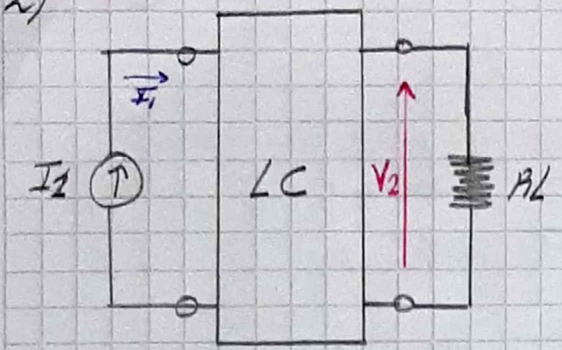
2)



$$T(s) = \left.\frac{V_2}{I_1}\right|_{I_2 = -\frac{V_2}{RL}} = k\,\frac{(s^2+9)}{s^3+2s^2+2s+1}$$

La tengo que vincular a una función de excitación

$$V_2 = Z_{21} I_1 + Z_{22} I_2$$

$$V_2 = Z_{21} I_1 + Z_{22}\left(-\frac{V_2}{RL}\right) \Rightarrow V_2\left(1 + \frac{Z_{22}}{RL}\right) = Z_{21} I_1$$

$$\Rightarrow \frac{V_2}{I_1} = \frac{Z_{21}}{1 + \frac{Z_{22}}{RL}} = \frac{Z_{21}}{1 + Z_{22}}$$

$1\Omega = RL \Rightarrow RL = 1$

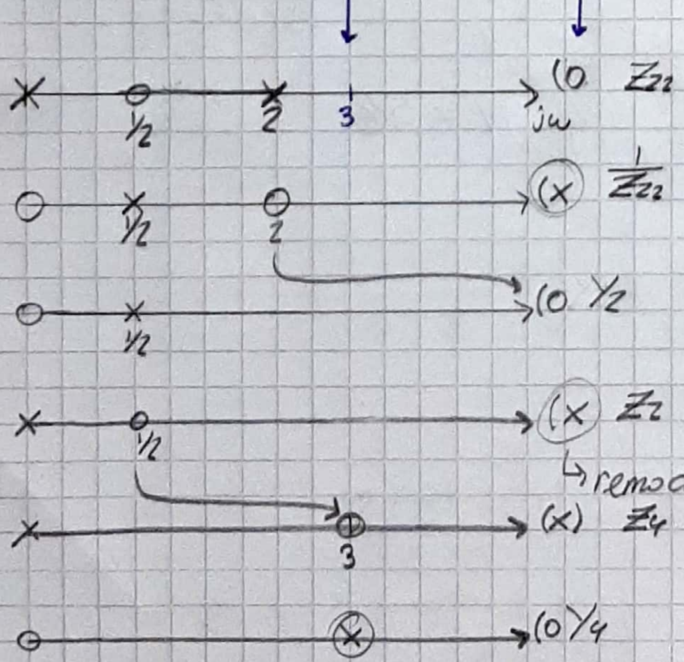
$$T(s) = k\,\frac{s^2+9}{s^3+2s^2+2s+1} = \frac{k\,\overbrace{\frac{s^2+9}{s^3+2s}}^{Z_{21}}}{1 + \underbrace{\frac{2s^2+1}{s^3+2s}}_{Z_{22}}}$$

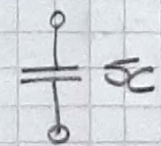
como el numerador es par
$\Rightarrow$ el den. común es impar

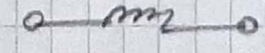
$$Z_{22} = \frac{2(s^2+1/2)}{s(s^2+2)}$$

La transferencia tiene ceros de transmisión en j3 y inf $\therefore$ tengo que remover polos en esas ubicaciones

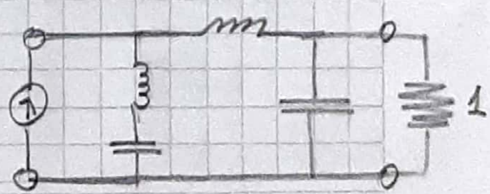
Se excita con $I_1 \Rightarrow$ tengo que arrancar en derivación.





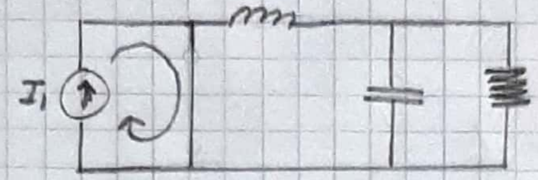


$\Rightarrow$



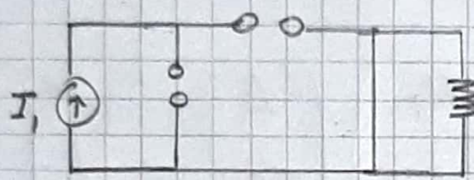
Antes del álgebra verifico $T = \frac{V_2}{I_1}$

$s \to 3$



cero de transmisión

$s \to \infty$



cero de transmisión

$$\frac{1}{Z_{22}} = \frac{s(s^2+2)}{2(s^2+1/2)} \quad ; \quad Y_2 = \frac{1}{Z_{22}} - s K_{C_2}$$

$$K_{C_2} = \lim_{s\to\infty} \frac{1}{Z_{22}} \cdot \frac{1}{s} = \frac{s^2+2}{2(s^2+1/2)} = \frac{1}{2} \Rightarrow C_2 = \frac{1}{2}$$

$$Y_2 = \frac{s(s^2+2)}{2(s^2+1/2)} - \frac{1}{2} s = \frac{s(s^2+2) - (s^2+1/2)s}{2(s^2+1/2)}$$

$$Y_2 = \frac{\cancel{s^3} + 2s - \cancel{s^3} - 1/2\, s}{2(s^2+1/2)} = \frac{3/2\, s}{2(s^2+1/2)}$$

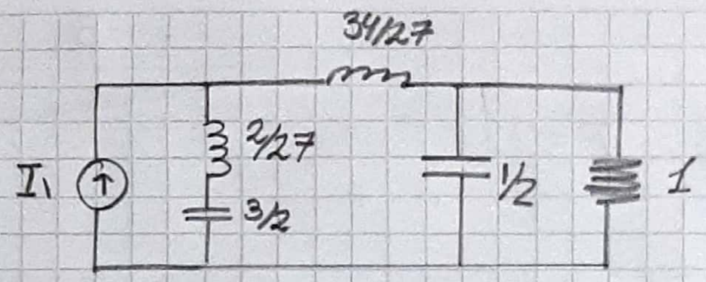
$$Z_4\Big|_{s=j3} = 1/Y_2 - K_{L_1} s = 0$$

$$K_{L_1} = \lim_{s\to j3} \frac{1}{Y_2} \cdot \frac{1}{s} = \lim_{s\to j3} \frac{2(s^2+1/2)}{3/2\, s^2} = \frac{34}{27}$$

$$\Rightarrow Z_4 = \frac{2(s^2+1/2)}{3/2\, s} - 34/27\, s = \frac{2(s^2+1/2) - 34/27 \cdot 3/2\, s^2}{3/2\, s}$$

$$\Rightarrow Z_4 = \frac{1/9\,(s^2+9)}{3/2\, s} \Rightarrow Y_4 = \frac{27}{2} \frac{s}{s^2+9}$$

$$Y_4 = \frac{1}{s\, 2/27 + \frac{9 \cdot 2}{27 s}} = \frac{1}{s\, 2/27 + \frac{1}{3/2\, s}} \Rightarrow \begin{cases} L_1 = \frac{2}{27} \\ C_1 = 3/2 \end{cases}$$



b)

$V_1 = A V_2 + B(-I_2)$ $\qquad T = \frac{1}{C}$

$I_1 = C V_2 + D(-I_2)$

$$T = \begin{pmatrix} 1 & 0 \\ \frac{1}{sL_1 + \frac{1}{sC_1}} & 1 \end{pmatrix} \begin{pmatrix} 1 & sL_2 \\ 0 & 1 \end{pmatrix} \begin{pmatrix} 1 & 0 \\ sC_2 & 1 \end{pmatrix} \begin{pmatrix} 1 & 0 \\ 1 & 1 \end{pmatrix}$$

$$T = \begin{pmatrix} - & - \\ Y_1 & Y_1 + sL_2 + 1 \end{pmatrix} \begin{pmatrix} 1 & 0 \\ sC_2 & 1 \end{pmatrix} \begin{pmatrix} 1 & 0 \\ 1 & 1 \end{pmatrix}$$

$$T = \begin{pmatrix} - & - \\ Y_1 + (Y_1 + sL_2 + 1)sC_2 & Y_1 + sL_2 + 1 \end{pmatrix} \begin{pmatrix} 1 & 0 \\ 1 & 1 \end{pmatrix}$$

$$C = Y_1 + (Y_1 + sL_2 + 1)sC_2 + Y_1 + sL_2 + 1$$

↳ que lo haga python

NOTA +4h