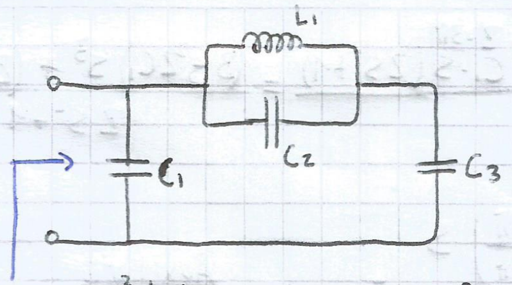
TP6

3)



• $L_1 \cdot C_2 = \pi^{-1}$

$$Z_{(s)} = \frac{2s^2+1}{s(3s^2+2)} \in FRP \text{ y } \frac{Par}{Impar}$$

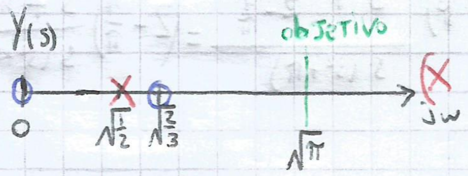
• Lo que significa que $L_1 \cdot C_2 = \pi$:

$$Z_{LC} = \frac{1}{\frac{1}{sL_1} + sC_2} = \frac{sL_1}{1+s^2 L_1 C_2} = \frac{s \cdot \frac{1}{C_2}}{s^2 + \frac{1}{L_1 C_2}}$$ → Polo de impedancia en $\pm j\sqrt{\pi}$

Análisis Gráfico:

$$Z_{(s)} = \frac{2\left(s^2+\frac{1}{2}\right)}{3 \cdot s\left(s^2+\frac{2}{3}\right)} \Longrightarrow$$

• Primero debo remover un capacitor en derivación, por lo que debo restar un polo de admitancia:



• Se debe hacer una remoción parcial para desplazar un cero a $\pm j\sqrt{\pi}$, de modo que en impedancia quede un polo, y remover el tanque LC_2, lo resultante será C_3.

Análisis Algebráico

$$Y_{(s)} - K_\infty' \cdot s = Y_{2(s)}$$

• Remuevo parcialmente un polo en infinito, que equivale al capacitor C_1

$$\left[Y_{(s)} - K_\infty' s\right]_{s=j\sqrt{\pi}} = 0$$

$$K_\infty' = \left[\frac{Y_{(s)}}{s}\right]_{s=j\sqrt{\pi}} = \left.\frac{3\left(s^2+\frac{2}{3}\right)}{2\left(s^2+\frac{1}{2}\right)}\right|_{s=j\sqrt{\pi}} = \frac{2-3\pi}{1-2\pi} \simeq \underline{1{,}40536} = C_1$$

• Luego obtengo $Z_2(s)$ y remuevo el polo en $\pm j\sqrt{\pi}$:

$$Y_2(s) = Y(s) - \overbrace{\frac{2-3\pi}{1-2\pi}}^{C_1} s = \frac{3s^3+2s - C_1 \cdot s(2s^2+1)}{2s^2+1} = \frac{(3-2C_1)s^3 + (2-C_1)s}{2s^2+1}$$

$$Y_2(s) = \frac{\left(3 - \frac{4-6\pi}{1-2\pi}\right)s^3 + \left(2 - \frac{2-3\pi}{1-2\pi}\right)s}{2s^2+1}$$

Auxiliar:

- $\dfrac{3-\cancel{6\pi}-4+\cancel{6\pi}}{1-2\pi} = -\dfrac{1}{1-2\pi} = \boxed{\dfrac{1}{2\pi-1}}$
- $\dfrac{\cancel{2}-4\pi-\cancel{2}+3\pi}{1-2\pi} = \dfrac{-\pi}{1-2\pi} = \boxed{\dfrac{\pi}{2\pi-1}}$

$$Y_2(s) = \frac{\frac{1}{2\pi-1}s^3 + \frac{\pi}{2\pi-1}s}{2s^2+1} = \frac{1}{4\pi-2} \cdot \frac{s(s^2+\pi)}{s^2+\frac{1}{2}}$$

$$\boxed{Z_2(s) = (4\pi-2)\frac{s^2+\frac{1}{2}}{s(s^2+\pi)}}$$

$$Z_3(s) = Z_2(s) - \frac{2K_1 \cdot s}{s^2+\pi} \implies Z_2(s) = Z_3(s) + \frac{2K_1 s}{s^2+\pi}$$

$$\lim_{s^2\to-\pi} Z_2(s) = \lim_{s^2\to-\pi} \frac{2K_1 s}{s^2+\pi} \implies 2K_1 = \lim_{s^2\to-\pi} \frac{s^2+\pi}{s} Z_2(s) = \lim_{s^2\to-\pi} (4\pi-2)\frac{s^2+\frac{1}{2}}{s^2}$$

$$2K_1 = (4\pi-2) \cdot \frac{-\pi+\frac{1}{2}}{-\pi} = \frac{-4\pi^2+2\pi+2\pi-1}{-\pi} = \boxed{4\pi-4+\frac{1}{\pi}}$$

$$\boxed{C_2 = \frac{1}{2K_1}} \qquad \boxed{L_1 = \frac{2K_1}{\pi}}$$

$$\therefore Z_3(s) = (4\pi-2)\frac{s^2+\frac{1}{2}}{s(s^2+\pi)} - \frac{\left(4\pi-4+\frac{1}{\pi}\right)\cdot s}{s^2+\pi} = \frac{\cancel{4\pi s^2}+2\pi-2s^2-1-\cancel{4\pi s^2}+4s^2-\frac{s^2}{\pi}}{s(s^2+\pi)}$$

$$Z_3(s) = \frac{2s^2-\frac{s^2}{\pi}+2\pi-1}{s(s^2+\pi)} = \frac{\left(2-\frac{1}{\pi}\right)s^2+2\pi-1}{s(s^2+\pi)} = \left(2-\frac{1}{\pi}\right)\frac{s^2+\frac{2\pi-1}{2-\frac{1}{\pi}}}{s(s^2+\pi)} = \left(2-\frac{1}{\pi}\right)\frac{\cancel{s^2+\pi}}{s\cancel{(s^2+\pi)}}$$

$$Z_3(s) = \frac{2\pi-1}{\pi}\cdot\frac{1}{s} = \boxed{\frac{1}{s\cdot\frac{\pi}{2\pi-1}}} \implies \boxed{C_3 = \frac{\pi}{2\pi-1}}$$

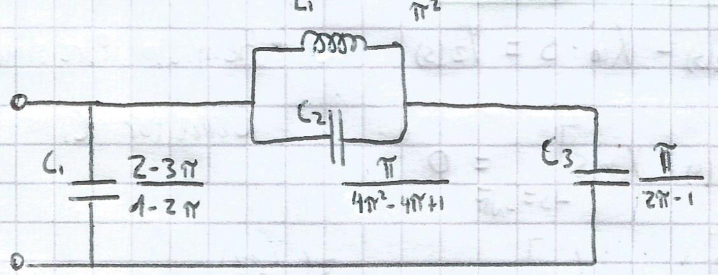
∴ Finalmente:

Auxiliar:

$$\boxed{C_2 = \frac{1}{4\pi-4+\frac{1}{\pi}} = \frac{\pi}{4\pi^2-4\pi+1}}$$

$$\boxed{L_1 = \frac{4\pi^2-4\pi+1}{\pi^2}}$$

$$\boxed{L_1 \cdot C_2 = \frac{1}{\pi}}$$



$$\boxed{Z(s) = \frac{2s^2+1}{s(3s^2+2)}}$$