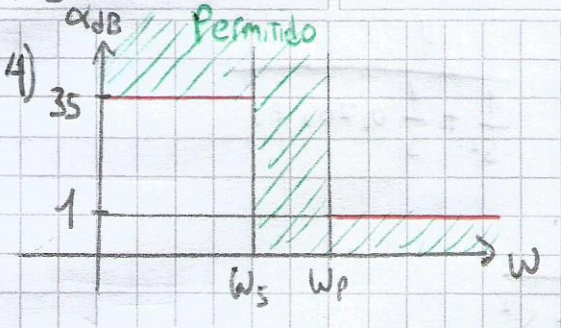
HOJA Nº

FECHA

TP2

4)



$\omega_s = 2\pi \cdot 1000\ Hz$

$\omega_p = 2\pi \cdot 3500\ Hz$

Normalizando: $\omega_p = 1$; $\omega_s = 0,2857$

$(\Omega_\omega = \omega_p)$

Plantilla de Pasabajos equivalente:

$\Omega_p = 1$; $\Omega_s = \frac{1}{\omega_s} = \frac{1}{0,2857} = 3,5$

Máxima Planicidad:

$$|T(j\Omega)|^2 = \frac{1}{1+\xi^2\Omega^{2n}} \Rightarrow \bullet\ \alpha_{dB}(\Omega_p) = 10\log(1+\xi^2) = \alpha_{max}$$

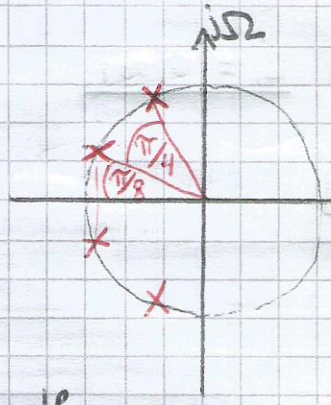
$$\xi^2 = 10^{\frac{\alpha_{max}}{10}} - 1 = 0,2589 \Rightarrow \xi = 0,5088$$

$$\bullet\ \alpha_{min} = 10 \cdot \log(1+\xi^2 \cdot \Omega_s^{2n})$$

Con $n = 3$: $\alpha_{min} = 26,7849$

Con $n = 4$ $\alpha_{min} = 37,6579$

Renormalizo a butter: $\Omega_n = \frac{\Omega_p}{\xi^{1/4}} = \frac{1}{\omega_p \cdot \xi^{1/4}}$



$$T(p) = \frac{1}{p^2 + p \cdot 2 \cdot \cos\frac{\pi}{8} + 1} \cdot \frac{1}{p^2 + p \cdot 2 \cdot \cos\frac{3}{8}\pi + 1}$$

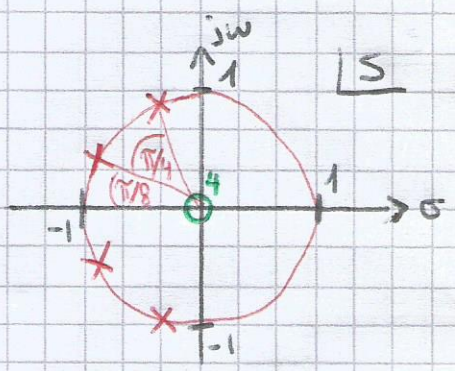
$$T(p) = \frac{1}{p^2 + p \cdot 1,8478 + 1} \cdot \frac{1}{p^2 + p \cdot 0,765 + 1}$$

NOTA

Transformación a Pasa Altos:

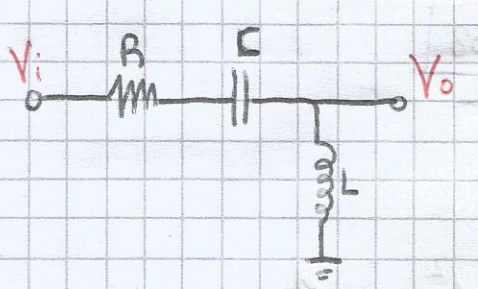
$$T(s) = T^{LP}\left(\frac{1}{s}\right) = \frac{1}{\frac{1}{s^2} + \frac{1}{s}1{,}848 + 1} \cdot \frac{1}{\frac{1}{s^2} + \frac{1}{s}0{,}765 + 1}$$

$$T(s) = \frac{s^2}{1 + s\,1{,}848 + s^2} \cdot \frac{s^2}{1 + s\,0{,}765 + s^2}$$



Con $\Omega_w = \frac{1}{\Omega_n} = \omega_p \cdot \xi^{1/4}$

Circuito Con Secciones Pasivas



$$\frac{V_o}{V_i} = \frac{SL}{SL + R + \frac{1}{SC}} = \frac{s^2 L}{s^2 L + sR + \frac{1}{C}}$$

$$\frac{V_o}{V_i} = T(s) = \frac{s^2}{s^2 + s\frac{R}{L} + \frac{1}{LC}}$$

- Sección 1:

$$\frac{1}{\dot{L_1}\dot{C_1}} = 1 \quad ; \quad \frac{R_1}{\dot{L_1}} = 1{,}848$$

Tomando $R_1 = 1847{,}759\,\Omega \Rightarrow \dot{L_1} = 1000 \rightarrow \dot{C_1} = 0{,}001$

$\therefore L_1 = \frac{\dot{L_1}}{\Omega_w} = 53{,}84\,mHy \quad \frac{\dot{C_1}}{\Omega_w} = 53{,}84\,nF = C_1$

Sección 2: $\frac{1}{\dot{L_2}\dot{C_2}} = 1 \quad ; \quad \frac{R_2}{\dot{L_2}} = 0{,}765$

Tomo mismo L y C: $L_2 = 53{,}84\,mHy \quad C_2 = 53{,}84\,nF$

$\therefore R_2 = 0{,}765 \cdot \dot{L_2} = 765{,}367\,\Omega$

NOTA

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Componentes Normalizados por $\Omega_2 = 1K\Omega$

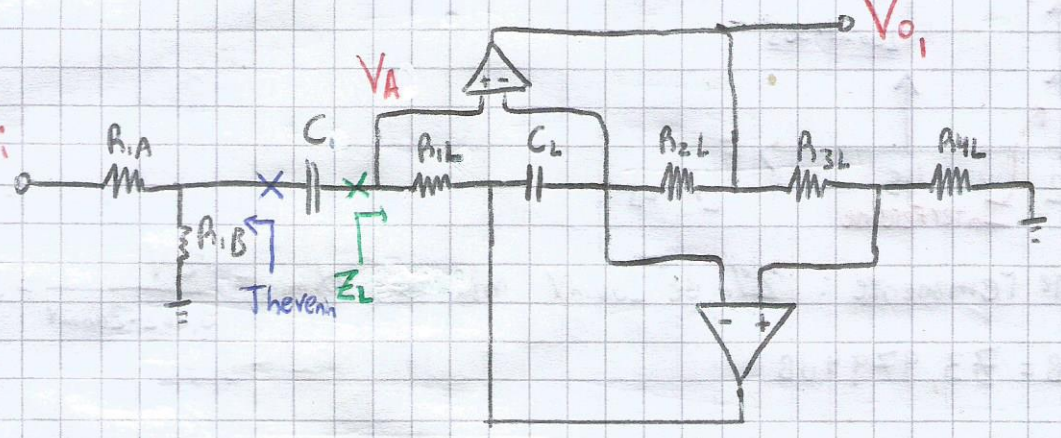
$$\dot{L} = \frac{L}{\Omega_2} = 53{,}84 \cdot 10^{-9} \qquad \dot{C} = C \cdot \Omega_2 = 53{,}84 \cdot 10^{-6}$$

$$\dot{R_1} = \frac{R_1}{\Omega_2} = 1{,}848 \qquad \dot{R_2} = 0{,}765$$

Activación de Bobinas con OPAMP

- Primera Sección:

Se necesita un atenuador para poder después usar la salida de uno de los opamps del girador pra interconectar etapas:



- Caso ideal.

Hago $R_{1L} = 1\ K\Omega$ y $C_L = 10\ nF$

- $Z_L = L = \dfrac{C_L \cdot R_{1L} \cdot R_{2L} \cdot R_{4L}}{R_{3L}} = C_L \cdot R_{1L} \cdot R_{2L} = R_{2L} \cdot 0{,}001 \Rightarrow R_{2L} = 5{,}384\ K\Omega$

- Hago $R_{3L} = R_{4L} = 2 \cdot 1847{,}759\ \Omega \longrightarrow V_{o_1} = V_A \cdot \dfrac{R_{3L} + R_{4L}}{R_{4L}} = V_A \cdot 2$

- Thevenin: $V_{th} = V_i \dfrac{R_{1B}}{R_{1A} + R_{1B}}$

$$R_{th} = R_{1A} // R_{1B} = R_1$$

$$\frac{V_o}{V_i} = \frac{V_A \cdot 2}{V_{th} \cdot \frac{R_{1A} + R_{1B}}{R_{1B}}} = \frac{V_A}{V_{th}} = T_1(s) \Longrightarrow \frac{R_{1A} + R_{1B}}{R_{1B}} = 2 \Rightarrow R_{1A} = R_{1B}$$

- Hago $R_{1A} = R_{1B} = 2 \cdot R1 \Rightarrow R_{1A} // R_{1B} = R_1$

NOTA

- Segunda Sección:

- C igual ; Z_L igual $\Rightarrow$ mismo R_{1L}, C_L, R_{2L}
- R_{3L} y R_{4L} solo deben ser iguales para mantener $Z_L \Rightarrow R_{3L_2} = R_{4L_2} = 1K\Omega$
- Mismo $R_2 = 765,367\Omega$