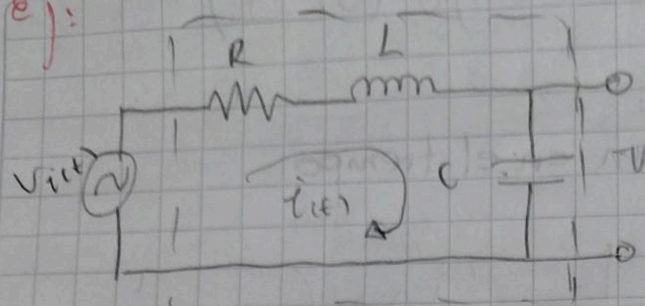
e):



$H\{\cdot\}$ $\quad i(t) = i_c(t) = C\dfrac{dV_c(t)}{dt}$

$V_c(t) = \dfrac{1}{C}\int i_c(t)\,dt$

$V_i(t) \rightarrow \boxed{H\{\cdot\}} \rightarrow v_c(t)$

$$V_i(t) = LC\frac{d^2}{dt}v_c(t) + RC\frac{d}{dt}V_c(t) + 1\,V_c(t)$$

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

$$= L\frac{d}{dt}i(t) + Ri(t) + v_c(t)$$

$$= LC\frac{d}{dt}\left\{\frac{dv_c(t)}{dt}\right\} + RC\frac{d}{dt}v_c(t) + V_c(t)$$

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

Tarea: Demostrar RLC serie es lineal

Representa el sistema

$V_c(t) = f(V_i(t), R, L, C)$

se supone la combinacion lineal

$V_i(t) = a_1 V_1(t) + a_2 V_2(t)$

$y(t) = H\{V_i(t)\} = H\{a_1 V_1(t) + a_2 V_2(t)\}$

$y(t) = V_c(t)$

$\tilde{y}(t) = a_1 y_1(t) + a_2 y_2(t)$

- $y_1(t) = H\{V_1(t)\}$

$V_1(t) = LC \cdot \frac{d^2}{dt^2} y_1(t) + RC \cdot \frac{d}{dt} y_2(t) + y_1(t)$

- $y_2(t) = H\{V_2(t)\}$

$V_2(t) = LC \frac{d^2}{dt} y_2(t) + RC \frac{d}{dt} y_2(t) + y_2(t)$

$$\tilde{y}(t) = LC \cdot \left(a_1 \frac{d^2}{dt^2} y_1 + a_2 \frac{d^2}{dt^2} y_2\right) + RC\left(a_1 \frac{dy_1}{dt} + a_2 \frac{dy_2}{dt}\right)$$

$$+ a_1 y_1 + a_2 y_2$$

$$= a_1\left(LC \cdot \frac{d^2}{dt^2} y_1 + RC \frac{d}{dt} y_1 + y_1\right) + a_2\left(LC \frac{d^2}{dt^2} y_2 + RC \cdot \frac{dy_2}{dt} + y_2\right)$$

$$V_i(t) = a_1 V_1(t) + a_2 V_2(t) = LC \cdot \frac{d^2}{dt^2} \tilde{y} + RC \cdot \frac{d}{dt} \tilde{y} + \tilde{y}(t)$$

entonces:

$y(t) = H\{V_i(t)\} = \tilde{y}(t)$ el sistema es lineal