Taller Laplace

1. Encuentre $H(s)$ y $H_{lc}(s)$ para circuito RLC serie. $C_F = 0$
2. Para $R = 1\Omega$, $C = 2\,mF$, $L = 10\,mH$. encuentre por fracciones parciales $y(t) = ?$

$x(t) = \delta(t)$

$x(t) = u(t)$

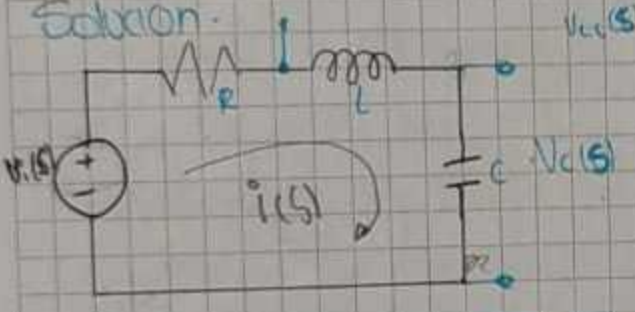
$x(t) = t$

$$\frac{\omega_n^2}{s^2 + 2\zeta\omega_n s + \omega_n^2}$$

en laso abierto

3. Repita 2 para loso cerado. Asumir $A(s) = 1$

Solucion:



$$V_i(s) = V_R(s) + V_L(s) + V_C(s).$$

$$V_R(s) = I_R(s)Z_R + I_L(s)Z_L + V_C(s)$$

$$I_R = I_L = I_C$$

$$Z_R(s) = R,\quad Z_L(s) = L \cdot s,\quad Z_C(s) = \frac{1}{C \cdot s}$$

$$V_i(s) = I_R(s)R + I_L(s)sL + V_C(s)$$

$$I_C = V_C(s) \cdot C \cdot s$$

$$V_i(s) = LCs^2 V_C(s) + CRs\,V_C(s) + V_C(s).$$

$$V_i(s) = V_C(s)\,(LCs^2 + CRs + 1)$$

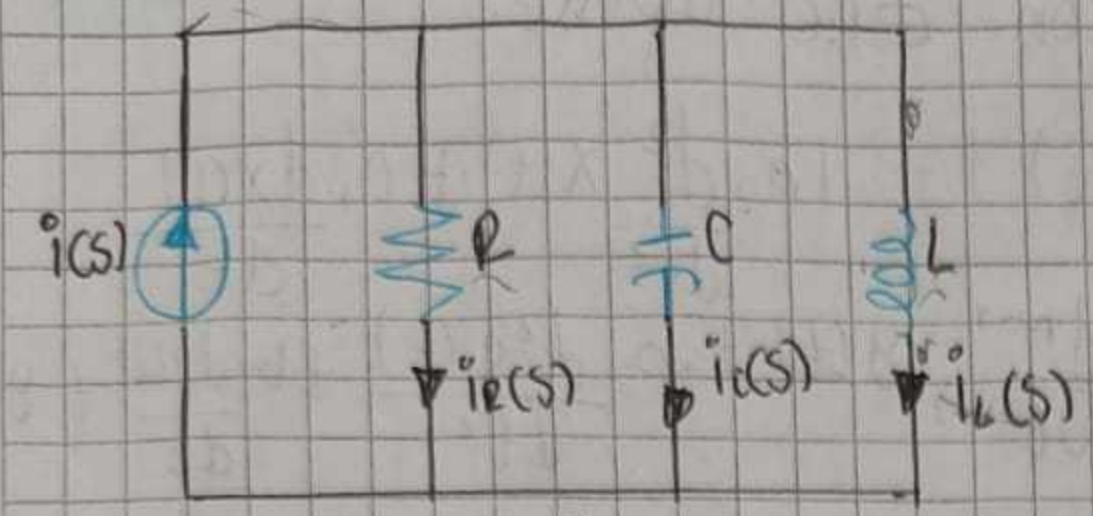
$$\frac{V_C(s)}{V_i(s)} = H(s) = \frac{1}{LCs^2 + CRs + 1}$$

$$H_{LC}(s) = \frac{H(s)}{1 + A(s)H(s)}$$

$$= \frac{\frac{1}{LCs^2 + CRs + 1}}{1 + A(s)\left(\frac{1}{1 + CRs + LCs^2}\right)}$$

$$= \frac{1}{(LCs^2 + CRs + 1)\cdot\left(1 + \frac{A(s)}{1 + CRs + LCs^2}\right)}$$

$$= \frac{1}{LCs^2 + CRs + 1 + A(s)}$$



$$\mathring{i}(s) = \mathring{i}_R(s) + \mathring{i}_C(s) + \mathring{i}_L(s)$$

$$\mathring{i}(s) = \frac{V_R(s)}{Z_R(s)} + \frac{V_C(s)}{Z_C(s)} + \mathring{i}_L(s) \quad (1)$$

Se sabe que $V_R(s) = V_C(s) = V_L(s)$

$$V_L(s) = \mathring{i}_L(s) \cdot Z_L(s)$$

$$V_L(s) = \mathring{i}_L(s) \cdot sL$$

Reemplazamo en (1)

$$\mathring{i}(s) = \frac{sL}{R} \cdot \mathring{i}_L(s) + s^2LC \cdot \mathring{i}_L(s) + \mathring{i}_L(s)$$

como lo que nos interesa es $\frac{\mathring{i}_L(s)}{\mathring{i}(s)}$ → factorizamos y despejamos.

$$\mathring{i}(s) = \mathring{i}_L(s)\left(\frac{sL}{R} + s^2LC + 1\right)$$

$$\frac{\mathring{i}_L(s)}{\mathring{i}(s)} = \frac{1}{s^2LC + s\frac{L}{R} + 1}$$

$$H_{cc}(s) = \frac{H(s)}{1 + A(s)H(s)}$$

$$H_{Ic}(s) = \frac{1}{\left(s^2LC + s\frac{L}{R} + 1\right)\left(\frac{A(s)}{s^2LC + s\frac{L}{R} + 1} + 1\right)}$$

$$H_{Ic}(s) = \frac{1}{A(s) + s^2LC + s\frac{L}{R} + 1}$$

2)

Para el punto 1

Serie

$$\frac{V_c(s)}{V_i(s)} = \frac{1}{LCs^2 + RCs + 1}$$

$$\left(\frac{1}{Ls^2 + Rs + 1}\right) \frac{\frac{1}{LC}}{\frac{1}{LC}} = \frac{\frac{1}{LC}}{s^2 + \frac{R}{L}s + \frac{1}{LC}} =$$

$$\frac{w_n^2}{s^2 + 2\zeta w_n + w_n^2}$$