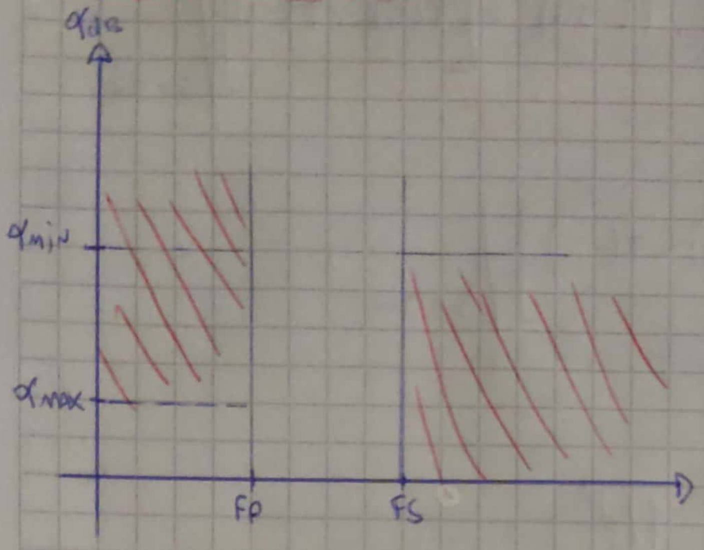
TAREA SEMANAL 3



$\alpha_{max} = 1dB$

$\alpha_{min} = 12dB$

$FP = 1{,}5KHz$

$FS = 3KHz$

$\xi^2 = 10^{\alpha_{max}/10} - 1 \Rightarrow \xi^2 = 10^{1/10} - 1 \rightarrow \xi^2 = 0{,}2589$

$\xi = 0{,}5088$

$\alpha_{min}(n) = 10\log\left(1 + \xi^2 \, Ws_N^{2n}\right)$; $\Omega w = 2\pi \overset{1{,}5kHz}{FP}$; $Ws_N = 2\pi \overset{3KHz}{FS} / \Omega w$

$Ws_N = 2$

$\alpha_{min}(1) = 10\log\left(1 + 0{,}2589 \cdot 2^{2.1}\right) \Rightarrow \alpha_{min}(1) \cong 3{,}087\,dB$

$\alpha_{min}(2) = 10\log\left(1 + 0{,}2589 \cdot 2^{2.2}\right) \Rightarrow \alpha_{min}(2) \cong 7{,}1116\,dB$

$\alpha_{min}(3) = 10\log\left(1 + 0{,}2589 \cdot 2^{2.3}\right) \Rightarrow \alpha_{min}(3) \cong 12{,}4476\,dB$

$\rightarrow > \alpha_{min} = 12\,dB$

ORDEN 3

TRANSFERENCIA DE MAXIMA PLANICIDAD DE ORDEN 3

PARTIMOS DE : $|T(jw)|^2 = T(jw) \cdot T(-jw) = \left[T(s) \cdot T(-s)\right]\Big|_{s=jw}$

$$|T(w)|^2 = \frac{1}{1+\xi^2 \cdot w^{2\underset{3}{\underbrace{n}}}} = \left[T(s) \cdot T(-s)\right]\Big|_{s=jw}$$

Si $w = s/j \Rightarrow |T(s/j)|^2 = \dfrac{1/\xi^2}{\frac{1}{\xi^2} + \underbrace{(s/j)^6}_{j^2 \cdot j^2 \cdot j^2 = (-1)(-1)(-1) = -1}}$

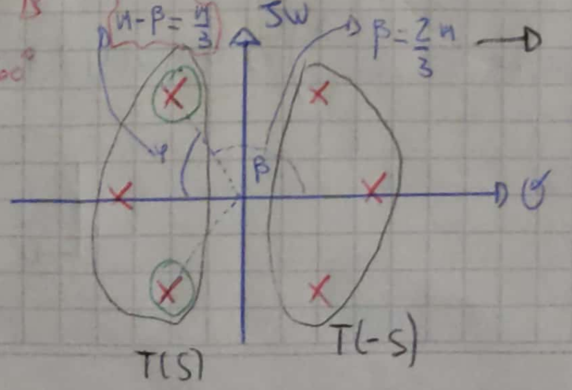
$$|T(s)|^2 = \frac{1/\xi^2}{\frac{1}{\xi^2} - s^6}$$

$$|T(s)|^2 = \frac{w_0^2}{s^2 + \frac{w_0}{Q}s + w_0^2} \cdot \frac{w_0}{s+w_0} \cdot \frac{w_0^2}{s^2 - \frac{w_0}{Q}s + w_0^2} \cdot \frac{w_0}{-s+w_0}$$

$$w_0^6 = 1/\xi^2 \Rightarrow w_0 = \sqrt[6]{1/\xi^2} = \sqrt[6]{\frac{1}{0{,}2589}} \Rightarrow w_0 = 1{,}2526$$

$\varphi \equiv 60°$ $\quad \pi - \beta = \frac{\pi}{3}$ $\quad \beta = \frac{2\pi}{3} \longrightarrow$ Polos para s^6

$$Q = \frac{1}{2\cos\varphi}$$



$$Q = \frac{1}{\underbrace{2\cos 60°}_{2 \cdot 1}} = 1$$

- Esos polos corresponden a un filtro de orden 2

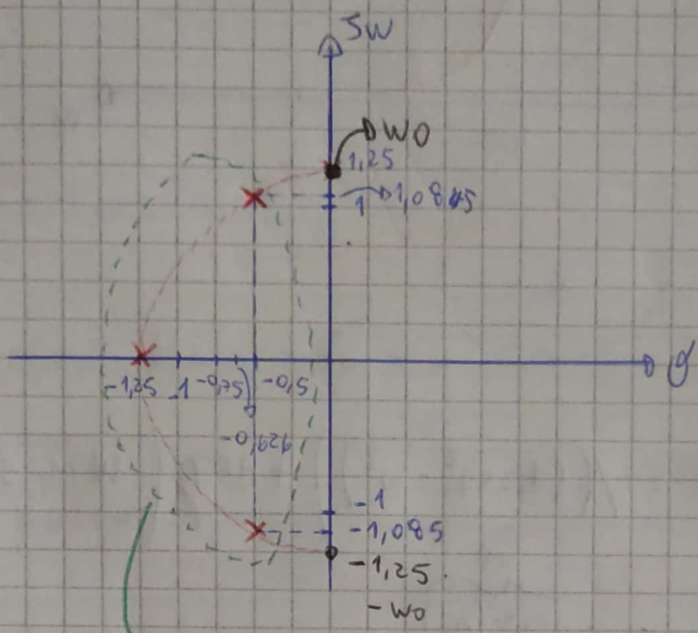
ENTONCES: $T(S) = \dfrac{(1{,}2526)^2}{S^2 + 1{,}2526\,S + (1{,}2526)^2} \cdot \dfrac{1{,}2526}{S + 1{,}2526}$

$\rightarrow S_1 = 1{,}25$

$S_2 = -0{,}626 + J\,1{,}085$

$S_3 = -0{,}626 - J\,1{,}085$

b)



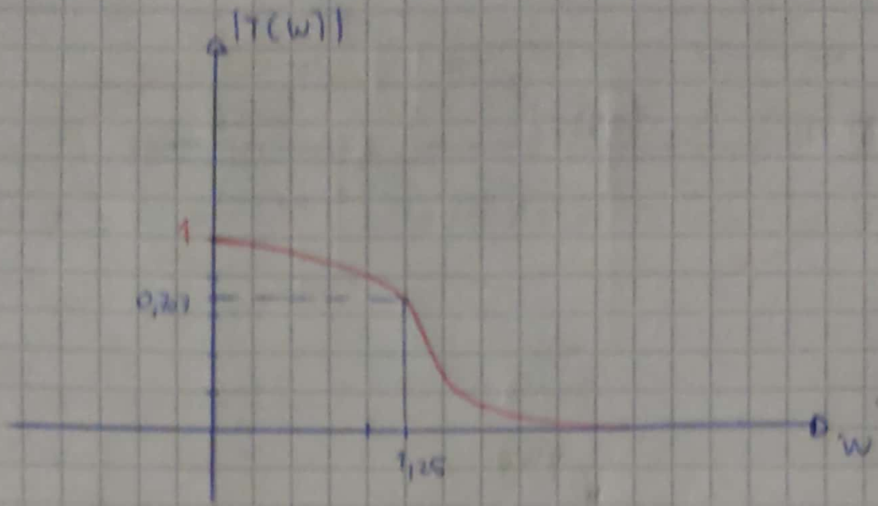
POLOS DE TRANSFERENCIA DE MAX. PLANICIDAD DE ORDEN 3.

$T(W) = T(S)\Big|_{S=JW} = \dfrac{(1{,}25)^2}{-W^2 + 1{,}25\,JW + (1{,}25)^2} \cdot \dfrac{1{,}2526}{JW + 1{,}2526}$

$|T(W)| = \dfrac{1{,}2526^2}{\sqrt{(1{,}25^2 - w^2)^2 + w^2 \cdot 1{,}25^2}} \cdot \dfrac{1{,}2526}{\sqrt{(1{,}25)^2 + w^2}}$

$\boxed{|T(w=0)| = 1}$; $\boxed{|T(w \rightarrow \infty)| = 0}$; $\boxed{|T(w = \underbrace{w_0}_{1{,}25})| = \dfrac{1}{\sqrt{2}} \cdot 1 = \dfrac{1}{\sqrt{2}}}$

MODULO:



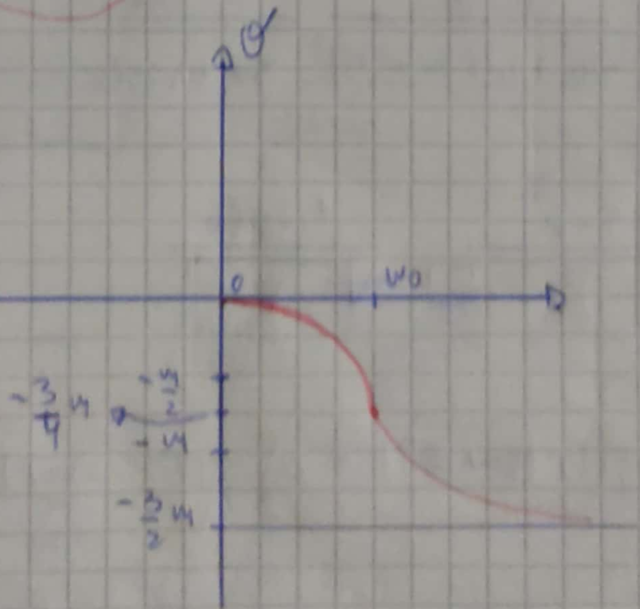
FASE:

$$\varphi(w) = 0^\circ - \left(\mathrm{ARCTG}\left(1{,}25w / \left((1{,}25)^2 - w^2\right)\right) + \mathrm{ARCTG}\left(w / 1{,}25\right)\right)$$

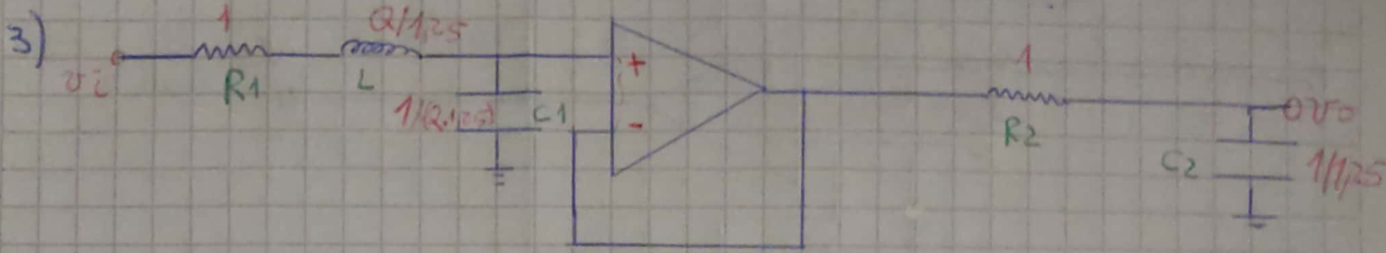
$$\overbrace{-\mathrm{ARCTG}(0^-)}^{\pi}$$

$$\varphi(0) = 0^\circ \quad ; \quad \varphi(w \to \infty) = -\pi - \frac{\pi}{2} = -\frac{3}{2}\pi$$

$$\varphi(w_0) = -\frac{\pi}{2} - \frac{\pi}{4} = -\frac{3}{4}\pi$$



3)



4) $C = 100nF$ (LOS DOS) ; $\Delta W_0 = 2\pi \cdot FP = 2\pi \cdot 1500\,HZ$

$$C = \underbrace{C_N}_{\text{NORMALIZADA}} / (\Omega w \cdot \Omega z) \rightarrow \Delta z^{-1} = \left(\Omega w \cdot C/C_N\right)^{-1} \Rightarrow \Delta z = 1/\left[(\Omega w \cdot C)\,1{,}25\right]$$

$R = \Delta z = ?$

$C_{N_1} = 1/(Q \cdot 1{,}25)$; $Q = 1 \rightarrow C_{N1} = \frac{1}{1{,}25}$

$C_{N2} = 1$

$\rightarrow \Delta z_1 = \Delta z_2 = \left(2\pi \cdot 1{,}5KHZ \cdot 1{,}25 \cdot 100nF / 1\right)^{-1}$

$R_1 = R_2 = \Delta z = (1{,}18\, m\Omega)^{-1} \Rightarrow R_1 = R_2 = 0{,}85K\Omega$

$$L = L_N \cdot \frac{\Delta z}{\Delta w} \Rightarrow L = 1 \cdot 0{,}85K\Omega / \left[(2\pi \cdot 1500\,Hz) \cdot 1{,}25\right]$$

$L = 0{,}072 \cong 72{,}051\, mH$

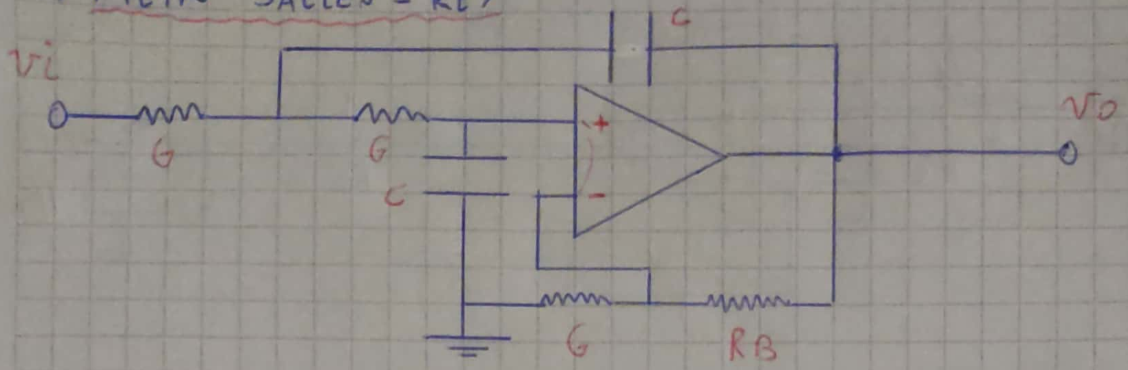
$\$ = S/w_0 \rightarrow S = \$ \cdot w_0$

$$T(\$) = \frac{w_0^2}{\$^2 w_0^2 + \$ \frac{w_0^2}{Q} + w_0^2} \cdot \frac{w_0}{\$ w_0 + w_0} \rightarrow T(\$) = \frac{1}{\$^2 + \frac{1}{Q}\$ + 1} \cdot \frac{1}{\$ + 1}$$

↳ Si $w_0 = 1$

$$\text{Si } \Omega w_0 = 2\pi FP \Rightarrow T(S) = \frac{\Omega w_0^2}{S^2 + \frac{\Omega w_0}{Q} S + \Omega w_0^2} \cdot \frac{\Omega w_0}{S + \Omega w_0}$$

5) FILTRO SALLEN - KEY

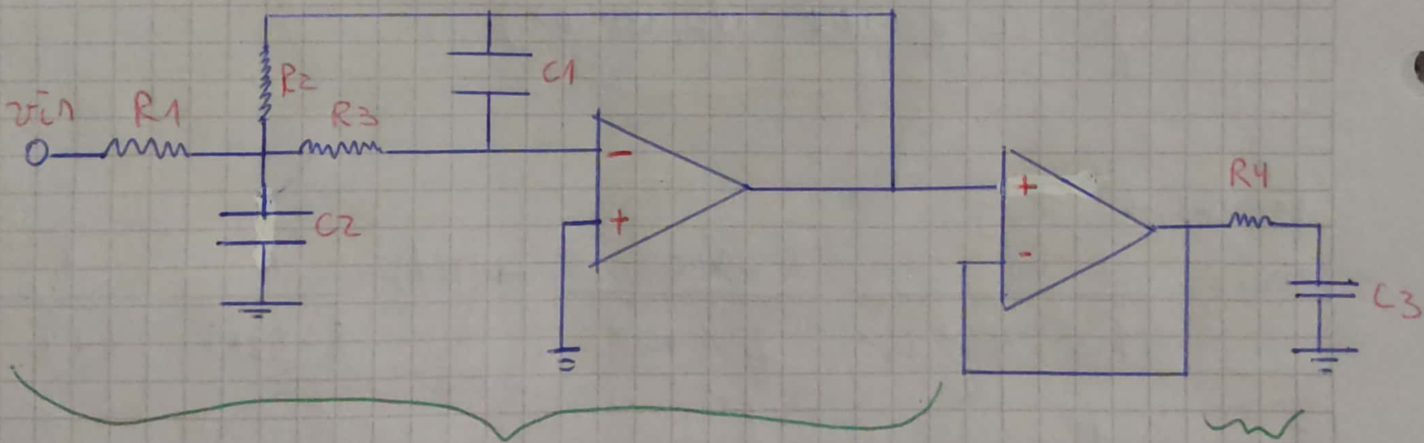


$$T(s) = \frac{K w_0^2}{s^2 + \frac{w_0}{Q} s + w_0^2} \quad ; \quad w_0 = \frac{1}{RC} \quad ; \quad R = 1/G$$

$$Q = \frac{1}{3-K} \quad ; \quad K = \frac{R+RB}{R}$$

Si $RB = 0 \rightarrow K = 1$; $Q = 1/3 \rightarrow$ NO ME SIRVE, Q DEBE VALER 1.

MULTIPLE FEEDBACK (VERSIÓN PASABAJOS)



PASA BAJOS DE 2^{NDO} ORDEN

1er ORDEN

NOTA

$w_0 = \frac{1}{R_2 R_3 C_1 C_2}$; $K = R_2 / R_1$; $Q = \frac{R_1 \sqrt{R_2 R_3 C_2}}{\sqrt{C_1}\,(R_1R_2 + R_2R_3 + R_1R_3)}$

$K = 1 \to R_1 = R_2$; $Q = 1 = \frac{\cancel{R_2}\sqrt{R_2 R_3 C_2}}{\sqrt{C_1}\,\underbrace{(R_2^2 + R_2R_3 + R_2R_3)}_{\cancel{R_2}(\cancel{R_2} + 2R_3)}}$

$\sqrt{C_1}\,(R_2 + 2R_3) = \sqrt{R_2 R_3 C_2}$

$R_1 = R_2 = R_3 = 1 \to \sqrt{C_1} \cdot 3 = \sqrt{C_2}$

$9 = \frac{C_2}{C_1} \to C_2 = 9C_1$; $\overset{w_0}{1} = \frac{1}{C_1 C_2}$

$C_1 . C_2 = 1$

$C_1 \cdot 9C_1 = 1 \to C_1 = \sqrt{1/9}$; $C_2 = 9\,\frac{1}{C_2}$

$C_2 = 3$

$C_1 = 1/3$

BONUS:

$W_B = 2\pi \cdot F_P \cdot \xi^{-1/n}$; $\xi = 0{,}5088$

PARTIMOS DE UN BUTTER DE ORDEN 3.

$$|T(w)|^2 = \frac{1}{1 + w^{2n}_{n=3}}$$

$$|T(s)|^2 = \frac{1}{1 - s^6} = \underbrace{\frac{w_0^2}{s^2 + \frac{w_0}{\underset{1}{Q}} s + w_0^2} \frac{w_0}{s + w_0}}_{T(S)} \frac{w_0^2}{s^2 - \frac{w_0}{Q} s + w_0^2} \frac{w_0}{-s + w_0}$$

$$w_0 = 1; \to T(S) = \frac{1}{s^2 + s + 1} \frac{1}{s + 1}$$

LA DIFERENCIA ESTA EN LA NORMA DE DESNORMALIZACION. ESTA ES:

$$\Omega_{WB} = 2\pi F_P \cdot \xi^{-1/\underset{3}{n}}$$

SI PARTIMOS DEL MISMO CIRCUITO, DESNORMALIZAMOS CON Ω_{WB} Y LLEGAMOS A LO MISMO.

$$\xi^{-1/3} = 1{,}25$$