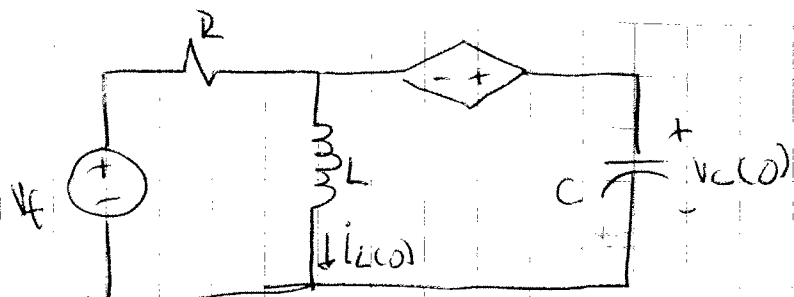


Redes I

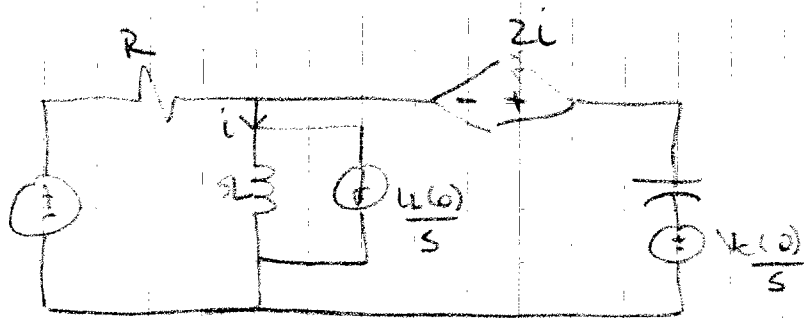
Problema auxiliar extra



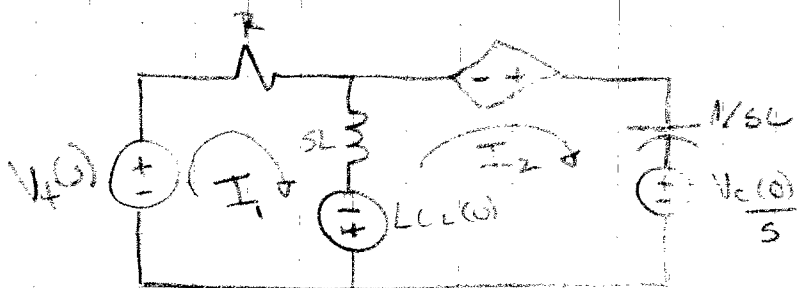
$$V_f(t) = 4e^{-t} u(t) \quad R = 2\Omega \quad L = 1H \quad C = 1F$$

$$i_L(0) = 1 \quad V_C(0) = 2$$

Para la red de la figura, usando transformada de Laplace, su inversa y explicitando todos los pasos, determine la respuesta completa para $i(t)$ para $t > 0$



Transformando la fuente de corriente en fuente de voltaje



$$\begin{bmatrix} R+SL & -SL \\ -SL & SL+1/sC \end{bmatrix} \begin{bmatrix} I_1 \\ I_2 \end{bmatrix} = \begin{bmatrix} V_f(s) + Li_L(0) \\ -Li_L(0) + Zi - V_c(0)/s \end{bmatrix}$$

$$i = (I_1 - I_2)$$

$$\begin{bmatrix} 2+s & -s \\ -s-2 & s+1/s+2 \end{bmatrix} \begin{bmatrix} I_1 \\ I_2 \end{bmatrix} = \begin{bmatrix} V_f(s) + 1 \\ -1 - 2/s \end{bmatrix}$$

$$\Delta = (s+2)(s+2+1/s) - s(s+2)$$

$$= s^2 + 2s + 1 + 2/s + 4 + 2/s - s^2 - 2s$$

$$\Delta = 2s + 5 + \frac{2}{s}$$

$$\Delta_1 = (V_f(s) + 1)(s+1/s+2) - s(1+2/s)$$

$$\Delta_1 = sV_f + V_f/s + 2V_f + s + \frac{1}{s} + 2 - s - \frac{2}{s}$$

$$\Delta_2 = -(2+s)(1+2/s) + (s+2)(V_f+1)$$

$$\Delta_2 = -2 - \frac{4}{s} - s - 2 + (s+2)V_f + s + 2$$

$$\Delta_2 = (s+2)V_f - 2 - 4/s$$

$$i = \frac{\Delta_1 - \Delta_2}{\Delta}$$

$$\Delta_1 - \Delta_2 = \frac{\sqrt{5}}{5} + 2 + \frac{5}{5}$$

$$L = \frac{\frac{\sqrt{5}}{5} + \frac{5}{5} + 2}{2s + 5 + \frac{2}{5}} = \frac{\sqrt{5} + 5 + 2s}{2s^2 + 5s + 2}$$

$$L = \frac{4}{s-1}$$

$$\frac{s-1}{2s^2 + 5s + 2/5}$$

RESC

$$+ \frac{2s + 5}{2s^2 + 5s + 2}$$

RENC

$$L(s) = \frac{2}{(s+1)(s^2 + \frac{5}{2}s + 1)} + \frac{s + 5/2}{(s^2 + 5/5s + 1)}$$

$$L(s) = \frac{2}{(s+1)(s+1/2)(s+2)} + \frac{s + 5/5}{(s+1/2)(s+2)}$$

$$\frac{2}{(s+1)(s+1/2)(s+2)} = \frac{A}{(s+1)} + \frac{B}{(s+1/2)} + \frac{C}{(s+2)}$$

$$A = \frac{2}{(-1+1/2)(-1+2)} = \frac{2}{-1/2} = -4$$

$$b = \frac{2}{(-1/2+1)(-1/2+2)} = \frac{8}{3}$$

$$c = \frac{2}{(-2+1)(-2+1/2)} = \frac{4}{3}$$

Segundo término

$$\frac{s + 5/2}{(s+1/2)(s+2)} = \frac{D}{(s+1/2)} + \frac{E}{(s+2)}$$

$$D = \frac{-1/2 + 5/2}{-1/2 + 2} = \frac{4/2}{3/2} = 4/3$$

$$E = \frac{-2 + 5/2}{-2 + 1/2} = \frac{1/2}{-3/2} = -1/3$$

$$i(s) = \frac{-4}{s+1} + \frac{4}{s+1/2} + \frac{1}{(s+2)}$$

$$i(t) = (-4e^{-t} + 4e^{-1/2t} + e^{-2t})u(t)$$