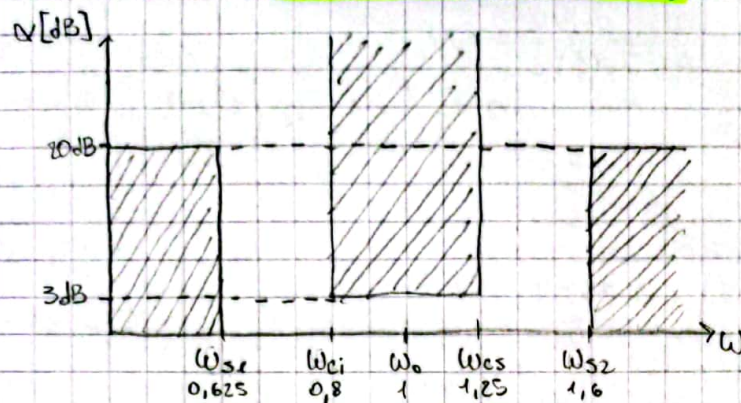


Tarea semanal 4 Bis



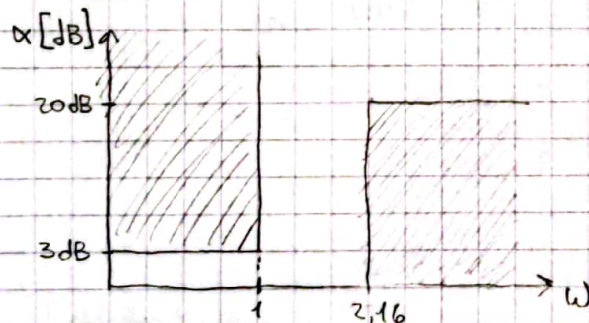
$$\begin{aligned}
 F_{ci} &= 1600 \text{ kHz} & \omega_{si} &= 2\pi F_{ci} \\
 F_{cs} &= 2500 \text{ kHz} & \omega_{cs} &= 2\pi F_{cs} \\
 F_{s1} &= 1250 \text{ kHz} & \omega_{s1} &= 2\pi F_{s1} \\
 F_{s2} &= 3200 \text{ kHz} & \omega_{s2} &= 2\pi F_{s2} \\
 \omega_o &= 4000\pi
 \end{aligned}$$

TRANSFORMACIÓN A PASA BAJOS

$$K(s) = Q \frac{\omega^2 - 1}{\omega} \quad Q = \frac{\omega_o}{BW} = \frac{2\pi \sqrt{F_{ci} \cdot F_{cs}}}{2\pi (F_{cs} - F_{ci})} = \frac{2 \cdot 10^6}{0,9 \cdot 10^6} = 2,22$$

$$\begin{aligned}
 \Omega_p &= 1 & \Omega_{s1} &= \frac{\omega_{s1}^2 - 1}{\omega_{s1}} & Q &= 2,16 \\
 & & \Omega_{s2} &= \frac{\omega_{s2}^2 - 1}{\omega_{s2}} & Q &= 2,16
 \end{aligned}
 \quad \left. \begin{array}{l} \\ \end{array} \right\} \text{Puede usar cualquiera}$$

PLANTILLA PASA BAJOS

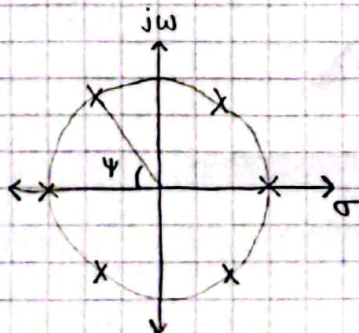


$$\epsilon_1 = 1 \text{ por condición de } 3\text{dB}$$

$$\alpha_{\min} = 10 \log_{10} (1 + \epsilon_1^2 \Omega_s^{2n})$$

$$\begin{aligned}
 n=2 &\rightarrow \alpha_{\min} = 13,57 \text{ dB} \quad \times \\
 n=3 &\rightarrow \alpha_{\min} = 20,11 \text{ dB} \quad \checkmark
 \end{aligned}$$

$$|T(s)| = \frac{1}{1-s^6} \rightarrow T_3(s) = \frac{1}{s+1} \frac{1}{s^2+s+1}$$



$$\Psi = \pi/3 \quad Q = \frac{1}{\cos \Psi \cdot 2} = 1$$

$$\cos \Psi = \frac{1}{2}$$

APLICO TRANSFORMACIÓN

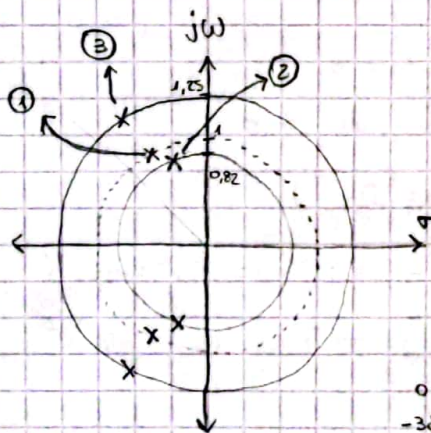
$$s \rightarrow \frac{s^2 + 1}{s} Q$$

$$T_2(s) = \frac{1}{s+1} \frac{1}{s^2+s+1} \rightarrow T_2(s) = \frac{1}{Q \frac{s^2+1}{s} + 1} \frac{1}{Q^2 \left(\frac{s^2+1}{s} \right)^2 + Q \frac{s^2+1}{s} + 1}$$

$$\begin{aligned} T_2(s) &= \frac{s}{Qs^2 + s + Q} \frac{1}{Q^2 \left(\frac{s^4 + 2s^2 + 1}{s^2} \right) + Q \frac{s^2+1}{s} + 1} \\ &= \frac{s/Q}{s^2 + s/Q + 1} \frac{s^2}{Q^2 s^4 + 2Q^2 s^2 + Q^2 + Qs^3 + Qs + s^2} \\ &= \frac{s/Q}{s^2 + s/Q + 1} \frac{s^2/Q^2}{s^4 + s^3/Q + s^2(2 + \frac{1}{Q^2}) + s/Q + 1} \end{aligned}$$

CON AYUDA DE SIMULACIÓN SEPARO EN SOS

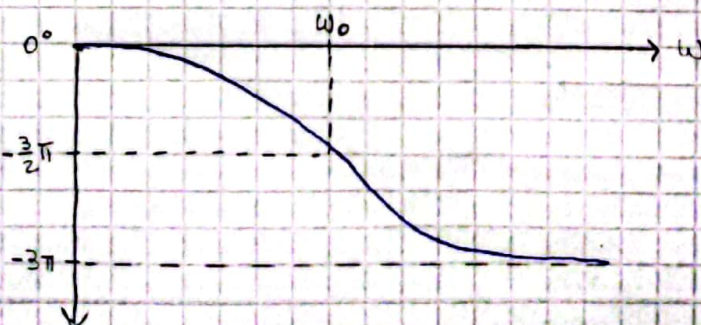
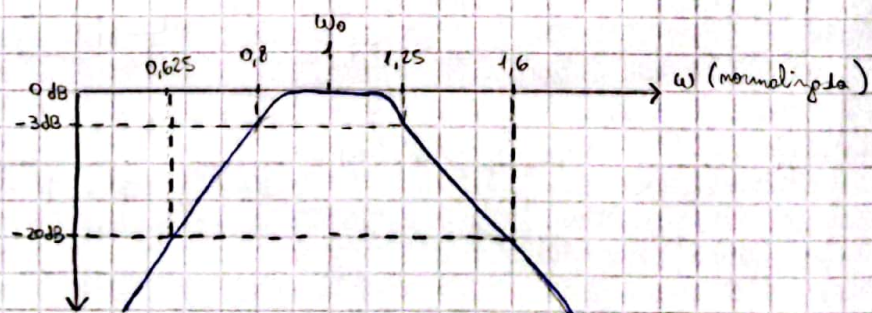
$$T_2(s) = \frac{\textcircled{1}}{s^2 + s \cdot 0,45 + 1} \frac{\textcircled{2}}{s^2 + s \cdot 0,18 + 0,677} \frac{\textcircled{3}}{s^2 + s \cdot 0,268 + 1,477}$$



$$\textcircled{1} \quad \omega_0 = 1 \quad \psi = \arctan\left(\frac{\omega_0}{2Q}\right) = 77^\circ$$

$$\textcircled{2} \quad \omega_0 = 0,82 \quad \psi = 77,37^\circ$$

$$\textcircled{3} \quad \omega_0 = 1,215 \quad \psi = 74,13^\circ$$



NOTA

IMPLEMENTACIÓN ACK-MOSS

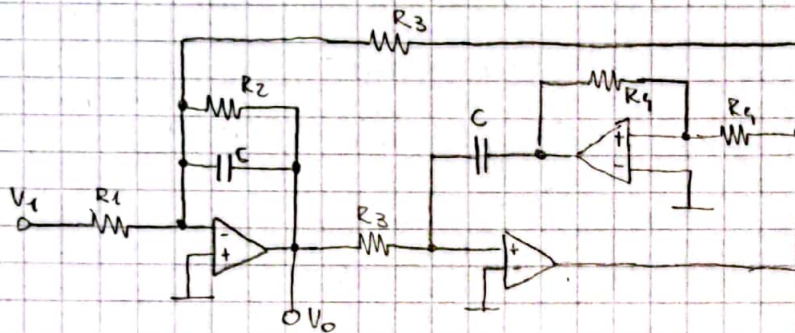
$$T_{ack}(s) = \frac{s \frac{\omega_0}{Q} K}{s^2 + s \frac{\omega_0}{Q} + \omega_0^2}$$

$$K = - \frac{R_2}{R_1}$$

$$Q = \frac{R_2}{R_3}$$

$$\omega_0 = \frac{1}{R_3 C}$$

Se utilizarán 3 de los siguientes circuitos de ACK-MOSS en cascada



La transferencia es:

$$T(s) = \frac{s \cdot 0,45}{s^2 + s \cdot 0,45 + 1} \quad (1)$$

$$\frac{s \cdot 0,18 \cdot 2,5}{s^2 + s \cdot 0,18 + 0,677} \quad (2)$$

$$\frac{s \cdot 0,262 \cdot 1,68}{s^2 + s \cdot 0,262 + 1,477} \quad (3)$$

$$(1) \quad \frac{1}{R_3 C} = 1 \rightarrow \begin{cases} R_3 = 1 \\ C = 1 \end{cases} \quad \frac{R_2}{R_1} = 0,45 \rightarrow R_2 = 2,22 \quad \frac{R_2}{R_1} = 1 \rightarrow R_1 = R_2$$

$$(2) \quad \frac{1}{R_3 C} = \sqrt{0,677} \rightarrow \begin{cases} R_3 = 1 \\ C = 1,215 F \end{cases} \quad \frac{\sqrt{0,677}}{R_2/R_3} = 0,18 \rightarrow R_2 = 4,57 \quad \frac{R_2}{R_1} = 2,5 \rightarrow R_1 = 1,83$$

$$(3) \quad \frac{1}{R_3 C} = \sqrt{1,477} \rightarrow \begin{cases} R_3 = 1 \\ C = 0,823 F \end{cases} \quad \frac{\sqrt{1,477}}{R_2/R_3} = 0,262 \rightarrow R_2 = 4,53 \quad \frac{R_2}{R_1} = 1,68 \rightarrow R_1 = 2,7$$