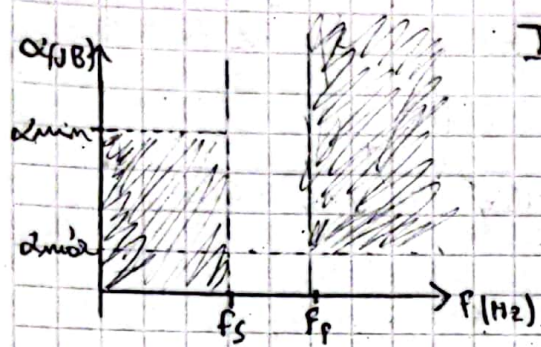


TS3



$$\alpha_{max} = 7 \text{ dB} \quad \alpha_{min} = 35 \text{ dB}$$

$$f_s = 1 \text{ kHz}$$

$$f_p = 3,5 \text{ kHz}$$

$$\omega = 2\pi \cdot 3,5 \text{ kHz}$$

Normaliza plantilla para otras: $\omega_p' = 1 \quad \omega_s' = \frac{\omega_s}{\omega_p} = 0,28$

Plantilla exponencial Para Bajas: $\omega_{LP} = \frac{1}{\omega_p'} = 1 \quad \omega_{CLP} = \frac{1}{\omega_s'} = 3,5$

$$|H(j\omega)| = \frac{1}{\sqrt{1 + \xi^2 \omega^{2m}}}$$

$\omega = 1 \rightarrow \alpha_{max} = 20 \log(\sqrt{1 + \xi^2 \omega_s^{2m}}) \rightarrow$ Siempre mismo Procedimiento

Resolviendo: $\xi = \sqrt{10^{\frac{\alpha_{max}}{20}} - 1} = 0,508 \quad \xi^2 = 0,258$

$\omega = 3,5 \rightarrow \alpha_{max} = 20 \log(\sqrt{1 + \xi^2 \omega_s^{2m}}) = 10 \log(1 + \xi^2 \omega_s^{2m})$

Con $m = 1 \rightarrow \alpha_{max} = 6,79 \text{ dB} \times \quad m = 2 \rightarrow \alpha_{max} = 15,95 \times$

Con $m = 3 \rightarrow \alpha_{max} = 26,77 \text{ dB} \times \quad m = 4 \rightarrow \alpha_{max} = 37,64 \checkmark$

Resultado: $\xi = 0,508 \quad m = 4$

Elijo otra for HP: $|H(j\omega)|_{\omega=\frac{1}{\omega_p}} = \frac{1}{1 + \xi^2 \omega_p^{2m}} = H(s)H(-s) = \frac{1}{1 + \xi^2 s^2}$

Por calculadora obtengo Polos:

$X_1 = -0,455 + j1,098 \quad X_2 = -0,455 - j1,098 \quad X_3 = -1,098 + j0,455 \quad X_4 = -1,098 - j0,455$

$X_1 \uparrow \omega$
 $X_2 \uparrow 1,098$

$H_1(s) = \frac{1}{(s + 0,455 + j1,098)(s + 0,455 - j0,52)}$

$X_3 \rightarrow -0,455$

$H_2(s) = \frac{1}{(s + 1,098 + j0,455)(s + 1,098 - j0,455)}$

$X_4 \rightarrow -0,455$

$H_3(s)$ En Paso Bajas

$X_5 \rightarrow -1,098$

$H_1(s) = \frac{1/\xi}{(s^2 + 0,915s + 1,972)}$

$H_2(s) = \frac{1/\xi}{(s^2 + 2,195s + 1,412)}$

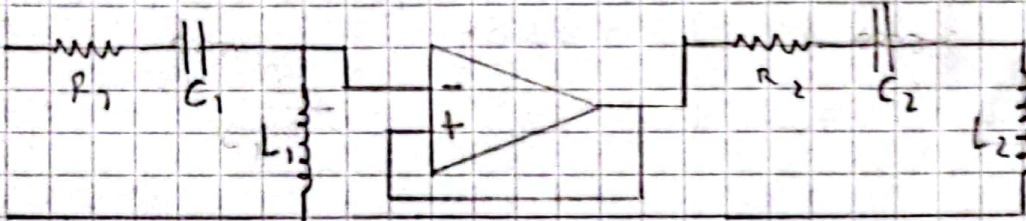
$$1,41 = \sqrt{2} - 1$$

Vuelvo a Paso- alto $s = \frac{1}{s}$

$$H_1(s) = \frac{7/4}{\left(\frac{7}{s^2} + 0,91 \frac{1}{s} + 1,41\right) \left(\frac{7}{s^2} + 2,19 \frac{1}{s} + 1,41\right)} = \frac{7/4}{s^2 (s^2 + 0,64s + 0,7) \frac{1}{s^2} (s^2 + 1,55s + 0,7)}$$

$$H_1(s) = \frac{s^4}{(s^2 + 0,64s + 0,7)(s^2 + 1,55s + 0,7)}$$

2) $n=4$, Necesito 2 estructuras de 2º orden: RLC



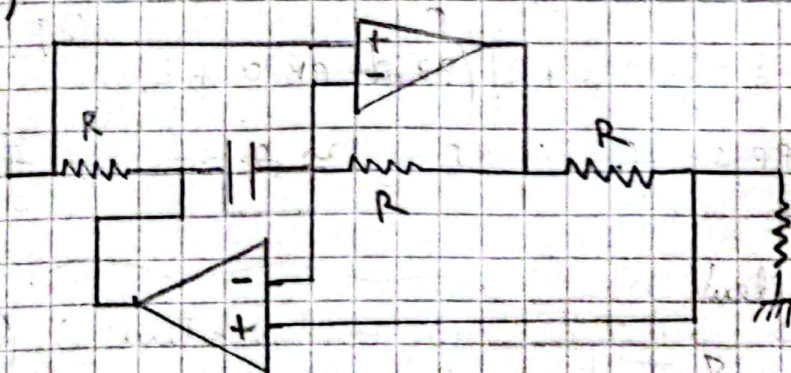
$$H_1(s) = \frac{s^2}{(s^2 + 0,64s + 0,7)} = \frac{s^2}{s^2 + s \frac{R}{L} + \frac{1}{LC}}$$

$$\frac{R}{L} = 0,64 \quad \text{Si } R_1 = 1k\Omega \rightarrow L_1 = 1,56kH \quad \frac{1}{LC} = 0,7 \rightarrow C_1 = 915\mu F$$

$$H_2(s) = \frac{s^2}{(s^2 + 1,55s + 0,7)} = \frac{s^2}{s^2 + s \frac{R}{L} + \frac{1}{LC}}$$

$$\frac{R}{L} = 1,55 \quad \text{Si } R_2 = 1k\Omega \rightarrow L_2 = 645H \quad \frac{1}{LC} = 0,7 \rightarrow C_2 = 2,2mF$$

5)



Del ej anterior:

$$\omega_0 = 0,836$$

$$Q_1 = 0,541 \quad Q_2 = 7,37$$

$$k=1$$

$$Z_2 = \frac{Z_1 Z_3 Z_5}{Z_1 Z_7} = s C R^2$$

$$L = C R^2 \frac{Q}{\omega_0} \rightarrow C = \frac{Q}{R^2 \omega_0}$$

$$C_1 = 647,12pF \quad L_1 = 0,64H$$

$$C_2 = 7,56\mu F \quad L_2 = 7,56H$$