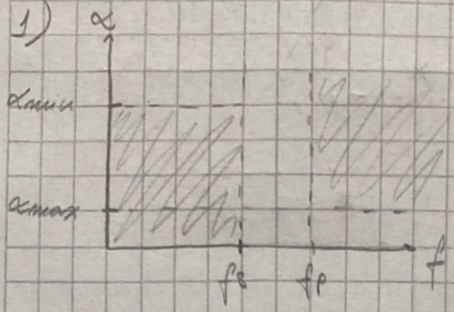
TS4

HOJA Nº 9

FECHA

1)



$\alpha_{max} = 1\,dB \quad \alpha_{min} = 30\,dB$

$f_p\,[kHz] = 40 \quad f_s\,[kHz] = 10$

Normalizo usando $\Omega_\omega = 2\pi f_p \longrightarrow \omega_p = 1 \;\wedge\; \omega_s = 1/4$

Lo trabajo como si fuera un pasabajos

$\Omega_p = 1 \quad \Omega_s = 4 \quad \alpha$ se mantiene

$\xi^2 = 10^{\alpha_{max}/10} - 1 \cong 0,26 \longrightarrow \xi \cong 0,51$

$\alpha_{min} = 10 \log(1+\xi^2 \Omega_s^{2n}) \Longrightarrow n = 3 \;,\; \alpha(\Omega_s)[dB] = 30,28\,dB$

$$|T(\omega)|^2 = \frac{1}{1+\xi^2\omega^{2n}} \xrightarrow{\omega_B = \xi^{-1/n}} |T(\omega)|^2 = \frac{1}{1+\omega^{2n}} = \frac{1}{1+\omega^6}$$

$$|T(\omega)|^2\Big|_{\omega = \frac{s}{j}} = \frac{1}{1-s^6} = \frac{-1}{s^6-1} = T(s)\cdot T(-s)$$

$$-\frac{1}{s^6-1} = \frac{1}{(s+1)(s^2+2\cos\varphi\, s+1)} \cdot \frac{-1}{(s-1)(s^2-2\cos\varphi\, s+1)} \qquad \varphi = \frac{\pi}{3}$$

$$T_{LP}(s) = \frac{1}{(s+1)(s^2+s+1)} = \frac{1}{s^3+2s^2+2s+1} \xrightarrow{\text{desnorm.}} \frac{\xi^{-1}}{s^3+2s^2\cdot\xi^{-1/3}+2\xi^{-2/3}s+\xi^{-1}}$$

$$T_{HP}(s) = T_{LP}\left(\frac{1}{s}\right) = \frac{1}{\frac{1}{s^3}+\frac{2}{s^2}+\frac{2}{s}+1} = \frac{s^3}{1+2s+2s^2+s^3}$$

$$T_{HP}(s) = \frac{s^3}{s^3+2s^2+2s+1}$$ Desnormalizo ω_B^{-1} porque paso de s a $\frac{1}{s}$

$$T_{HP}(s) = \frac{s^3\cdot(\xi^{-1/3})^3}{s^3\cdot(\xi^{-1/3})^3+2s^2(\xi^{-1/3})^2+2s(\xi^{-1/3})+1} = \frac{s^3}{s^3+2s^2\cdot\xi^{1/3}+2s\cdot\xi^{2/3}+(\xi^{1/3})^3} \qquad \xi = 0,51$$

$$T_{HP}(s) = \frac{s^3}{s^3+1,59s^2+1,27s+0,51}$$

$$\left[\; T_{HP}(s) = \frac{s^3}{(s+\xi^{1/3})(s^2+\xi^{1/3}s+(\xi^{1/3})^2)} = \frac{s^3}{(s+0,8)(s^2+0,8s+(0,8)^2)} \;\right]$$

NOTA

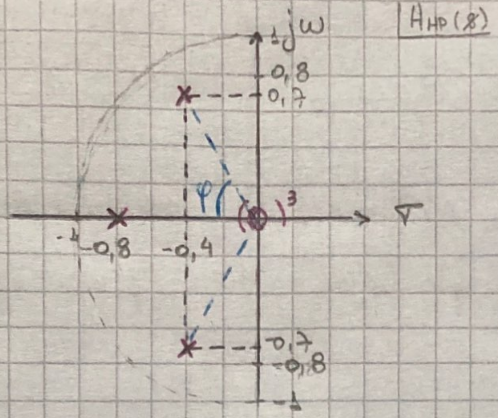
1/s = R/L

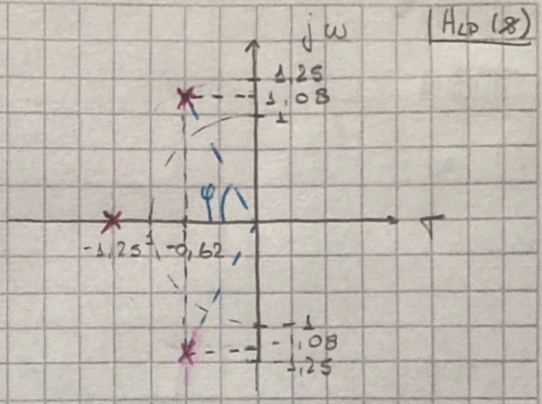
1/s = Ω/L

$L = \Omega s$

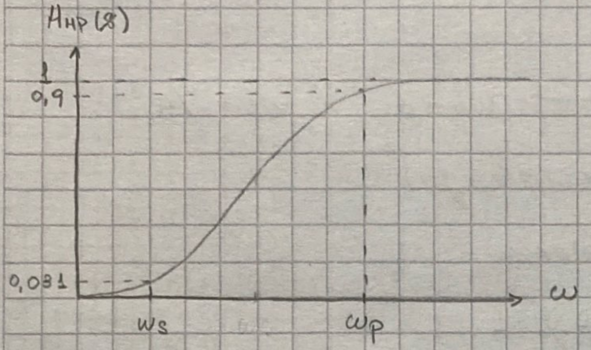
$C = s/\Omega$

2)

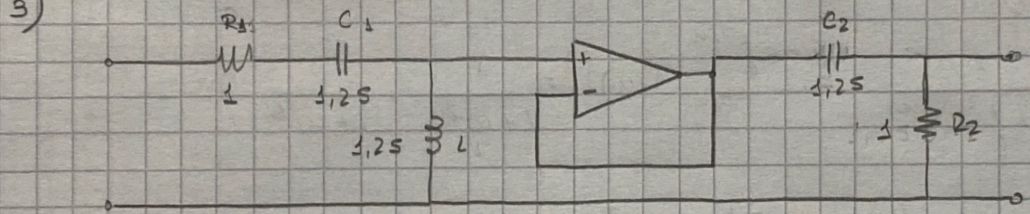




$\varphi = \frac{\pi}{3}$



3)



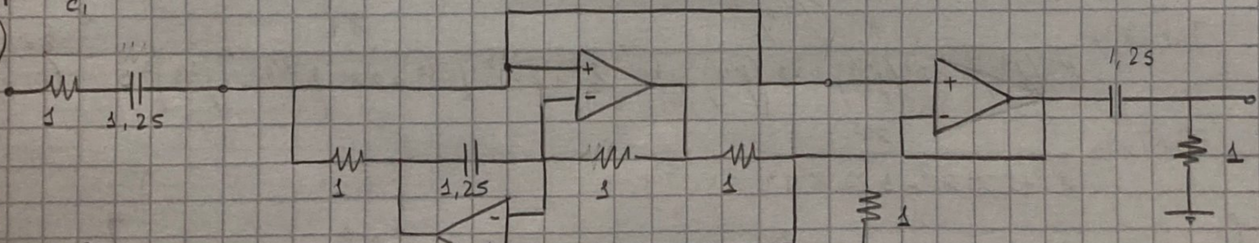
$$H_{HP}(s) = \frac{s^2}{s^2+0{,}8s+(0{,}8)^2} \cdot \frac{s}{s+0{,}8} = \frac{s^2}{s^2+\frac{R_1}{L_1}s+\frac{1}{L_1C_1}} \cdot \frac{s}{s+\frac{1}{R_2C_2}}$$

$$\begin{cases} \frac{R_1}{L} = \frac{1}{R_2C_2} = 0{,}8 \\ \frac{1}{L\,C_1} = 0{,}64 \end{cases}$$

normalizo $\Omega_Z = R$ y propongo $Z_1 = Z_2$

$$\begin{cases} R = 1 \\ \frac{1}{L} = \frac{1}{C_2} = 0{,}8 \longrightarrow L = 1{,}25 \wedge C_2 = 1{,}25 \\ \frac{0{,}8}{C_1} = (0{,}8)^2 \longrightarrow C_1 = 1{,}25 = C_2 \end{cases}$$

4)



$L = R^2 C$

Si propongo $R_{gic} = R$, $C_{gic} = C_1 = C_2$ y normalizando, $L = 1^2 \cdot C = 1{,}25$

NOTA