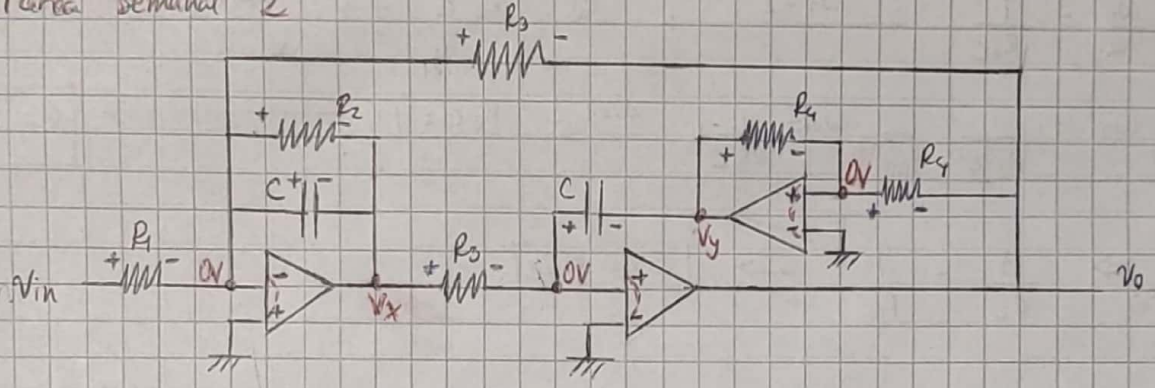
Fabrizio Hermosa

HOJA Nº 1

FECHA 17/4/23

Tarea semanal 2



1) $T = \frac{V_o}{V_i}$ en función de ω_o y Q.

$$-\frac{V_o}{R_4} = \frac{V_y}{R_4} \rightarrow \boxed{V_y = -V_o} \quad ; \quad \frac{V_x}{R_3} = -V_y\,\$C \rightarrow \boxed{V_x = V_o\,\$C\,R_3}$$

$$\frac{V_i}{R_1} = -\frac{V_x}{R_2} - V_x\,\$C - \frac{V_o}{R_3} = -V_o\$C\,\frac{R_3}{R_2} - V_o\,\$^2C^2R_3 - \frac{V_o}{R_3}$$

$$-V_i = V_o\left(\$C\,\frac{R_1R_3}{R_2} + \$^2C^2R_1R_3 + \frac{R_1}{R_3}\right)$$

$$-V_i = V_o\left(\frac{\$CR_1R_3^2 + \$^2C^2R_1R_2R_3^2 + R_1R_2}{R_2R_3}\right)$$

$$T = \frac{V_o}{V_i} = -\frac{R_2R_3}{\$^2C^2R_1R_2R_3^2 + \$CR_1R_3^2 + R_1R_2}$$

$$T(\$) = -\frac{R_2R_3}{C^2R_1R_2R_3^2}\,\frac{1}{\$^2 + \$\,\frac{1}{R_2C} + \frac{1}{R_3^2C^2}}$$

$$T(\$) = -\frac{\frac{1}{R_1R_3C^2}}{\$^2 + \$\,\frac{1}{R_2C} + \frac{1}{R_3^2C^2}}$$

$$\begin{cases} \frac{\omega_o}{Q} = \frac{1}{R_2C} \\ \omega_o^2 = \frac{1}{R_3^2C^2} \end{cases} \qquad T(\$) = -\frac{\omega_o\,\frac{1}{R_1C}}{\$^2 + \$\,\frac{\omega_o}{Q} + \omega_o^2}$$

NOTA

2) Obtener los valores de los componentes si $\omega_0 = 1$ y $Q = 3$

$$\begin{cases} \frac{\omega_0}{Q} = \frac{1}{R_2 C} \xrightarrow{\omega_0 = 1} Q = R_2 C \xrightarrow{Q=3} R_2 C = 3 \rightarrow C = \frac{3}{R_2} \\ \omega_0^2 = \frac{1}{R_3^2 C^2} \rightarrow \omega_0 = \frac{1}{R_3 C} \xrightarrow{\omega_0 = 1} R_3 C = 1 \rightarrow \boxed{C = \frac{1}{R_3}} \end{cases}$$

$$\Rightarrow \frac{3}{R_2} = \frac{1}{R_3} \rightarrow \boxed{3R_3 = R_2}$$

3) Ajustar R_1 para que $|T(0)| = 20\,dB = 10$ (veces) $\rightarrow dB = 20 \log\left(\frac{V_1}{V_2}\right)$, $\frac{V_1}{V_2} = 10$

$$|T(0)| = \frac{\omega_0 \frac{1}{R_1 C}}{\omega_0^2} = 10 \text{ , y } \omega_0 = 1$$

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

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