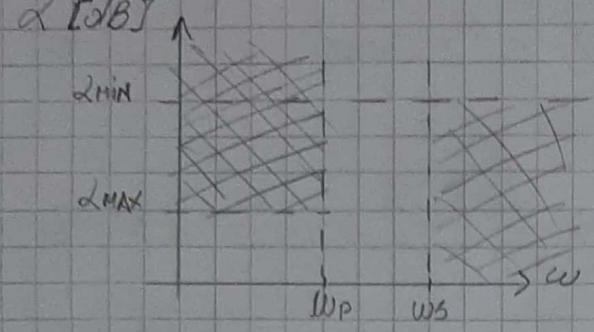
Plantilla



α_{MAX} [dB]	α_{MIN} [dB]	f_p [Hz]	f_s [Hz]
1	12	1500	3000

$\omega_p' = \frac{\omega_p}{\Omega_\omega} = 1$

$\Omega_\omega = 2\pi f_p$

$\Rightarrow \omega_s' = 2$

1)

$|T_B(j\omega)|^2 = \frac{1}{1+\varepsilon^2\omega^{2N}}$

$\alpha^2 = \frac{1}{|T|^2} = 1+\varepsilon^2\omega^{2N}$

$\Rightarrow \alpha_{dB} = 10\log(1+\varepsilon^2\omega^{2N})$

Para $\omega = \omega_p = 1 \Rightarrow \alpha_{MAX\,dB} = 10\log(1+\varepsilon^2 1^{2N})$

$\Rightarrow \varepsilon^2 = 10^{\frac{\alpha_{MAX\,dB}}{10}} - 1 = 0{,}259$

Para $\omega = \omega_s = 2 \Rightarrow \alpha_{MIN_N\,dB} = 10\log(1+0{,}259 \cdot 2^{2N})$

Itero n hasta que $\alpha_N > \alpha_{MIN\,dB}$

$\alpha_{MIN_1} = 3.09$ dB $\alpha_{MIN_3} = 12{,}45$ dB ✓

$\alpha_{MIN_2} = 7{,}11$ dB $\Rightarrow n = 3$

$\boxed{\varepsilon^2 = 0{,}259}$ y $\boxed{n = 3}$

$|T_B(j\omega)|^2_{\omega=s/j} = \frac{1}{1+\varepsilon^2\frac{s^6}{j^6}} = \frac{1}{1-\varepsilon^2 s^6} = T(s)\,T(-s)$

$\frac{1}{1-s^6\varepsilon^2} = \frac{1}{as^3+bs^2+cs+d} \cdot \frac{1}{-as^3+bs^2-cs+d}$

Fáciles

$\begin{cases} d^2 = 1 \\ -a^2 = -\varepsilon^2 \end{cases} \Rightarrow d = 1$ y $a = \varepsilon = 0{,}509$

NOTA 14:45 → 17:00 21:40 → 21:56

2:15 h

$$s^5\ 0 = (2b - 2b)\,s^5$$
$$s^4\ 0 = (-2c + b^2 - 2c)\,s^4 \Rightarrow b^2 = 2\,2c$$
$$s^3\ 0 = (2d - bc + bc - 2d)\,s^3$$
$$s^2\ 0 = (bd - c^2 + 2b)\,s^2 \Rightarrow c^2 = 2bd$$
$$s\ 0 = (cd - c\alpha)\,s$$

Sabiendo $Q = \frac{1}{\xi} \wedge d = 1 \Rightarrow$

$$\Rightarrow \begin{cases} b^2 = 2\xi c \quad (1) \\ c^2 = 2b \quad (2) \end{cases} \qquad c = \sqrt{2b} \quad (2') \Rightarrow^{(2')\to(1)} \Rightarrow b^2 = 2\xi\sqrt{2b}$$

$$b^{4/3} = 4\xi^2 2b \Rightarrow b = \sqrt[3]{8\xi^2}$$

$$\Rightarrow b = 2\xi^{2/3} \quad \wedge \quad c = \sqrt{2.2\xi^{2/3}} = 2.\xi^{1/3}$$

$$|T_3(s)| = \frac{1}{s^3\xi + s^2 2\xi^{2/3} + s2\xi^{1/3} + 1}$$

$$\boxed{|T_3(s)| = \frac{\xi^{-1}}{s^3 + s^2 2\xi^{-1/3} + s2\xi^{-2/3} + \xi^{-1}}}$$

2)

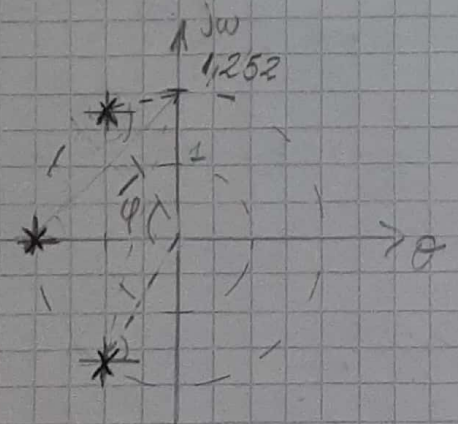
$$|T_3(s)| = \frac{1,965}{s^3 + s^2 2,505 + s\,3,138 + 1,965}$$

Polos $s_1 = -1,252 \qquad s_{2,3} = -0,626 \pm j\,1,085$

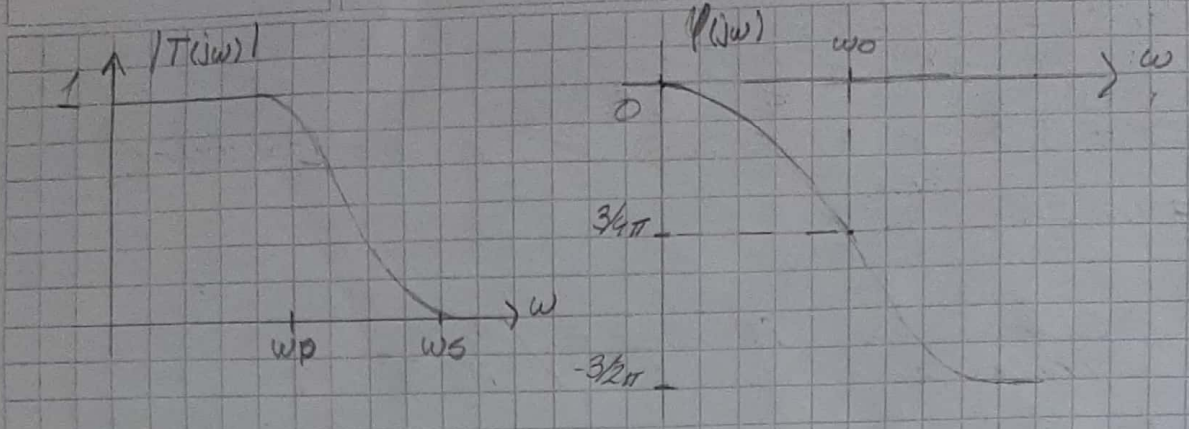
$\omega_0 = |s_1| = 1,252$ y $Q = \frac{1}{2\cos\varphi}$ siendo $\varphi = \pi/n = \pi/3$

$\Rightarrow Q = 1$ con $\omega_0 = 1,252$

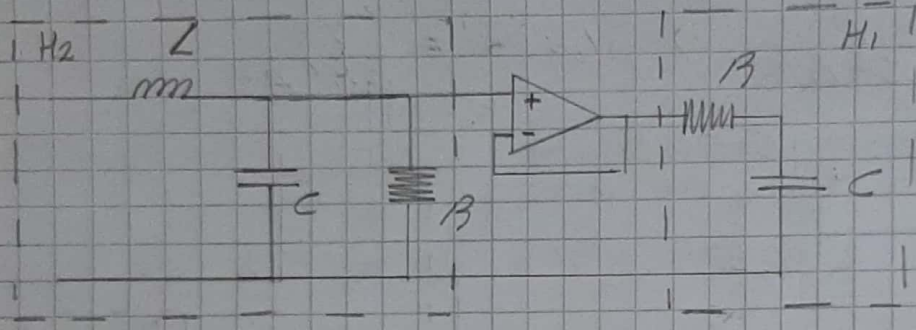
$$|T_3(s)| = \frac{\omega_0}{(s + \omega_0)} \cdot \frac{\omega_0^2}{s^2 + s\frac{\omega_0}{Q} + \omega_0^2} = \frac{1,252}{s + 1,252} \cdot \frac{1,567}{s^2 + s\,1,252 + 1,567}$$



NOTA



3)



$$H_1(s) = \frac{1/BC}{s + 1/BC}$$

$$H_2(s) = \frac{\omega_0^2}{s^2 + s\frac{\omega_0}{Q} + \omega_0^2} = \frac{1/LC}{s^2 + s\,1/BC + 1/LC}$$ siendo $H(s) = H_2(s)\,H_1(s)$

$\frac{\omega_0}{Q} = \frac{1}{BC}$; $\omega_0^2 = \frac{1}{LC}$ siendo $Q = 1$ y $\omega_0 = 1{,}252$

Tomo $R_2 = R \Rightarrow R' = 1$

$\omega_0 = \frac{1}{RC} \Rightarrow C' = 1/\omega_0$ y $L' = \frac{1}{\omega_0}$

$\Rightarrow R' = 1 \quad C' = 0{,}8 \quad$ y $L' = 0{,}8$.

4) Si solo puedo usar $C = 100\,nF$

$C = \frac{C'}{R_w \cdot R_2}$ $\Rightarrow$ tengo que averiguar R_2 para que $C = 100\,nF$

$\Rightarrow R_2 = \frac{C'}{C} \cdot \frac{1}{R_w} = \frac{0{,}8}{100\,nF} \cdot \frac{1}{2\pi \cdot 1{,}5\,kHz} = 848{,}83\,\Omega$

$\Rightarrow R \cong 850\,\Omega$

$L = \frac{L'}{R_w} \cdot R_2 = \frac{0{,}8}{2\pi\,1{,}5\,kHz} \cdot 848{,}83\,\Omega = 72{,}05\,mHy$

NOTA 22:14 → 23:30 11:50 → 12:30