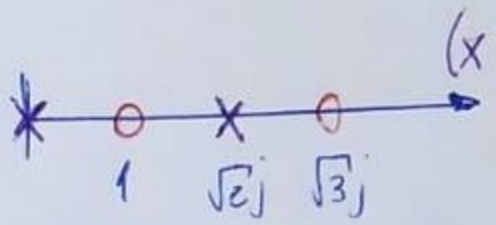
1) Sea la Función

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

Se pide hallar la topología circuital y los valores de los componentes

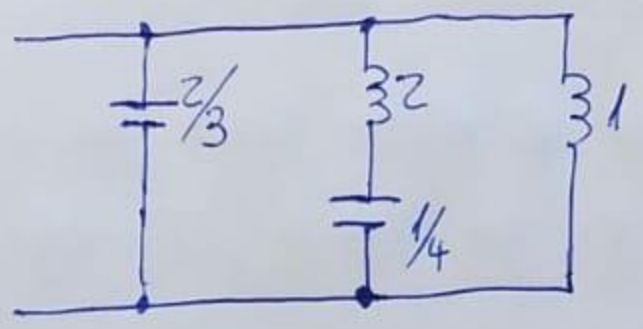
Foster Paralelo

$$K_0 = \lim_{s\to 0} s \cdot Z(s) = \lim_{s\to 0} \frac{(s^2+3)(s^2+1)}{s^2+2} = \frac{3}{2}$$

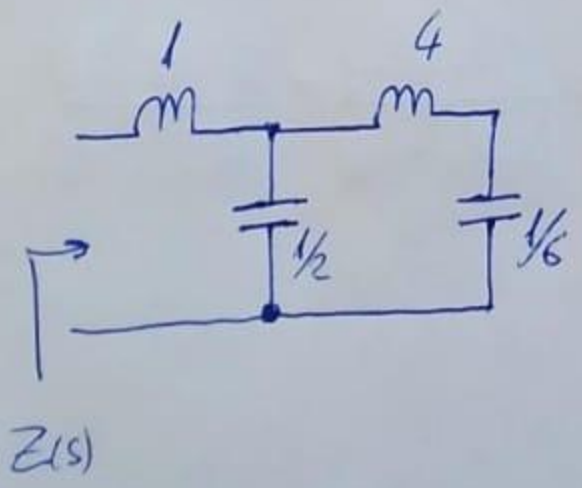


$$K_\infty = \lim_{s\to\infty} \frac{1}{s} \cdot \frac{(s^2+3)(s^2+1)}{s(s^2+2)} = 1$$

$$2k_1 = \lim_{s^2\to -2} \frac{(s^2+2)}{s} \cdot \frac{(s^2+3)(s^2+1)}{s(s^2+2)} = \frac{1}{2}$$



b) Mediante Cauer I

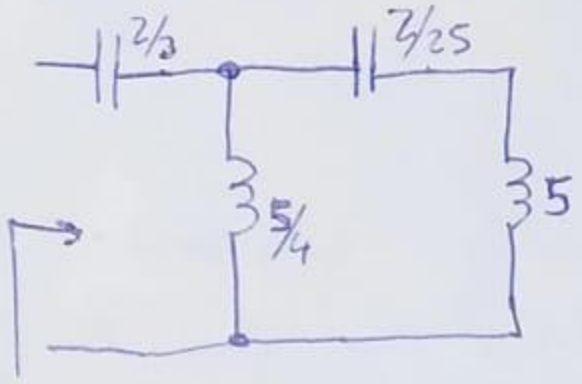


$$\begin{array}{r|l} s^4+4s^2+3 & s^3+2s \\ \hline s^4+2s^2 & s \to z \end{array}$$

$$\begin{array}{r|l} s^3+2s & 2s^2+3 \\ \hline s^3+\frac{3}{2}s & \frac{1}{2}s \to y \end{array}$$

$$\begin{array}{r|l} 2s^2+3 & \frac{1}{2}s \\ \hline 2s^2+0 & 4s \to z \\ \hline \frac{1}{2}s & 3 \\ & \frac{s}{6} \to y \end{array}$$

Caso II



$Z_{(S)}$

$3+4S^2+S^4 \mid 2S+S^3$

$3+\frac{3}{2}S^2 \quad \frac{3}{2S} \rightarrow Z$

$2S+S^3 \mid \frac{5}{2}S^2+S^4$

$2S+\frac{4}{5}S^3 \quad \frac{4}{5}\cdot\frac{1}{S} \rightarrow Y$

$\frac{5}{2}S^2+S^4 \mid \frac{1}{5}S^3$

$\frac{5}{2}S^2+0 \quad \frac{25}{2}\cdot\frac{1}{S} \rightarrow Z$

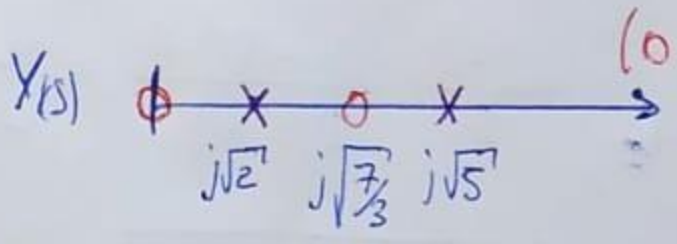
$\frac{1}{5}S^3 \mid S^4$

$\frac{1}{5}S^3 \quad \frac{1}{5}\cdot\frac{1}{S} \rightarrow Y$

0

Ejercicio 2

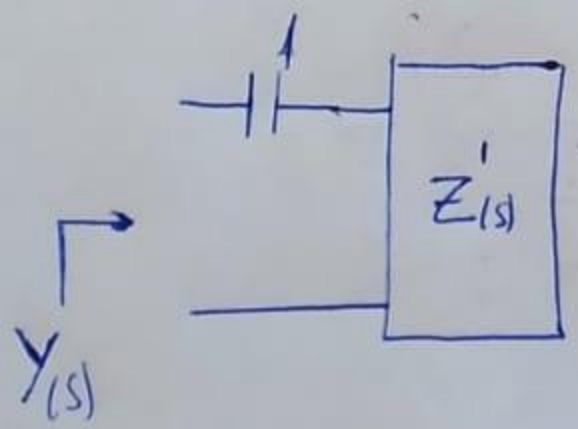
$$Y_{(S)} = \frac{3S(S^2+7/3)}{(S^2+2)(S^2+5)}$$



Vamos a tratarlo como una impedancia e intentar remover parcialmente el polo en cero para que el cero que está en $j\sqrt{2}$ vaya a $j1$

$$\lim_{S\to j1} S \cdot Z_{(S)} = \lim_{S\to j1} \frac{(S^2+2)(S^2+5)}{3(S^2+7/3)} = 1$$

$$Z'_{(S)} = Z_{(S)} - \frac{1}{S} = \frac{(S^2+2)(S^2+5)}{3S(S^2+7/3)} - \frac{1}{S} = \frac{S^4+4S^2+3}{3S(S^2+7/3)} = \frac{(S^2+1)(S^2+3)}{3S(S^2+7/3)}$$



$$Y_{1(s)} = \frac{1}{Z_{(s)}} = \frac{3s(s^2+7/3)}{(s^2+1)(s^2+3)}$$

$$\lim_{s^2 \to -1} \frac{(s^2+1)}{s} \cdot \frac{3s(s^2+7/3)}{(s^2+1)(s^2+3)} = 2 = 2k_1$$

$$\lim_{s^2 \to -3} \frac{(s^2+3)}{s} \cdot \frac{3s(s^2+7/3)}{(s^2+1)(s^2+3)} = \frac{3s^2+7}{-3+1} = \frac{-2}{-2} = 1 = 2k_2$$