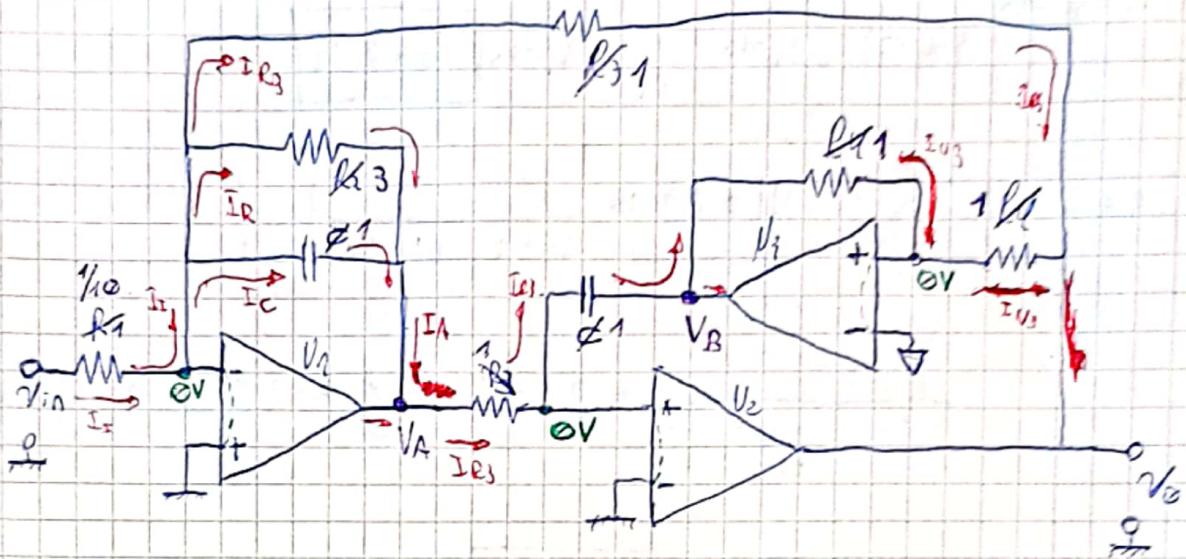


Tarea Semanal 2

HOJA N°

FECHA



$$I_A = \frac{0V - V_A}{\frac{1}{SC} + \frac{1}{R_2}} = -V_A \cdot \frac{(SCR_2 + 1)}{R_2}$$

$$I_i = \frac{V_i}{R_1} = I_A + I_{R3} = I_A + \frac{0V - V_0}{R_3} \Rightarrow \frac{V_i}{R_1} = -V_A \frac{(SCR_2 + 1)}{R_2} - \frac{V_0}{R_3}$$

$$\frac{V_A}{R_3} = -V_B \cdot SC \Rightarrow V_A = -V_B \cdot SCR_3 ; \frac{V_B}{R_4} = -\frac{V_0}{R_4}$$

$$V_A = V_0 \cdot SCR_3$$

$$\frac{V_i}{R_1} = -\frac{V_0 \cdot SCR_3 (SCR_2 + 1)}{R_2} - \frac{V_0}{R_3}$$

$$\frac{V_i}{R_1} = -V_0 \left(\frac{S^2 C^2 R_2 R_3^2}{R_1 R_3} + \frac{SCR_3^2}{R_2 R_3} + \frac{1}{R_3} \right)$$

$$T(s) = \frac{V_0}{V_i} = -\frac{R_2 R_3}{S^2 C^2 R_1 R_2 R_3^2 + SCR_2 R_3^2 + R_1 R_2}$$

$$T(s) = \frac{\frac{1}{C^2 R_1 R_2 R_3}}{s^2 + s \cdot \frac{1}{R_2 C} + \frac{1}{C^2 R_3^2}} = \frac{\frac{R_2 R_3}{R_1 C^2 R_3^2}}{s^2 + s \cdot \frac{1}{CR_2} + \frac{1}{C^2 R_3^2}} = \frac{\omega_0^2}{s^2 + s \frac{\omega_0}{Q} + \omega_0^2}$$

$$\omega_0^2 = \frac{1}{C^2 R_3^2} ; Q = \omega_0 CR_2$$

NOTA $\omega_0 = \frac{1}{CR_3} \Rightarrow Q = C^2 R_2 R_3$

Ahora:

$$\omega_0 = 1 \Rightarrow 1 = \frac{1}{CR_3} \Rightarrow \boxed{C = \frac{1}{R_3}}$$

$$Q = 3 \Rightarrow 3 = C^2 R_2 R_3 \Rightarrow \frac{R_2}{R_3} = 3 \Rightarrow \boxed{R_2 = 3R_3}$$

$$|T(0)|_{dB} = 20 \text{ dB} \Rightarrow |T(0)| = 10 \Rightarrow \frac{k \omega_0^2}{s^2 + s \frac{\omega_0 + \omega_0^2}{Q}} \Big|_{s=0} = 10$$

$$\frac{k \omega_0^2}{(0)^2 + (0) \frac{\omega_0 + \omega_0^2}{Q}} = 10 \Rightarrow \frac{k \omega_0^2}{\omega_0^2} = 10 \Rightarrow k = 10$$

$$k = \frac{R_3}{R_1} = 10 \Rightarrow \boxed{R_1 = \frac{R_3}{10}}$$

Tomando como norma de impedancia $\Omega_0 = R_3$

$$R_1' = \frac{R_1}{R_3} = \frac{1}{10}$$

$$C' = \frac{1}{R_1} R_3 = 1$$

$$R_4' = \frac{R_4}{R_3} = 1 \star$$

$$R_2' = \frac{3R_3}{R_3} = 3$$

$$R_3' = \frac{R_3}{R_3} = 1$$

⊛ Como R_4 No influye en la transferencia, la igualo a R_3 para simplificar

$$S_C^{\omega_0} = \frac{C}{\omega_0} \cdot \frac{\partial \omega_0}{\partial C} = \frac{C}{\frac{1}{CR_3}} \cdot \frac{\partial (1/CR_3)}{\partial C} = C^2 R_3^2 \cdot \frac{-R_3}{C^2 R_3^2} = -1$$

$$S_{R_2}^Q = \frac{R_2}{Q} \cdot \frac{\partial Q}{\partial R_2} = \frac{R_2}{R_2/R_3} \cdot \frac{1}{R_3} = 1$$

$$S_{R_3}^Q = \frac{R_3}{Q} \cdot \frac{\partial Q}{\partial R_3} = \frac{R_3^2}{R_2} \cdot \left(\frac{-R_2}{R_3^2} \right) = -1$$

La red normalizada resulta:

