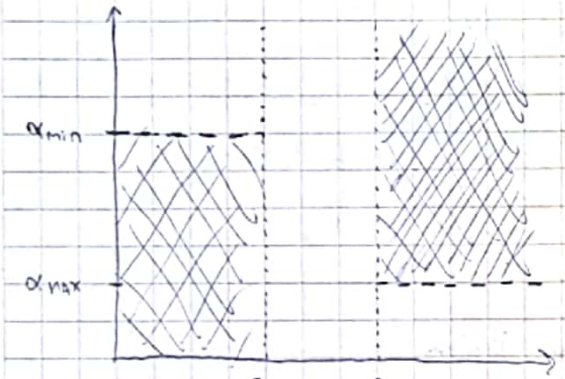
TRABAJO SEMANAL 4



$\alpha_{MAX} = 1\,dB$

$\alpha_{min} = 30\,dB$

$F_s = 10\,KHz$

$F_p = 40\,KHz$

$\omega_s = \frac{1}{4}$ $\quad \omega_p = 1 \longrightarrow$ Equivalente PB $\longrightarrow \omega_{s\_LP} = 4 \quad \omega_{p\_LP} = 1$

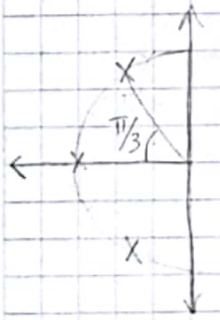
(1)

$\varepsilon^2 = 10^{\alpha_{max}/10} - 1 \longrightarrow \boxed{\varepsilon = 0,509}$

$\alpha_{min} = 10 \log\left(1 + \varepsilon^2 \cdot \omega_{s\_lp}^{2n}\right) \longrightarrow n = 4 \longrightarrow \alpha_{min} = 42,3\,dB$ ✗

$\boxed{n = 3} \longrightarrow \alpha_{min} = 30,26\,dB$ ✓

$\Omega_B = \varepsilon^{-1/n} \cdot \Omega_p = (0,509)^{-1/4} \cdot 2\pi \cdot 10KHz$



$$T(p) = \frac{1}{p+1} \cdot \frac{1}{p^2 + p\,2\cos\left(\frac{\pi}{3}\right) + 1}$$

$$= \frac{1}{p+1} \cdot \frac{1}{p^2 + p + 1}$$

$T(\$) = T(p)\Big|_{p = k_{PA}(\$)}$ $\qquad k_{PA}(\$) = \frac{1}{\$}$

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

Desnormalizando con $\omega_B = \varepsilon^{1/n} \cdot \omega_p$ $\qquad \omega_p = 2\pi \cdot 40KHz$

$$T(\$) = \frac{\$}{\$ + \omega_B} \cdot \frac{\$^2}{\$^2 + \$\omega_B + \omega_B^2}$$

$\omega_B = 63244,7\,\pi\,Hz$

$\omega_B = 200668,46\,Hz$

(2)

Expresando la transferencia normalizada solo por ω_p queda:

$$T(\hat{s}) = \frac{\hat{s}}{\hat{s}+\varepsilon^{1/3}} \cdot \frac{\hat{s}^2}{\hat{s}^2+\hat{s}\,\varepsilon^{1/3}+\varepsilon^{2/3}}$$

$\varepsilon^{1/3} = \omega_0 \cong 0{,}8$

$Q = 1 \Rightarrow \varphi = \pi/3$

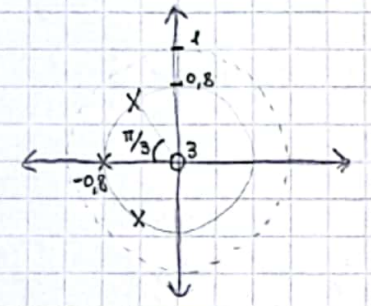
La del pasa bajos queda:

$$T(p) = \frac{\varepsilon^{-1/3}}{\hat{s}+\varepsilon^{-1/3}} \cdot \frac{\varepsilon^{-2/3}}{\hat{s}^2+\hat{s}\,\varepsilon^{-1/3}+\varepsilon^{-2/3}}$$

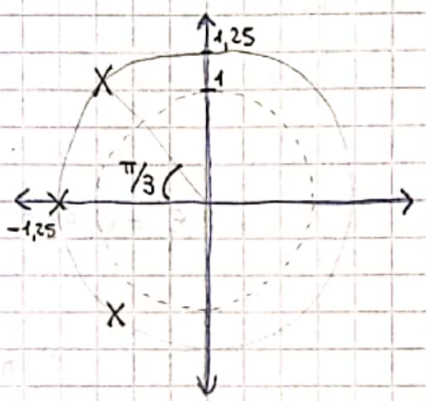
$\varepsilon^{-1/3} = \omega_0 = 1{,}25$

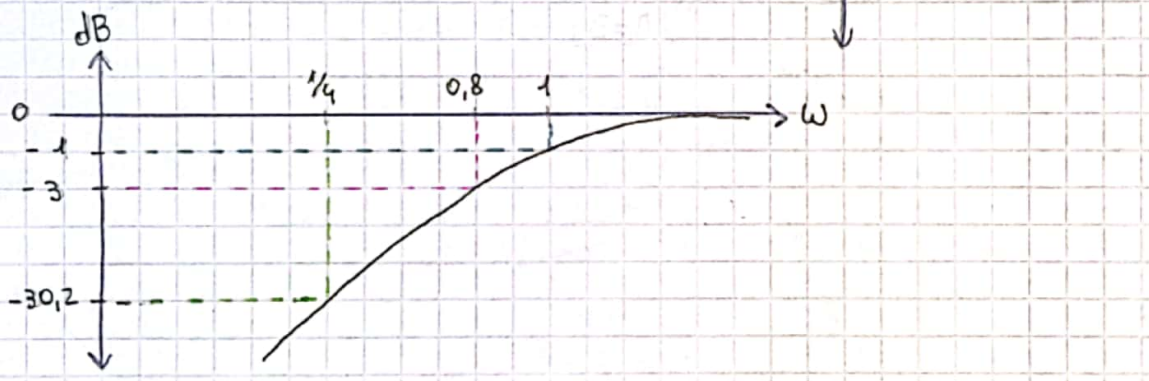
$Q = 1 \Rightarrow \varphi = \pi/3$

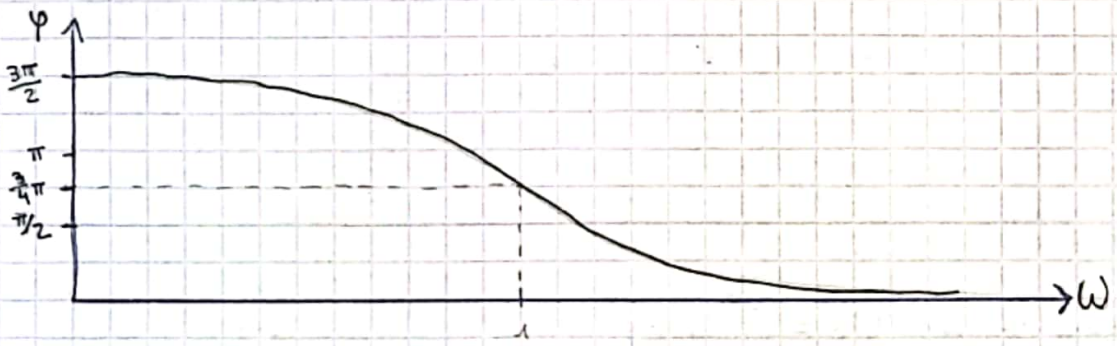
Pasa altos



Pasa Bajos



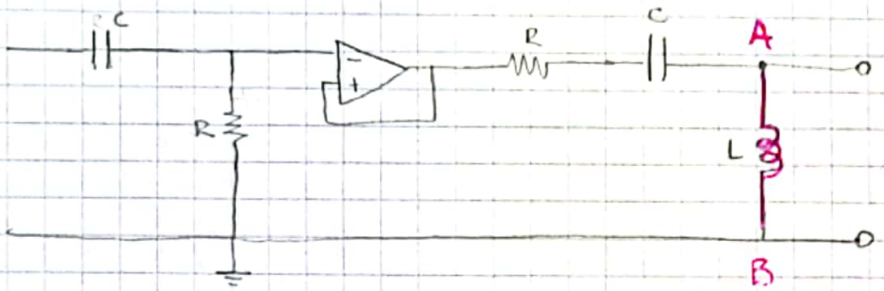




NOTAS

(3)

Transferencia pasa altos



$$T(\$) = \frac{\$^2}{\$^2 + \$\frac{R}{L} + \frac{1}{LC}} \qquad \frac{\$}{\$ + \frac{1}{RC}}$$

$$\rightarrow \frac{1}{LC} = \xi_1^{2/3} = 0{,}637 \qquad \frac{1}{RC} = \xi_1^{1/3} = 0{,}8$$

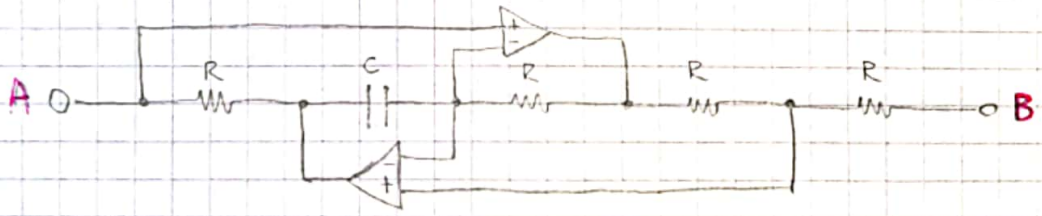
$C=1 \Rightarrow L = 1{,}57\,Hy$ $\qquad$ $C=1 \Rightarrow R = 1{,}25$

$$\rightarrow \frac{R}{L} = \xi_1^{1/3} = 0{,}8$$

$R = 1{,}25$

(4)

Reemplazo el inductor por el siguiente circuito



$$Z_{eq} = \frac{R \cdot R \cdot \cancel{R}}{\frac{1}{\$C}\cancel{R}} = \$R^2C \qquad [R^2C = 1{,}57]$$

$R = 1\,\Omega$

$C = 1{,}57\,F$