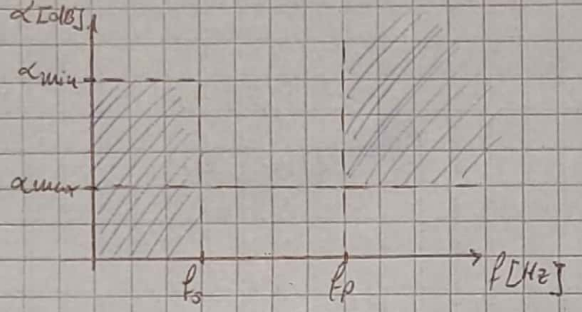
Fabrizio Hermosa

HOJA N° 1

FECHA

▸ Tarea semanal 4

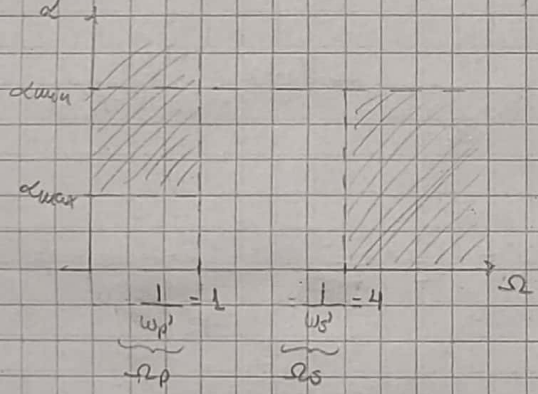


α_{max}	α_{min}	f_p	f_s
1 dB	30 dB	40 kHz	10 kHz

1) El filtro que se pide es un pasa altos

Con $\Omega_\omega = 2\pi f_p \rightarrow \omega_p' = \dfrac{2\pi f_p}{\Omega_\omega} = 1$ y $\omega_s' = \dfrac{2\pi f_s}{\Omega_\omega} = 0{,}25$

La plantilla del pasa bajos prototipo queda entonces:



Para máxima planicidad:

$\varepsilon^2 = 10^{\alpha_{max}/10} - 1 = 0{,}25892$

$\alpha_{min_n} = 10\log(1+\varepsilon^2\,\Omega_s^{2n}) = 10\log(1+\varepsilon^2(4)^{2n})$

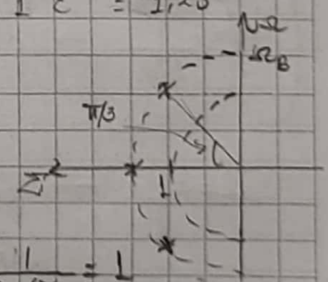
$\alpha_{min_3} = 30{,}2594\ dB \rightarrow \boxed{n=3}$

Uso la Ω_{Butter}:

$$|T(\Omega)|^2 = \frac{1}{1+\varepsilon^2\Omega^{2n}} = \frac{1}{1+\Omega_B^{\,2n}}, \quad \Omega\omega = \Omega p \rightarrow \Omega\omega' = \Omega p\, \varepsilon^{-1/n} = \Omega_B$$

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

$$T_{LP_B}(p) = \frac{1}{(p+1)(p^2+p+1)} \rightarrow T_{LP_{MP}}(p) = \frac{\Omega_B}{p+\Omega_B}\ \frac{\Omega_B^2}{p^2+s\frac{\Omega_B}{Q}+\Omega_B^2}$$



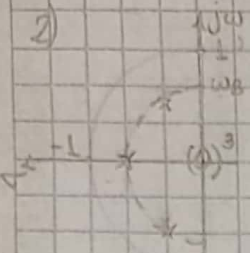
$$Q = \frac{1}{2\cos(\pi/3)} = 1$$

$$T_{HP}(s) = T_{LP}(p)\Big|_{p=1/s} = \frac{\Omega_B}{1/s+\Omega_B}\ \frac{\Omega_B^2}{1/s^2+1/s\ \Omega_B+\Omega_B^2}$$

$$T_{HP}(s) = \frac{s\,\cancel{\Omega_B}}{\cancel{\Omega_B}(s+1/\Omega_B)}\ \frac{\Omega_B^2\ s^2}{(1+s\,\Omega_B+s^2\Omega_B^2)} = \frac{s}{s+\omega_B}\ \frac{s^2}{s^2+s\,\omega_B+\omega_B^2}$$

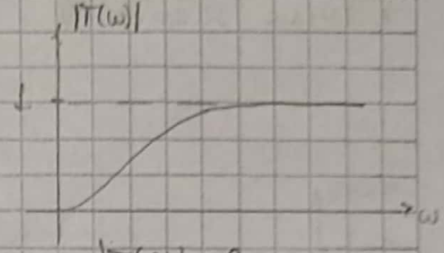
NOTA

2)



Ahora hay un cero de orden 3 (en el origen) y comparando con el diagrama de P y Z del pasabajos.

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

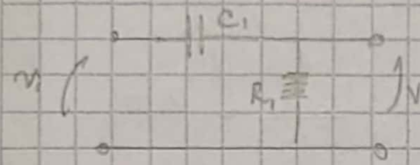


$$\omega_B = \frac{1}{\Omega_B} = 0{,}8$$

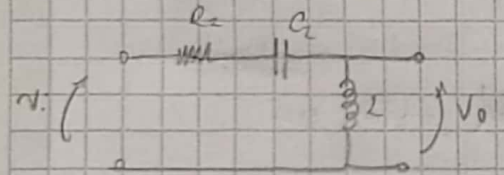
$|T(0)| = 0$

$|T(\infty)| = 1$

3) $T(s) = T_1(s) \cdot T_2(s)$



$$V_0(s) = V_i(s) \frac{R}{R+\frac{1}{sC}} \rightarrow T_1(s) = \frac{s}{s+\frac{1}{RC_1}} = \frac{s}{s+\omega_B}$$



$$V_0(s) = V_i(s) \frac{sL}{R_2+\frac{1}{sC_2}+sL} \rightarrow T_2(s) = \frac{s^2LC_2}{s^2LC_2+sR_2C_2+1}$$

$$T_2(s) = \frac{s^2}{s^2+s\frac{R_2}{L}+\frac{1}{LC_2}} = \frac{s^2}{s^2+s\,\omega_B+\omega_B^2}$$

$$\begin{cases} \omega_B = \frac{1}{R_1C_1} \rightarrow C_1 = \frac{1}{\omega_B R_1} \\ \omega_B = \frac{R_2}{L} \rightarrow L = \frac{R_2}{\omega_B} \\ \omega_B^2 = \frac{1}{LC_2} \rightarrow C_2 = \frac{1}{\omega_B^2 L} \end{cases}$$

Determino $\boxed{C_1 = C_2 = C}$:

$$\frac{1}{\omega_B R_1} = \frac{1}{\omega_B^2 L}$$

$$L = \frac{R_1}{\omega_B} \rightarrow \boxed{R_1 = R_2 = R}$$

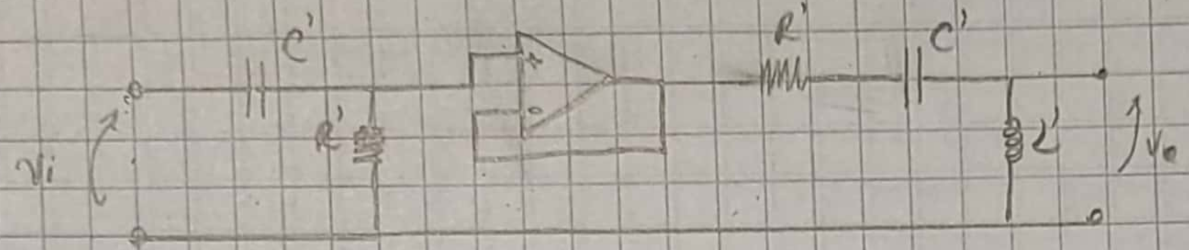
$$\Omega_z = R_1 \rightarrow \begin{cases} C' = \frac{1}{\omega_B R_1}\,\Omega_z = \frac{1}{\omega_B} = 1{,}25 \\ R' = 1 \\ L' = \frac{R_1}{\omega_B}\,\frac{1}{\Omega_z} = \frac{1}{\omega_B} = 1{,}25 \end{cases}$$

NOTA

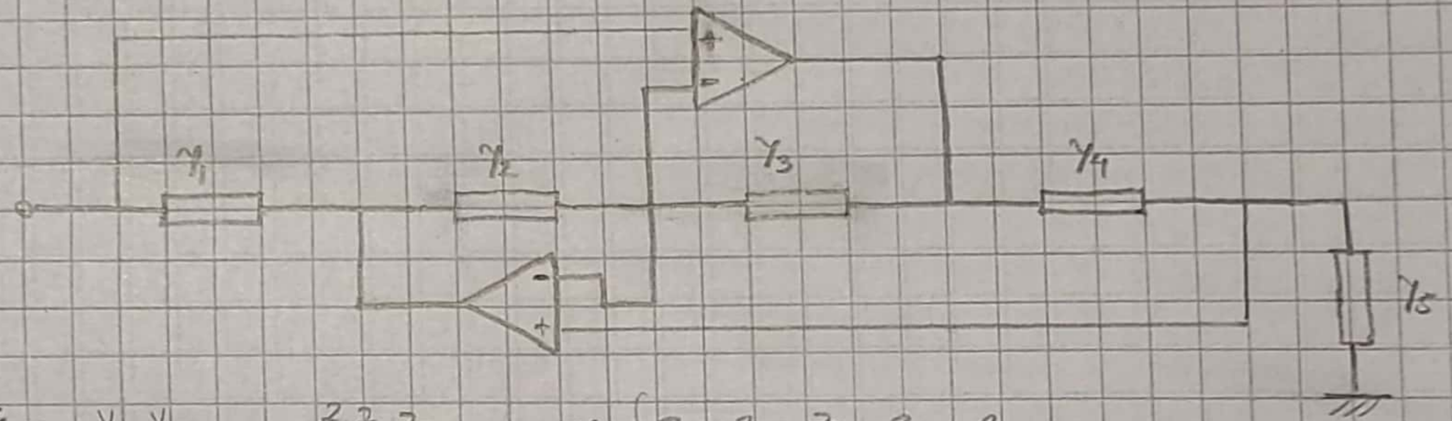
HOJA Nº 2

FECHA

Tarea semanal 4



4) El GIC de Antoniou lo uso para activar el inductor aterrizado:



$$Z_i = \frac{Y_2\, Y_4}{Y_1 Y_3 Y_5} = \frac{Z_1 Z_3 Z_5}{Z_2 Z_4} \quad , \quad si: \begin{cases} Z_1 = Z_3 = Z_4 = Z_5 = R \\ \quad y \\ Z_2 = \dfrac{1}{sC} \end{cases}$$

Entonces: $Z_i = s\, R^2 C = s\, L_{eq}$

$L_{eq} = L' = R^2 C$, de antes $\boxed{R = 1}$ y $\boxed{C = 1{,}25}$