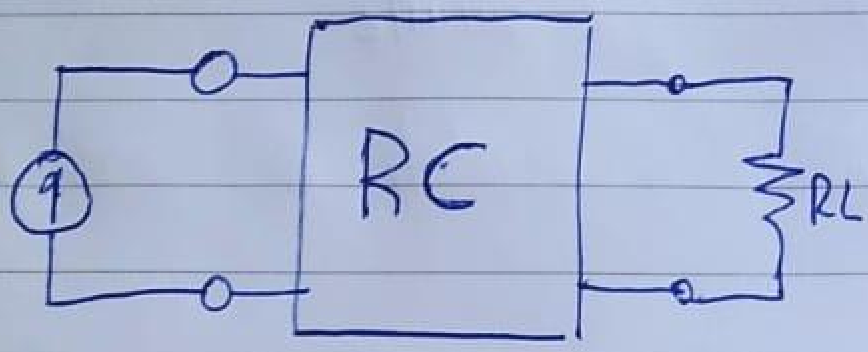
Tarea Semanal 12



$$-\frac{I_2}{I_1} = H \cdot \frac{s^2+5s+4}{s^2+8s+12} \quad ; \quad Z_{21} = 6H$$

$$Z_{21} = \left.\frac{V_2}{I_1}\right|_{I_2=0} \qquad Z_{22} = \left.\frac{V_2}{I_2}\right|_{I_1=0}$$

La carga RL impone la condición $V_2 = -I_2 . R_L$ distinto del cuadripolo. Por ello vamos a buscar una síntesis de Función de ~~transferencia~~ exitación por parámetros Z

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

$$-I_2 . RL = Z_{21} . I_1 + Z_{22} . I_2$$

$$-\frac{I_2}{I_1} = \frac{Z_{21}}{RL + Z_{22}}$$

Normalizamos $RL = 1$

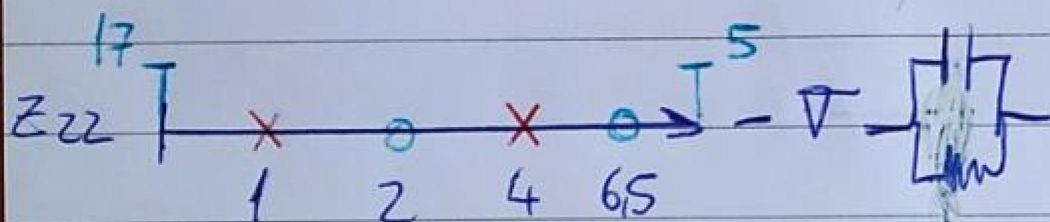
$$T(s) = \frac{Z_{21}}{1+Z_{22}} \Rightarrow Z_{22} = \frac{Z_{21}}{T(s)} - 1 = 6\cancel{H} . \frac{s^2+8s+12}{\cancel{H} . (s^2+5s+4)} - 1$$

$$Z_{22} \cong \frac{5\,(s+2)\,(s+6{,}5)}{(s+4)\,(s+1)}$$

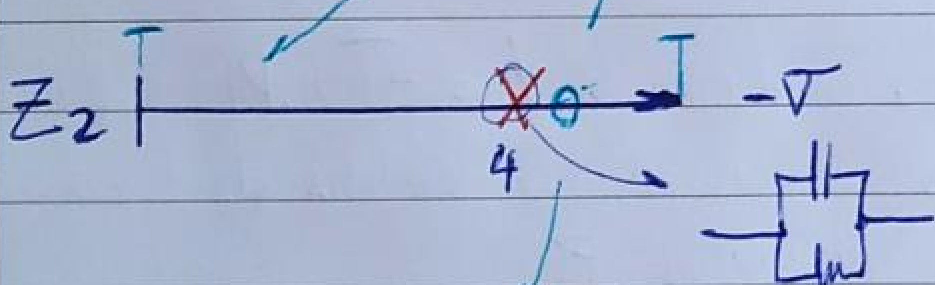
Como tenemos un generador de corriente en la entrada vamos a comenzar en derivación.

$$-\frac{I_2}{I_1} = H \cdot \frac{(s+4)(s+1)}{(s+2)(s+6)}$$

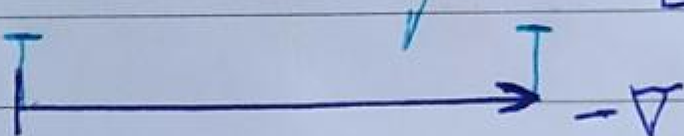
→ Vamos a querer cancelar dos ceros de transferencia, en -1 y en -4



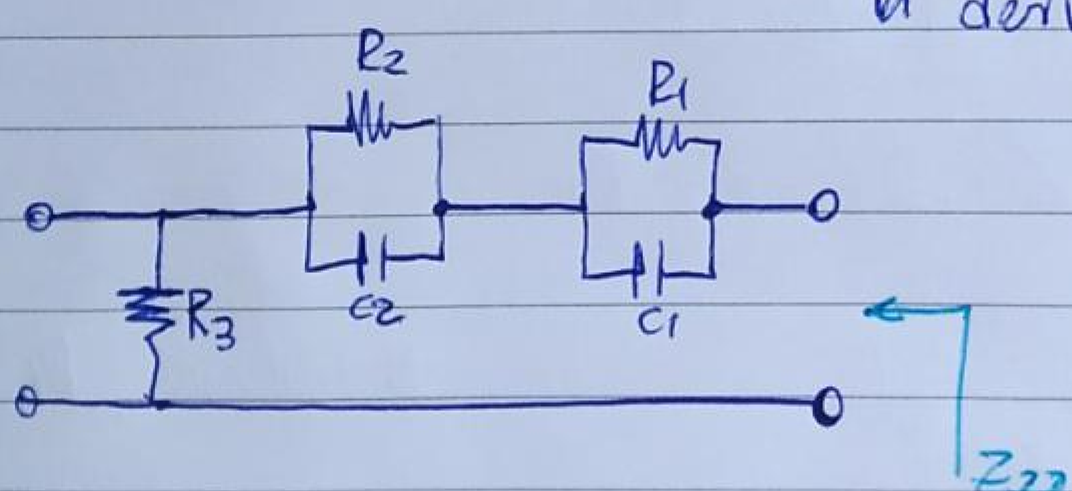
Removemos polo en 1



Ahora vamos a buscar el polo en 4



Nos queda un resistor en derivación



$$Z_{22} \cong \frac{5\,(s+2)\,(s+6{,}5)}{(s+4)\,(s+1)} \qquad Z_{22} = \frac{6\left(5/6 \cdot s^2 + 43/6 \cdot s + 68/6\right)}{s^2+5s+4} \quad 3$$

$$\cancel{\lim_{s\to -4} Z_{22} = \lim_{s\to -4} \frac{5(s+2)(s+6{,}5)}{(s+4)(s+1)}} =$$

$$\cancel{\lim_{s\to -1} (s+1) \cdot \frac{5(s+2)(s+6{,}5)}{(s+4)(s+1)}} =$$

$$Z_{22} = \frac{5s^2 + 43s + 68}{(s+4)\;(s+1)}$$

$$\lim_{s\to -1} \cancel{(s+1)} \cdot \frac{5s^2+43s+68}{(s+4)\,\cancel{(s+1)}} = 10$$

$$\frac{K_1}{s+\sigma} \Rightarrow \qquad R_1 = \frac{K_1}{\sigma} \qquad C_1 = \frac{1}{K_1}$$

$$R_1 = 10 \qquad C_1 = \frac{1}{10}$$

$$Z_2 = Z_{22} - \frac{10}{s+1} = \frac{5s^2+43s+68 - 10(s+4)}{(s+4)(s+1)} = \frac{5s^2+33s+28}{(s+4)(s+1)}$$

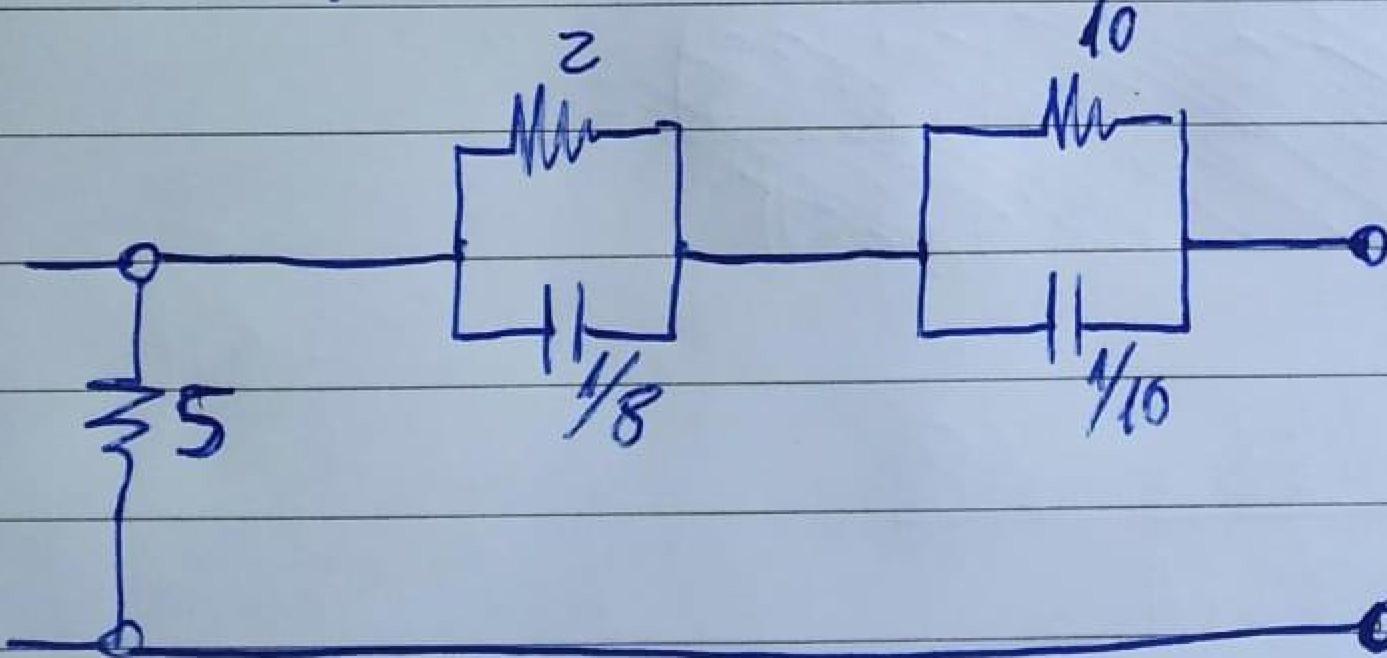
$$Z_2 = \frac{5\,\cancel{(s+1)}\,(s+28/5)}{(s+4)\,\cancel{(s+1)}} = \frac{5\,(s+28/5)}{s+4}$$

$$\lim_{s\to -4} \cancel{(s+4)} \cdot \frac{5(s+28/5)}{\cancel{s+4}} = 8 \qquad \frac{K_2}{s+4} \Rightarrow R_2 = \frac{K_2}{\sigma} = 2$$

$$C_2 = \frac{1}{K_2} = \frac{1}{8}$$

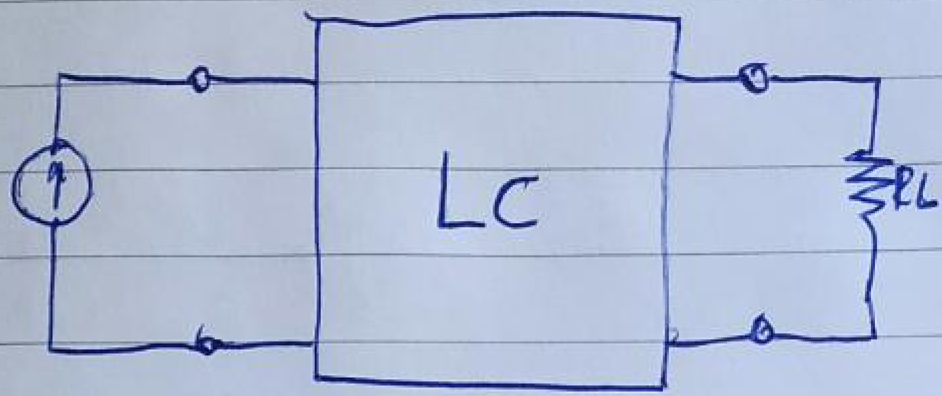
$$Z_3 = \frac{5\left(S+28/5\right)}{S+4} - \frac{8}{S+4} = \frac{5\left(S+28/5\right)-8}{S+4}$$

$$Z_3 = \frac{5S+20}{S+4} = 5 \Rightarrow$$ Termino u $R_3 = 5$



Ejercicio 2

Dado la siguiente tranferencia de impedancia



$$T(s) = \frac{V_2}{I_1} = \frac{K(s^2+9)}{s^3+2s^2+2s+1}$$

Con la condición $I_2 = -\frac{V_2}{R_L}$

Usamos los parámetros Z

$$V_2 = Z_{21} \cdot I_1 + Z_{22}\left(-\frac{V_2}{R_L}\right)$$

$$V_2\left(1 + \frac{Z_{22}}{R_L}\right) = Z_{21} \cdot I_1$$

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

Si normalizamos $R_L = 1$

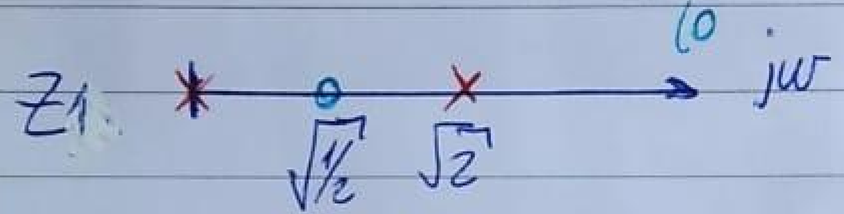
$$\frac{V_2}{I_1} = \frac{Z_{21}}{1+Z_{22}} = \frac{K \cdot (s^2+9)}{s^3+2s^2+2s+1}$$

$$M(s) + N(s) = s^3+2s^2+2s+1 \Rightarrow \begin{array}{l} N(s) = s^3+2s \\ M(s) = 2s^2+1 \end{array}$$

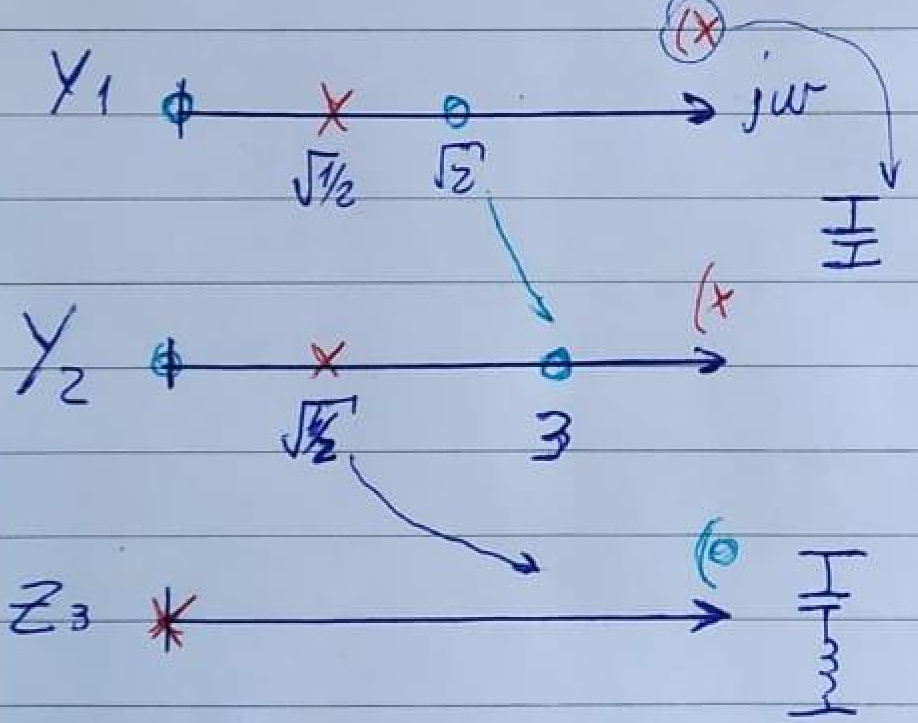
$$M(s)+N(s) = N(s)\left(1+\frac{M(s)}{N(s)}\right) \longrightarrow$$ Si intentamos de la forma contraria no nos queda bien

$$T(s)=\frac{K\,\frac{s^2+9}{s^3+2s}}{1+\frac{2s^2+1}{s^3+2s}}$$

$$Z_{22}=\frac{2s^2+1}{s^3+2s}=\frac{2(s^2+1/2)}{s(s^2+2)}=Z_1$$



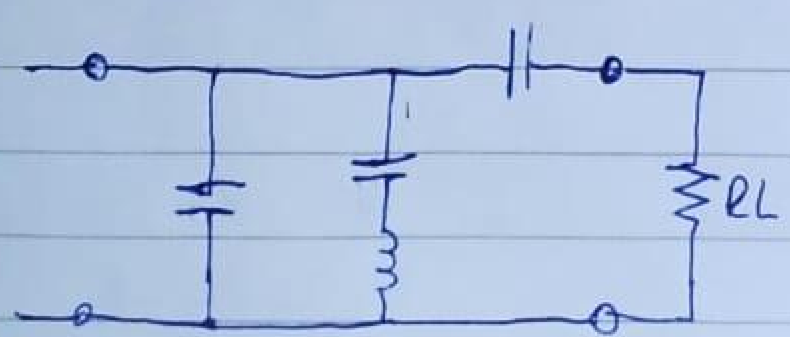
Buscamos remover polo en 3 y en infinito



Invertimos y removemos parcialmente el polo de inf

Invertimos y removemos polo en 3

y acá nos queda un cap



$$\frac{1}{Z_{22}} = Y_1 = \frac{s(s^2+2)}{2(s^2+1/2)}$$

$$\lim_{s\to -9} \frac{Y_1}{s} = \lim_{s\to -9} \frac{\cancel{s}(s^2+2)}{2(s^2+1/2)\cdot\cancel{s}} = \frac{7}{17} \longrightarrow C = \frac{7}{17}$$

$$Y_2 = Y_1 - 7/17 \cdot s = \frac{s(s^2+2) - 7/17 \cdot s \cdot 2(s^2+1/2)}{2(s^2+1/2)}$$

$$Y_2 = \frac{3/17\, s^3 + 27/17 \cdot s}{2(s^2+1/2)} = \frac{3/17 \cdot s(s^2+9)}{2(s^2+1/2)}$$

$$Z_2 = \frac{2(s^2+1/2)}{3/17 \cdot s(s^2+9)} \qquad \lim_{s\to -9} \frac{\cancel{(s^2+9)}}{s} \cdot \frac{2(s^2+1/2)}{3/17 \cdot s\cancel{(s^2+9)}} = \frac{289}{27}$$

$$C = \frac{1}{K_1} = \frac{27}{289} \qquad L = \frac{K_1}{\sigma} = \frac{289}{243}$$

$$Z_3 = Z_2 - \frac{289/27 \cdot s}{s^2+9} = \frac{2(s^2+1/2) - 289/27 \cdot s(3/17 \cdot s)}{3/17 \cdot s(s^2+9)} = \frac{1/9 \cdot s^2+1}{3/17 \cdot s(s^2+9)}$$

$$Z_3 = \frac{1/9\cancel{(s^2+9)}}{3/17 \cdot s\cancel{(s^2+9)}} = \frac{17}{27 \cdot s} \Rightarrow C = \frac{27}{17}$$