



**Departament de Teoria
del Senyal i Comunicacions**



UNIVERSITAT POLITÈCNICA DE CATALUNYA

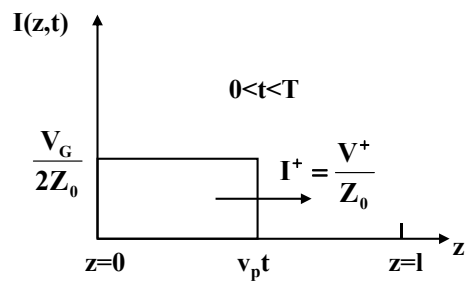
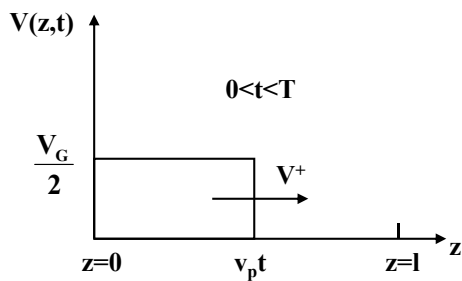
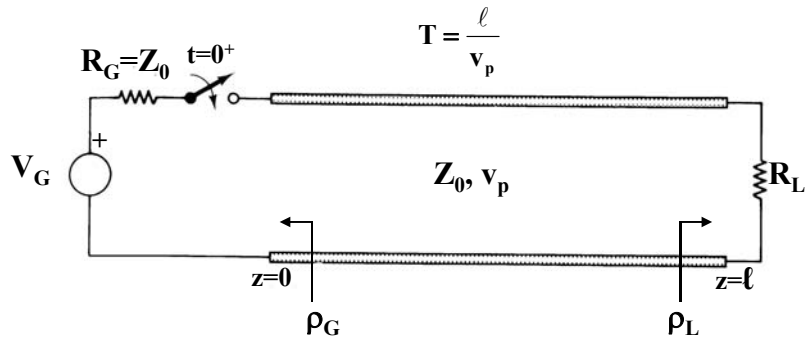
Transitori en Línies de Transmissió Ideal

Radiació i Propagació

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Francesc Torres Torres**

Febrer 2014

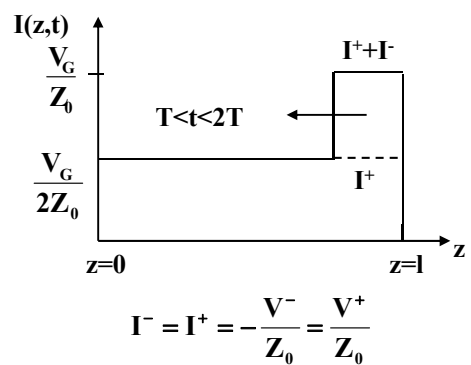
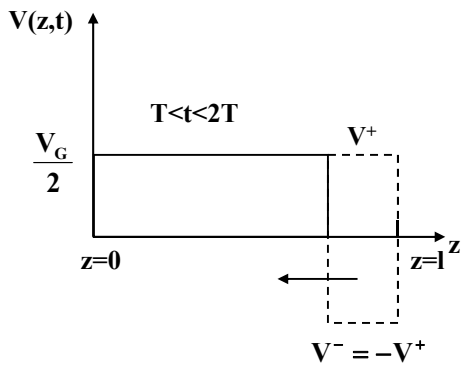
TRANSISTORIS EN LÍNIES DE TRANSMISSIÓ IDEALS RESPOSTA A L'ESGLAÓ DE TENSIÓ



$R_L = 0$ (C.C.)

$\rho_L = -1$

$V^- = \rho_L V^+ = -V^+$

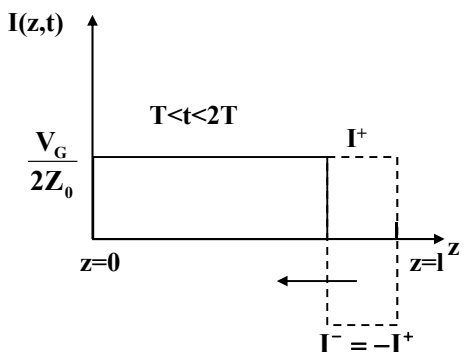
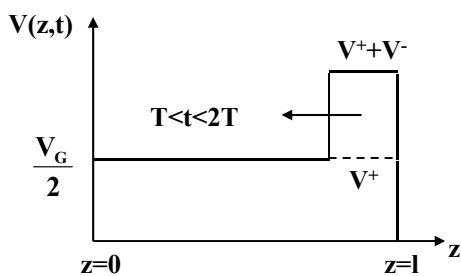


$I^- = I^+ = -\frac{V^-}{Z_0} = \frac{V^+}{Z_0}$

$R_L = \infty$ (C.O.)

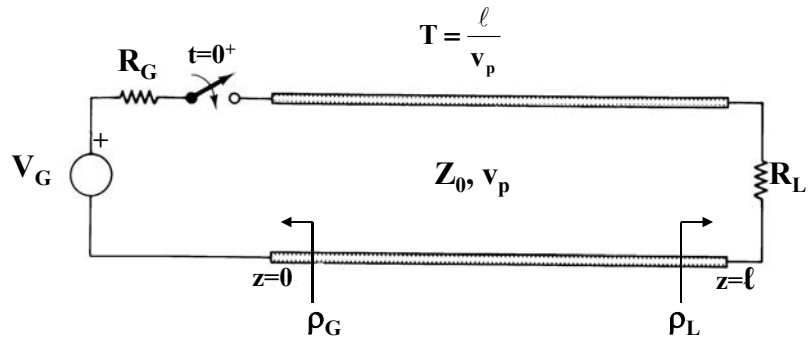
$\rho_L = 1$

$V^- = \rho_L V^+ = V^+$



$I^- = -I^+$

RÈGIM PERMANENT TEMPORAL



$$V^+ = V_G \frac{Z_0}{Z_0 + R_G}$$

$$\rho_L = \frac{R_L - Z_0}{R_L + Z_0}$$

$$\rho_G = \frac{R_G - Z_0}{R_G + Z_0}$$

$$V_{t \rightarrow \infty} = V^+ + V^+ \rho_L + V^+ \rho_L \rho_G + V^+ \rho_L^2 \rho_G + \dots = V^+ \left[\sum_{i=0}^{\infty} \rho_L^i \rho_G^i + \sum_{i=1}^{\infty} \rho_L^i \rho_G^{i-1} \right]$$

$$V_{t \rightarrow \infty} = V_G \frac{R_L}{R_L + R_G}$$

$$I_{t \rightarrow \infty} = \frac{V_G}{R_L + R_G}$$

DIAGRAMES ESPAI-Temps DE TENSIÓ I DE CORRENT

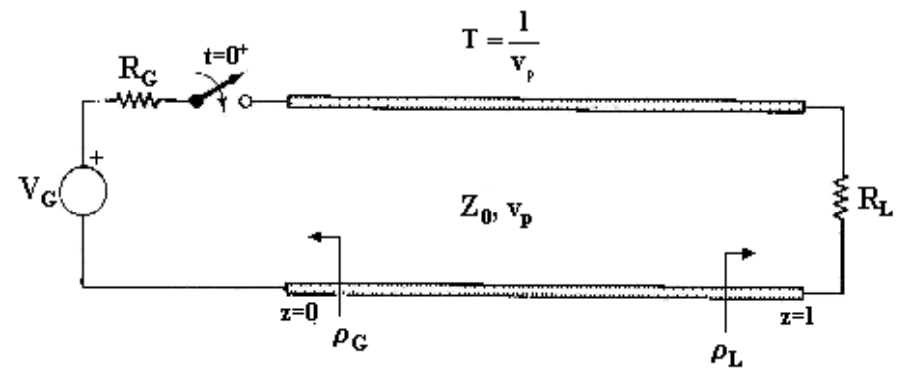


DIAGRAMA DE TENSIÓ

DIAGRAMA DE CORRENT

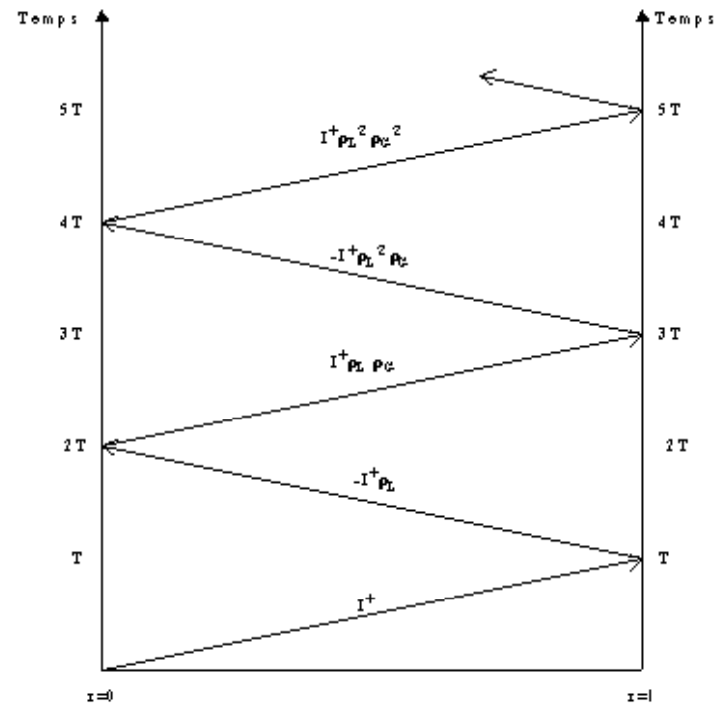
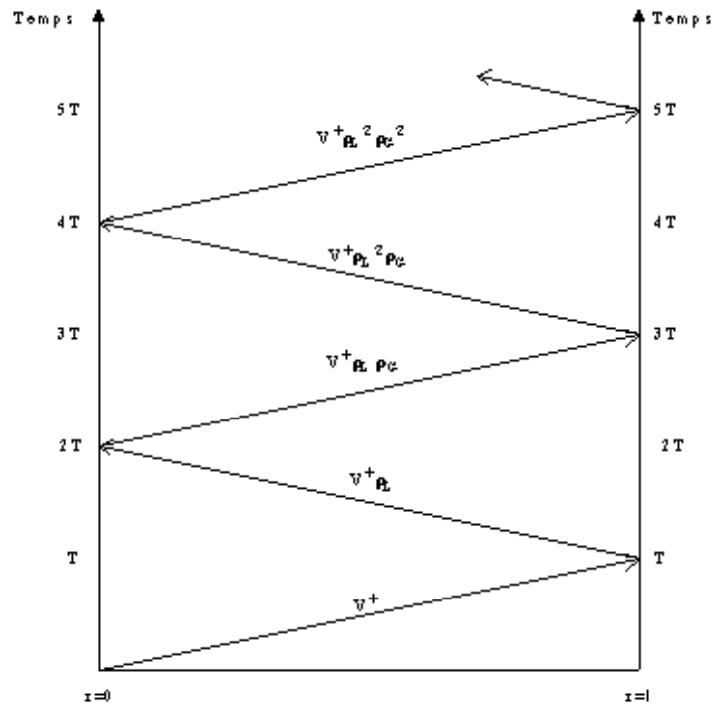
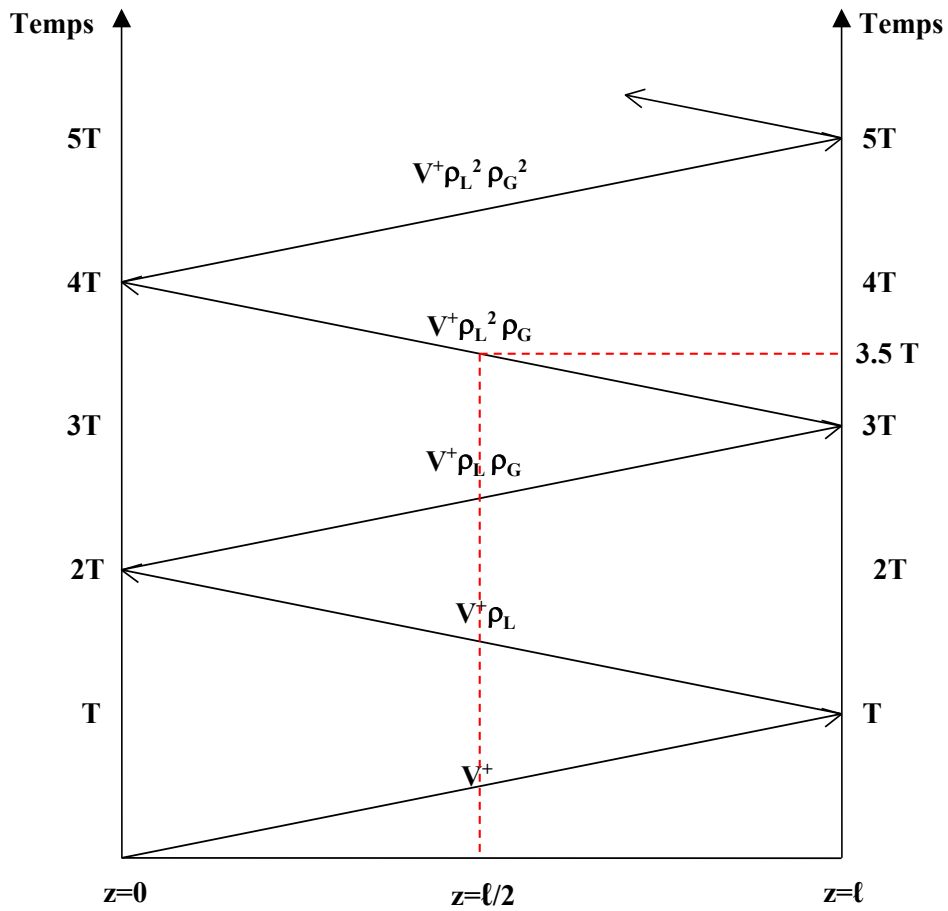


DIAGRAMA DE TENSIONS



$$V_i = 0$$

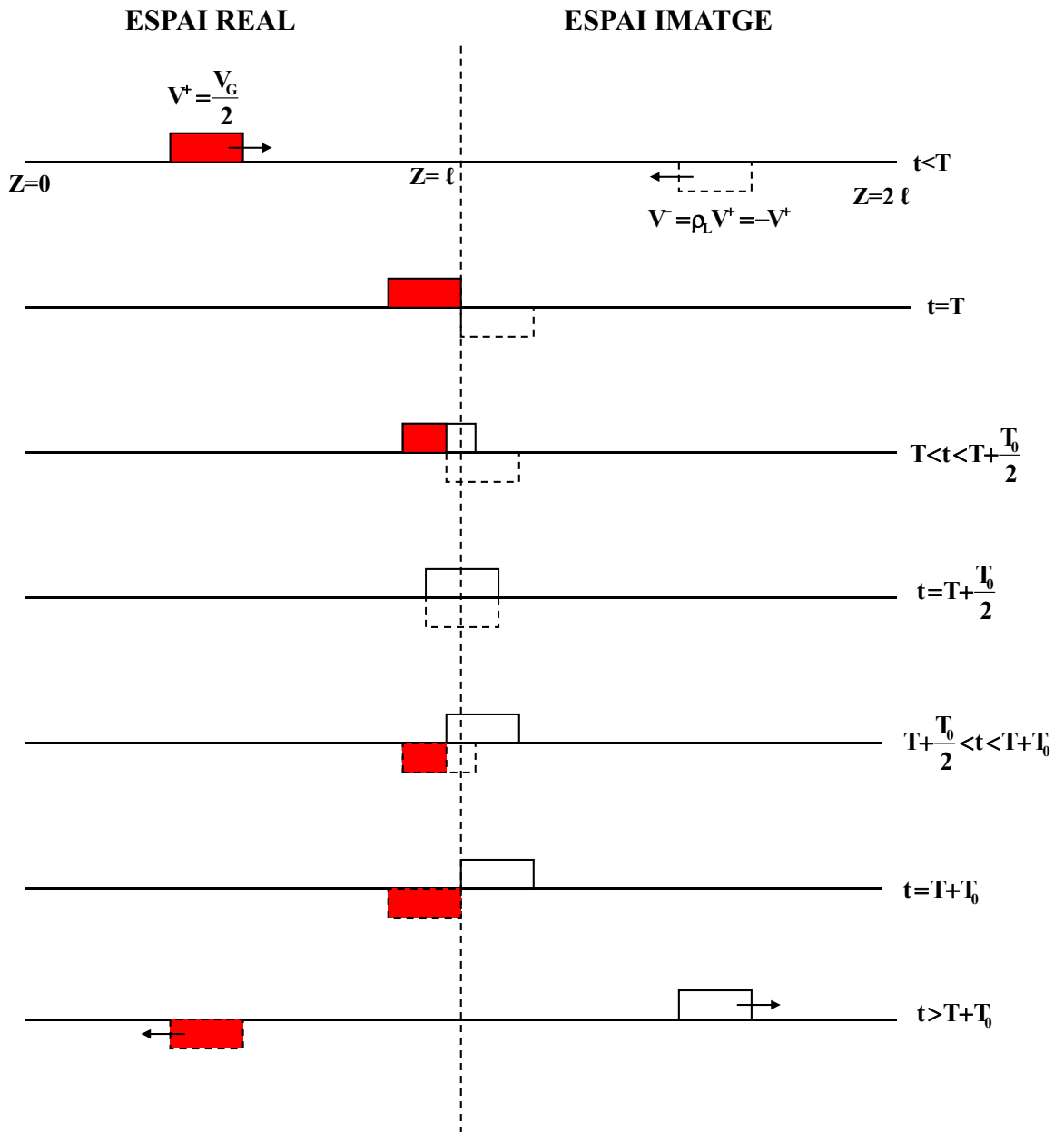
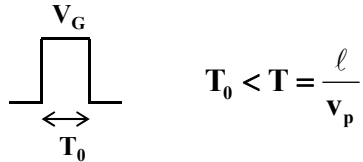
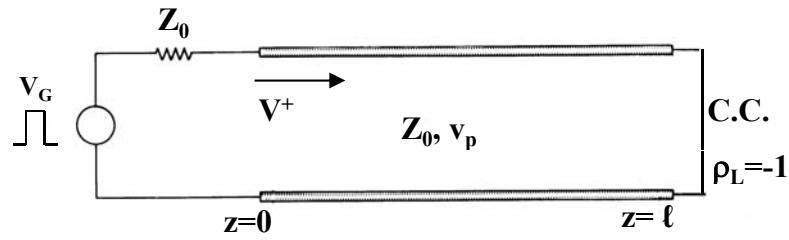
$$V(z=l/2, t=3.5T) = V^+ + V^+\rho_L + V^+\rho_L\rho_G + V^+\rho_L^2\rho_G + V_i$$

$$V(z > l/2, t=3.5T) = V(z=l/2, t=3.5T)$$

$$V(z < l/2, t=3.5T) = V^+ + V^+\rho_L + V^+\rho_L\rho_G + V_i$$

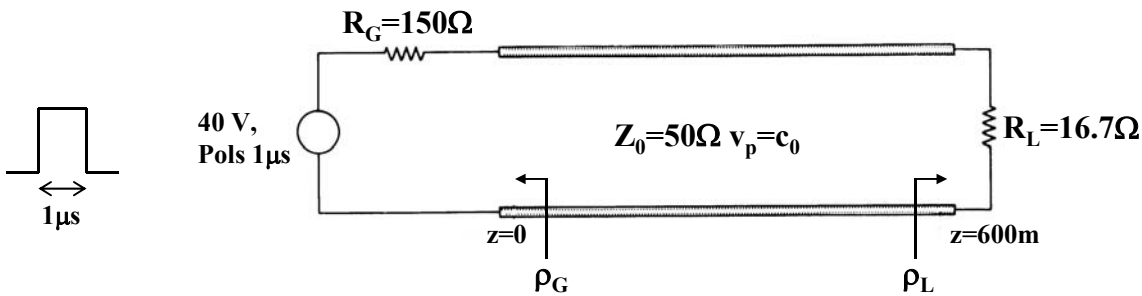
$$V(z=0, t=4T) = V^+ + V^+\rho_L + V^+\rho_L\rho_G + V^+\rho_L^2\rho_G + V^+\rho_L^2\rho_G^2 + V_i$$

PROPAGACIÓ DE POLSOS EN UNA LÍNIA DE TRANSMISSIÓ

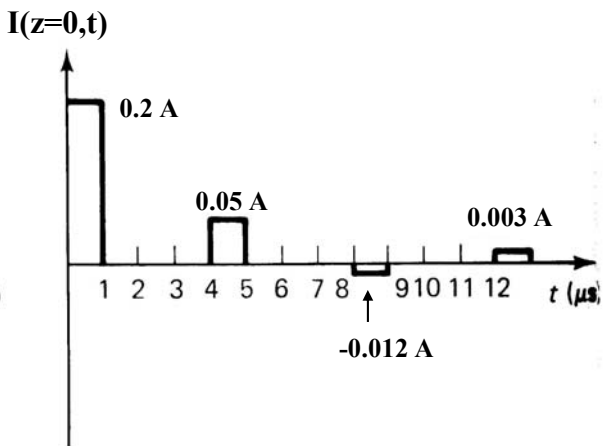
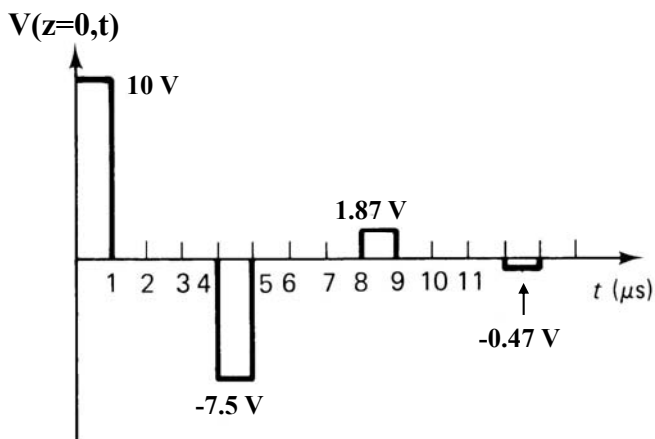
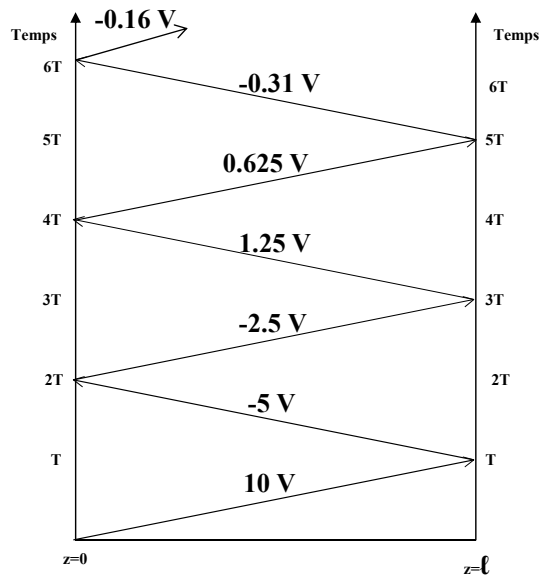


EXEMPLE SOBRE PROPAGACIÓ DE POLSOS

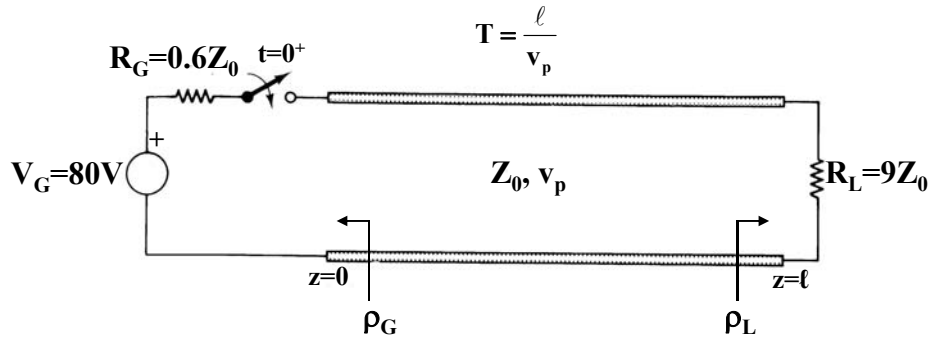
V(z=0), I(z=0) ?



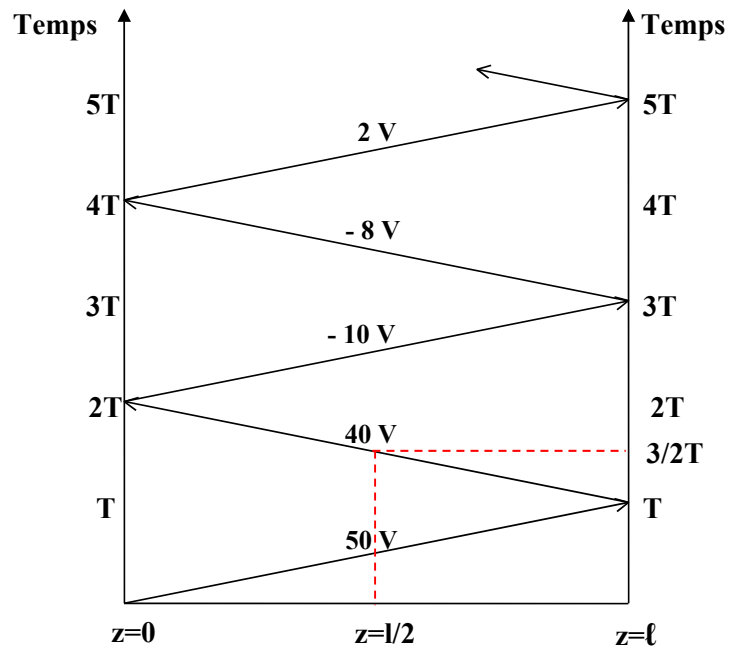
$$V^+ = V_G \frac{Z_0}{Z_0 + R_G} = 10 \text{ V} \quad \rho_L = \frac{R_L - Z_0}{R_L + Z_0} = -0.5 \quad \rho_G = \frac{R_G - Z_0}{R_G + Z_0} = 0.5 \quad T = \frac{l}{v_p} = 2 \mu\text{s}$$



PROBLEMA 2

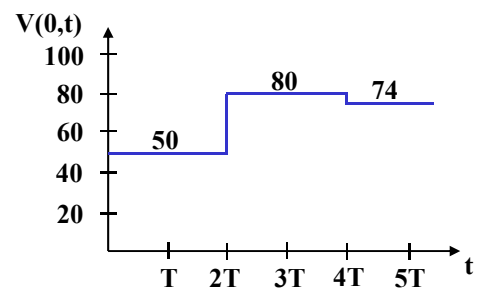
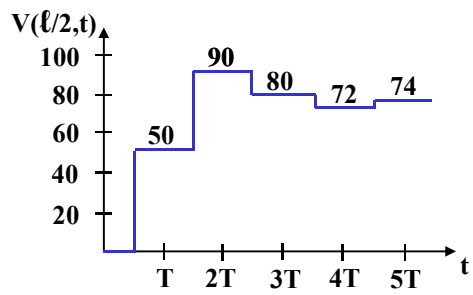


a)

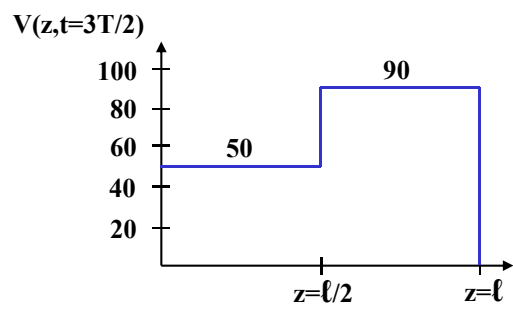


$V^+ = V_G \frac{Z_0}{Z_0 + R_G} = 50V$	$\rho_L = \frac{R_L - Z_0}{R_L + Z_0} = 0.8$	$\rho_G = \frac{R_G - Z_0}{R_G + Z_0} = -0.25$
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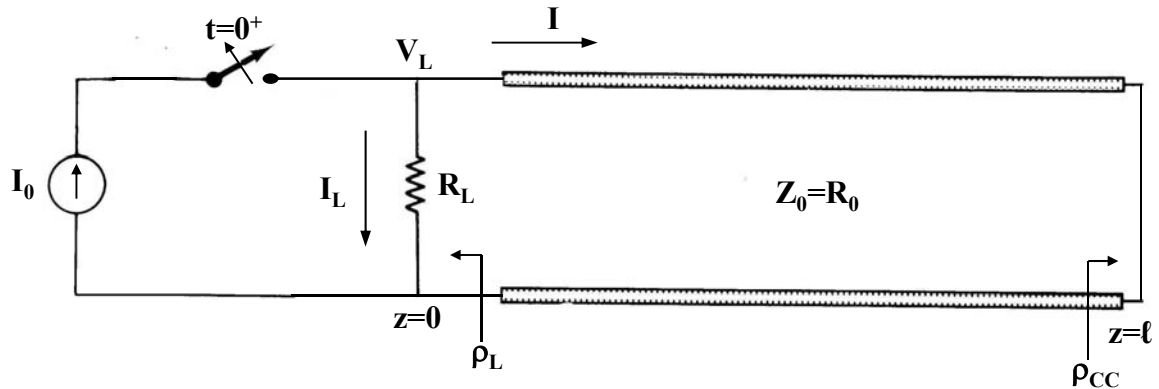
b)



c)



PROBLEMA 6



CONDICIONS INICIALS EN LA L.T. : ($t < 0^+$)

$$V_i = V(0, t) = 0$$

$$I_i = I(0, t) = I_0$$

CÀLCUL DE V^+ :

AL COMMUTAR $t = 0^+$:

$$V(0, 0^+) = V^+ + V_i = V^+$$

$$I(0, 0^+) = I^+ + I_i = V^+/Z_0 + I_0$$

$$V_L = I_L R_L$$

$$V_L = V(0, 0^+)$$

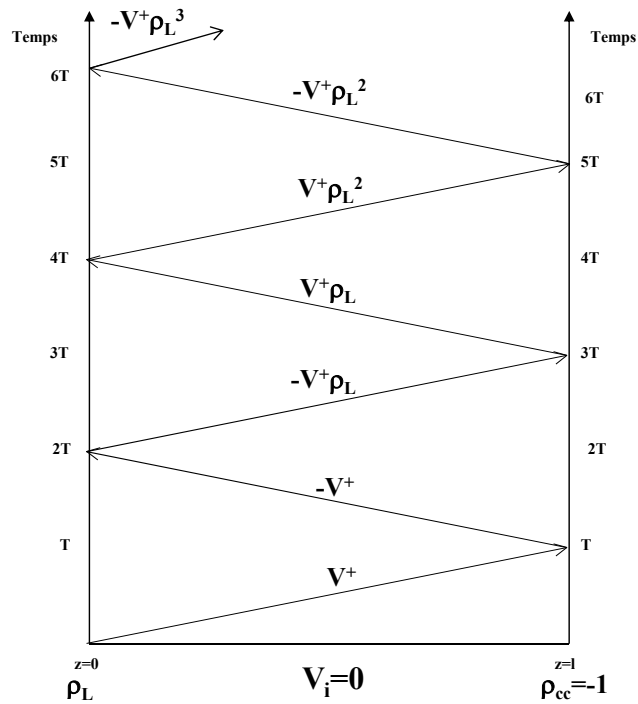
$$I_L = -I(0, 0^+)$$

SUBSTITUINT:

$$V^+ = -R_L(I_0 + V^+/Z_0)$$



$$V^+ = -\frac{R_L Z_0}{R_L + Z_0} I_0$$



$V^+ = -\frac{R_L R_0}{R_L + R_0} I_0$	$\rho_L = \frac{R_L - R_0}{R_L + R_0}$	$\rho_{cc} = -1$
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a) $R_L > Z_0, \rho_L > 0$

b) $R_L = Z_0, \rho_L = 0$

