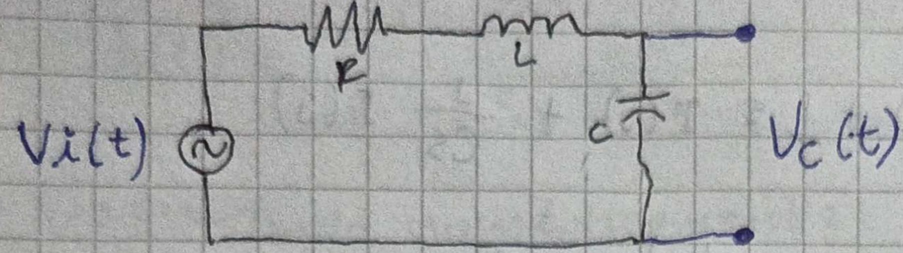


2.12
Solución

① PUNTO - EDO SISTEMA

Partiendo de:

$$LC\frac{d^2V_c(t)}{dt^2}+RC\frac{dV_c(t)}{dt}+V_c(t)=V_i(t)$$

dividiendo por LC:

$$\frac{d^2V_c(t)}{dt^2}+\frac{R}{L}\frac{dV_c(t)}{dt}+\frac{1}{LC}V_c(t)=\frac{1}{LC}V_i(t)$$

② PUNTO

- Partiendo de EDO:

$$LC\frac{d^2V_c}{dt^2}+RC\frac{dV_c}{dt}+V_c(t)=V_i(t)$$

- Sabemos que: $V_R=R\,i(t)$ $\quad V_C=\frac{1}{C}\int i(t)$

$\qquad\qquad\quad V_L=L\,di(t)$

$$V_i(t)=V_R+V_L+V_C$$

$$V_i(t)=R\,i(t)+L\frac{di(t)}{dt}+\frac{1}{C}\int i(t)$$

- Pasando los elementos al dominio de Laplace

$R=R \qquad L=LS \qquad C=1/CS$

Al ser un circuito en serie, la corriente es la misma

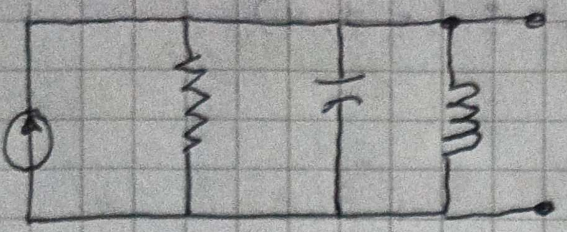
$$V_i(s) = R\,I(s) + Ls\,I(s) + \frac{1}{Cs}\,I(s)$$

$$V_i(s) = \left(R + Ls + \frac{1}{Cs}\right) I(s)$$

$$H(s) = \frac{V_C}{V_i(s)} = \frac{\frac{1}{Cs}\,(I(s))}{\left(R + Ls + \frac{1}{Cs}\right) I(s)} = \frac{\frac{1}{Cs}}{R + Ls + \frac{1}{Cs}}\,\frac{(\times Cs)}{(\times Cs)}$$

$$H(s) = \frac{1}{RCs + LCs^2 + 1} \rightarrow \boxed{H(s) = \frac{1}{LCs^2 + RCs + 1}}$$

2.12 Solución



$$I_R(s) = \frac{V(s)}{R}$$

$$I_L(s) = V(s)$$

$$I_C(s) = V(s) \cdot Cs$$

Para condiciones iniciales cero, los elementos en el dominio de Laplace

$$R = R \; ; \quad L = LS \; ; \quad C = \frac{1}{CS}$$

Aplicando ley de corrientes de Kirchhoff que dice que "la corriente total es la suma de las corrientes por cada rama".

$$I_{in}(s) = I_R(s) + I_L(s) + I_C(s)$$

$$I_{in}(s) = \frac{V(s)}{R} + \frac{V(s)}{LS} + V(s)\,CS$$

$$I_{in}(s) = \left(\frac{1}{R} + \frac{1}{LS} + CS\right) V(S)$$

$$H(s) = \frac{I_L(s)}{I_{in}(s)} = \frac{V(s)/LS}{\left(\frac{1}{R} + \frac{1}{LS} + CS\right) V(S)}$$

$$= \frac{1/LS}{\left(\frac{1}{R} + \frac{1}{LS} + CS\right)} \quad \frac{\times (LS)}{\times LS}$$

$$H(S) = \frac{1}{\frac{L}{R} S + 1 + LCS^2} = H(s) = \frac{1}{LCS^2 + \frac{L}{R} S + 1}$$