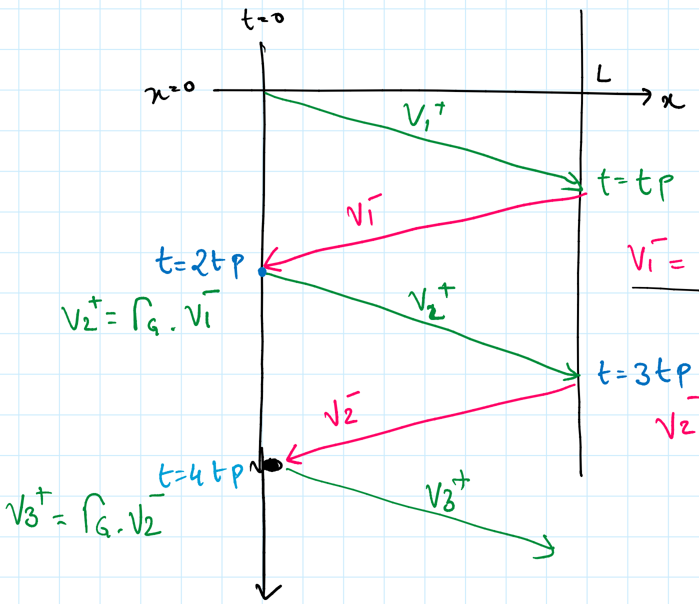
V_S at time $t = \infty$

Γ_S or $\Gamma_G = \dfrac{Z_G - Z_0}{Z_G + Z_0}$

$V_S = V_L$ at $t = \infty$

Q: What is V_S & V_L at $t = \infty$?

Q What is V_S + V_L at any time t ?



$V_1^+ = \dfrac{Z_0}{Z_0 + R_G} \cdot V_G$

$V_1^- = \Gamma_L V_1^+$

$V_2^- = \Gamma_L \cdot V_2^+$

- Voltage near the generator (left side of Tx line) at time t

$t = 0^+ \quad = V_1^+$

$t = 2t_p^+ \quad = V_1^+ + V_1^- + V_2^+ \quad = V_1^+ + \Gamma_L V_1^+ + \Gamma_G V_1^-$

$= V_1^+ + \Gamma_L V_1^+ + \Gamma_L \Gamma_G V_1^+$

$t = 4t_p^+ \quad = V_1^+ + V_1^- + V_2^+ + V_2^- + V_3^+ =$

$V_1^+ + \Gamma_L V_1^+ + \Gamma_L \Gamma_G V_1^+ + \Gamma_L^2 \Gamma_G V_1^+ + \Gamma_L^2 \Gamma_G^2 V_1^+$

$t = \infty \quad =$

$$V_1^+ \left[1 + \Gamma_L + \Gamma_L \Gamma_G + \Gamma_L^2 \Gamma_G + \Gamma_L^2 \Gamma_G^2 + \cdots \cdots \right]$$

$$= V_1^+ \Big[1 + \Gamma_L \Gamma_G + \Gamma_L^2 \Gamma_G^2 + \Gamma_L^3 \Gamma_G^3 + \cdots$$
$$+ \Gamma_L \left\{ 1 + \Gamma_L \Gamma_G + \Gamma_L^2 \Gamma_G^2 + \cdots \right\} \Big]$$

$$= V_1^+ \left[\frac{1}{1 - \Gamma_L \Gamma_G} + \frac{\Gamma_L}{1 - \Gamma_L \Gamma_G} \right]$$

$$= V_1^+ \left[\frac{1 + \Gamma_L}{1 - \Gamma_L \Gamma_G} \right]$$

$$= V_G \left[\frac{Z_0}{Z_0 + R_G} \right] \left[\frac{1 + \frac{R_L - Z_0}{R_L + Z_0}}{1 - \left(\frac{R_L - Z_0}{R_L + Z_0} \right) \left(\frac{R_G - Z_0}{R_G + Z_0} \right)} \right]$$

$$= V_G \left[\frac{Z_0}{Z_0 + R_G} \right] \cdot \left[\frac{\frac{R_L + \cancel{Z_0} + R_L - \cancel{Z_0}}{\cancel{R_L + Z_0}}}{\frac{(R_L + Z_0)(R_G + Z_0) - R_L R_G + R_L Z_0 + R_G Z_0 - Z_0^2}{\cancel{(R_L + Z_0)}(R_G + Z_0)}} \right]$$

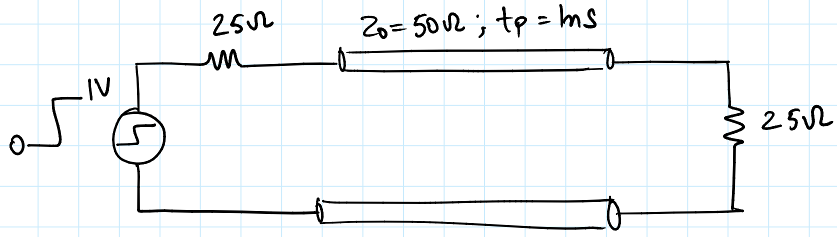
$$= V_G \left[\frac{Z_0}{\cancel{Z_0 + R_G}} \right] \left[\frac{2R_L \cancel{(R_G + Z_0)}}{\cancel{R_L R_G} + R_L Z_0 + R_G Z_0 + \cancel{Z_0^2} - \cancel{R_L R_G} + R_L Z_0 + R_G Z_0 - \cancel{Z_0^2}} \right]$$

$$= \frac{V_G \cdot \cancel{Z_0} \cdot \cancel{2} R_L}{\cancel{2} \cancel{Z_0} [R_L + R_G]}$$

$$\boxed{\text{Voltage man generator at } t = \infty \;=\; V_G \cdot \frac{R_L}{R_L + R_G} \;=\; \text{Voltage at load at } t = \infty}$$

$$\boxed{\text{Voltage near generator at } t=\infty = V_G \cdot \frac{R_L}{R_L+R_G} = \text{Voltage at load at } t=\infty}$$

Example:



$\Gamma_G = -1/3$ $\qquad\qquad\qquad\qquad$ $\Gamma_L = -\frac{1}{3}$

$V_1^+ = 2/3$

$V_1^- = -2/9$

$V_2^+ = -\frac{2}{9} \times -\frac{1}{3} = \frac{2}{27}$