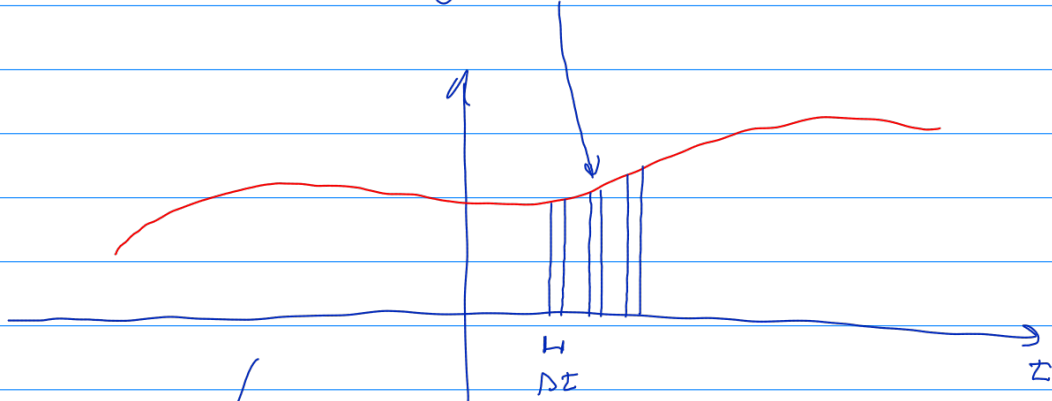


Circ en Laplace

¿ dim de s ? $[S] = Hz = \text{seg}^{-1}$

$$F(s) = \int_0^{+\infty} f(t) e^{-st} dt$$



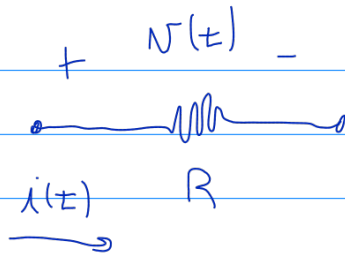
$$\Rightarrow [F] = [f] \cdot \text{seg}$$

EJ: $N(t) = \frac{y(t) \cdot E \cdot t}{T} \Rightarrow [N(t)] = V$

\mathcal{L}

$$V(s) = \frac{E}{T} \cdot \frac{1}{s^2} \Rightarrow [V(s)] = V \cdot \text{seg} \quad \checkmark$$

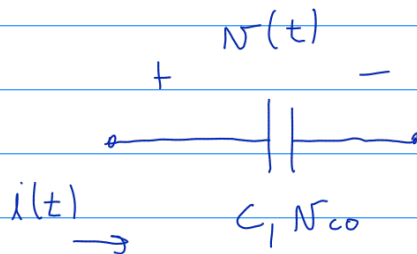
R:



$$N(t) = R \cdot i(t)$$

$$V(s) = R \cdot I(s)$$

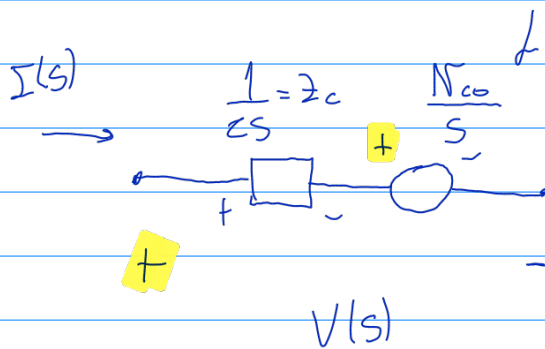
C:

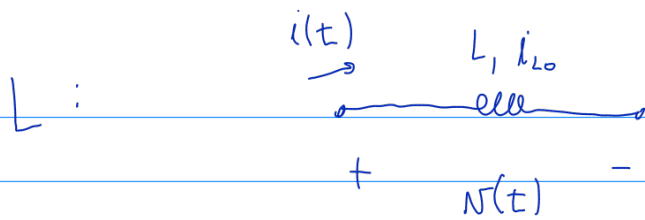


$$N(0) = N_{co}; \quad i(t) = C \cdot \frac{dN(t)}{dt}$$

$$I(s) = c (s \cdot V(s) - N_{co}) \Rightarrow$$

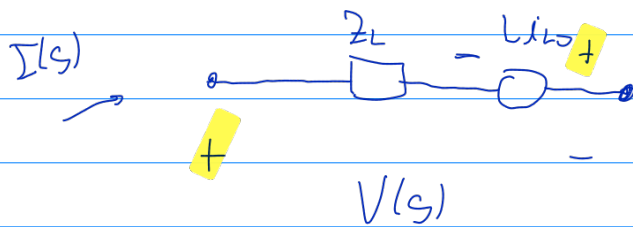
$$V(s) = \frac{1}{c s} I(s) + \frac{N_{co}}{s}$$



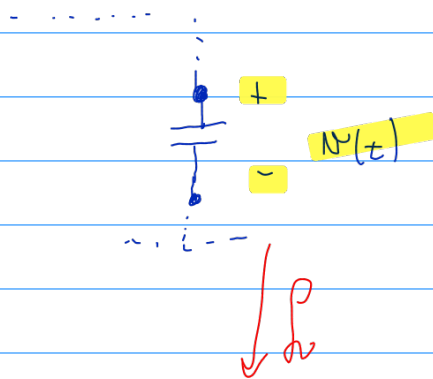


$$N(z) = L \cdot \frac{di(t)}{dt} ; \quad i(0^-) = i_{L0}$$

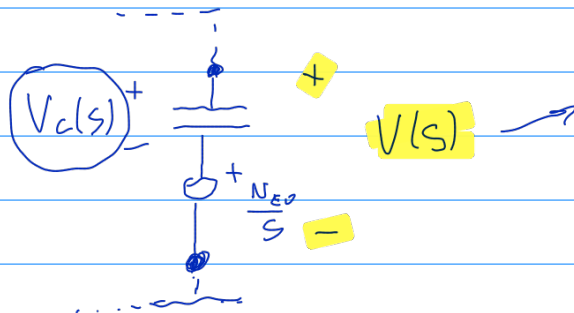
$$V(s) = L \cdot (sI(s) - i_{L0}) = \mathbf{LS} I(s) - L i_{L0}$$



tiempo



Laplace

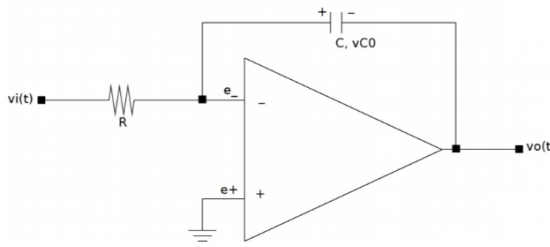


$$V_c(s) = \mathcal{L} \int_0^t N(\tau) d\tau$$

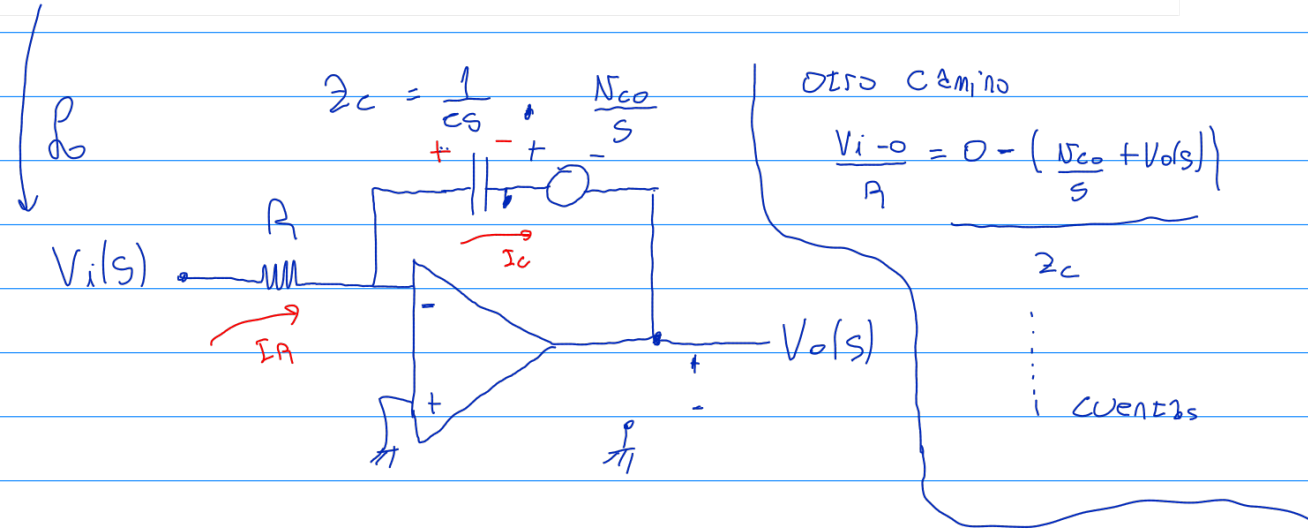
$$V(s) = V_c(s) + \frac{N_{L0}}{s}$$

$$\mathcal{L}^{-1} [V(s)]$$

Ejercicio 4. (40 min)



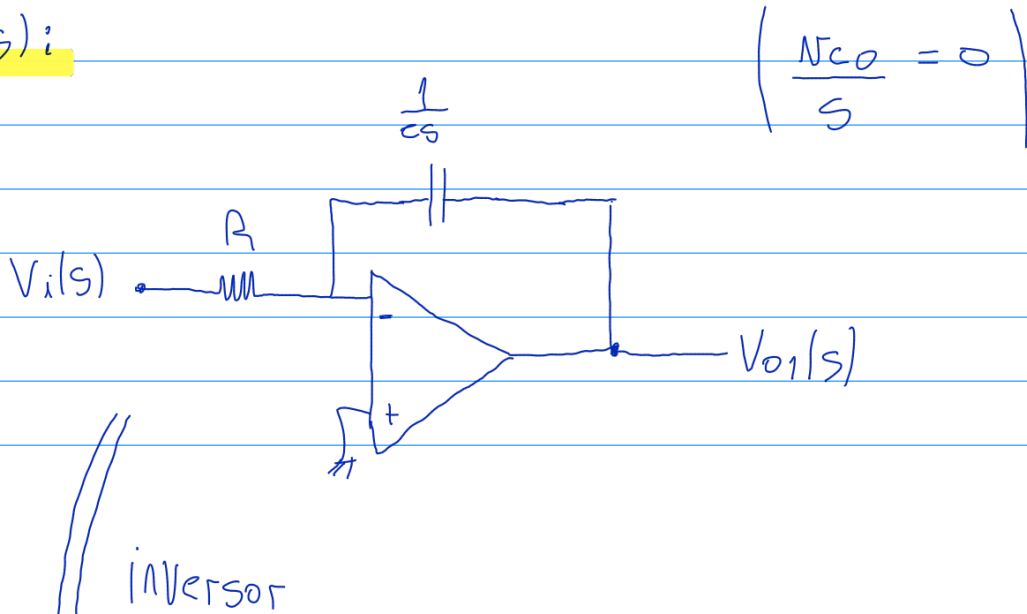
En el circuito de la figura, con el operacional ideal y el condensador inicialmente cargado a v_{C0} , hallar la respuesta $v_o(t)$ a la entrada $v_i(t) = Y(t) \cdot E$. Se sugiere primero pasar al circuito en Laplace y luego aplicar superposición.



Superposición:

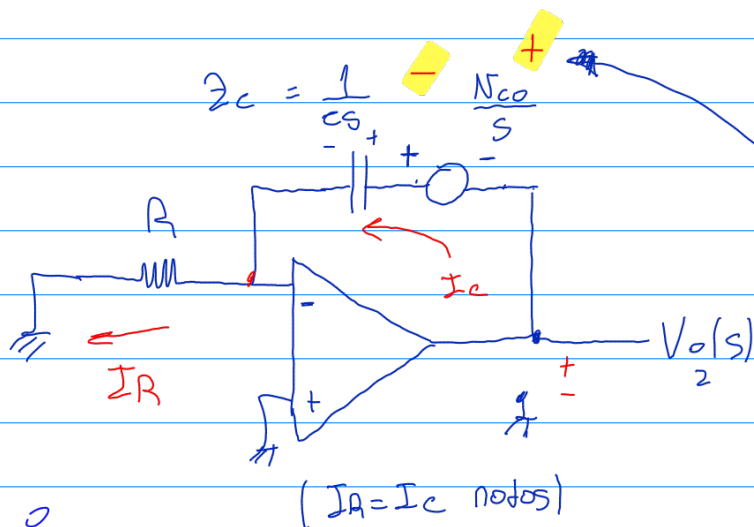
$$V_o(s) = V_{o1}(s) + V_{o2}(s) \quad ; \quad \begin{cases} V_{o1}(s) = V_o(s) @ \frac{N_{C0}}{s} = 0 \\ V_{o2}(s) = V_o(s) @ V_i(s) = 0 \end{cases}$$

$V_{o1}(s)$:



$$V_{o1}(s) = \frac{-\frac{1}{Cs} \cdot V_i(s)}{R} = \frac{-1}{RC \cdot s} \cdot V_i(s)$$

$V_{o2}(s):$ $(V_i(s) = 0)$



$$I_R = \frac{e^- - 0}{R} = 0 \Rightarrow I_C = 0 \Rightarrow V_{o2}(s) = -\frac{N_{co}}{s}$$

$$\Rightarrow V_o(s) = V_{o1}(s) + V_{o2}(s) = -\frac{1}{RCs} V_i(s) - \frac{N_{co}}{s}$$

$$V_o(s) = -\left(\frac{V_i(s)}{RCs} + \frac{N_{co}}{s} \right); \quad V_i(s) = \frac{E}{s} \quad (N_i(z) = X(z) \cdot E)$$

$$\rightarrow V_o(s) = -\left(\frac{E}{RC} \cdot \frac{1}{s^2} + \frac{N_{co}}{s} \right) \quad [V_o] = V \cdot s$$

$$N_o(z) = -\left(\frac{V_i}{RC} \cdot z + N_{co} \right) Y(z) \rightarrow [N_o] = V \checkmark$$