TS10

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

a) Síntesis de $Z(s)$ mediante Foster paralelo.

$$Z(s) = \frac{s^4+s^2+3s^2+3}{s^3+2s} = \frac{s^4+4s^2+3}{s^3+2s}$$

$$k_0 = \lim_{s\to 0} s\,Z(s) = \lim_{s\to 0} \frac{\cancel{s}\,(s^2+3)(s^2+1)}{\cancel{s}\,(s^2+2)} = \frac{3}{2}$$

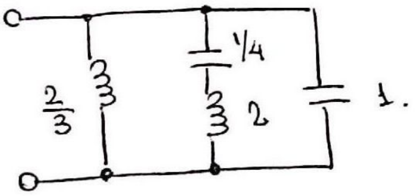
$$k_1 = \lim_{s^2\to 2} \frac{(s^2+2)}{2s} Z(s) = \lim_{s^2\to -2} \frac{\cancel{s^2+2}}{2s} \cdot \frac{(s^2+3)(s^2+1)}{s\,\cancel{(s^2+2)}} = \frac{1\cdot(-1)}{2\cdot(-2)} = \frac{1}{4}$$

$$k_\infty = \lim_{s\to\infty} \frac{Z(s)}{s} = \lim_{s\to\infty} \frac{(s^2+3)(s^2+1)}{s^2\,(s^2+2)} = 1.$$

$$\Rightarrow Z(s) = \frac{3/2}{s} + \frac{1/2\, s}{s^2+4} + s \qquad \frac{2k_1}{\omega_1^2} = \frac{2\cdot 1/4}{2} = \frac{1}{4}$$

$$\frac{1}{2k_1} = 2$$

El circuito queda:

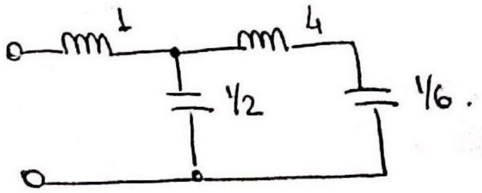


Mediante CAUER I

$$Z(s) = \frac{s^4+4s^2+3}{s^3+2s}$$

$$\begin{array}{l}
s^4+4s^2+3 \;\big|\; s^3+2s \to s \\
-(s^4+2s^2) \\
\hline
s^3+2s \;\big|\; 2s^2+3 \to \tfrac{1}{2}s \\
-(s^3+\tfrac{3}{2}s) \\
\hline
2s^2+3 \;\big|\; \tfrac{1}{2}s \to 4s \\
-(2s^2) \\
\hline
\tfrac{1}{2}s \;\big|\; 3 \to \tfrac{1}{6}s \\
-\tfrac{1}{2}s \\
\hline
0 \checkmark
\end{array}$$

El circuito queda:



Scanned with CamScanner

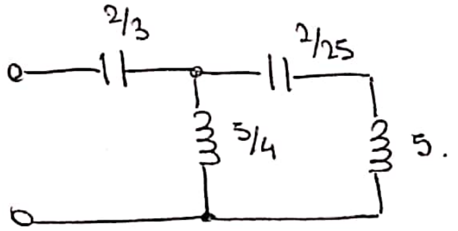
Mediante CAUER II

$$\begin{array}{l|l} 3+4s^2+s^4 & 2s+s^3 \\ -\left(3+\frac{3}{2}s^2\right) & \frac{3}{2}\cdot\frac{1}{s} \\ \hline \frac{5}{2}s^2+s^4 & \end{array}$$

$$\begin{array}{l|l} 2s+s^3 & \frac{5}{2}s^2+s^4 \\ -\left(2s+\frac{4}{5}s^3\right) & \frac{4}{5}\cdot\frac{1}{s} \\ \hline \frac{1}{5}s^3 & \end{array}$$

$$\begin{array}{l|l} \frac{5}{2}s^2+s^4 & \frac{1}{5}s^3 \\ \frac{5}{2}s^2+ & \frac{25}{2}\frac{1}{s} \\ \hline s^4 & \end{array}$$

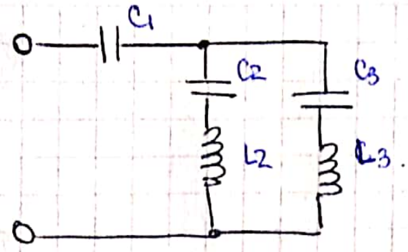
$$\begin{array}{l|l} \frac{1}{5}s^3 & s^4 \\ -\frac{1}{5}s^3 & \frac{1}{5}\frac{1}{s} \\ \hline 0 & \end{array}$$



Ejercicio 2 TS10

$$Y(s) = \frac{3s\,(s^2+4/3)}{(s^2+2)(s^2+5)}$$

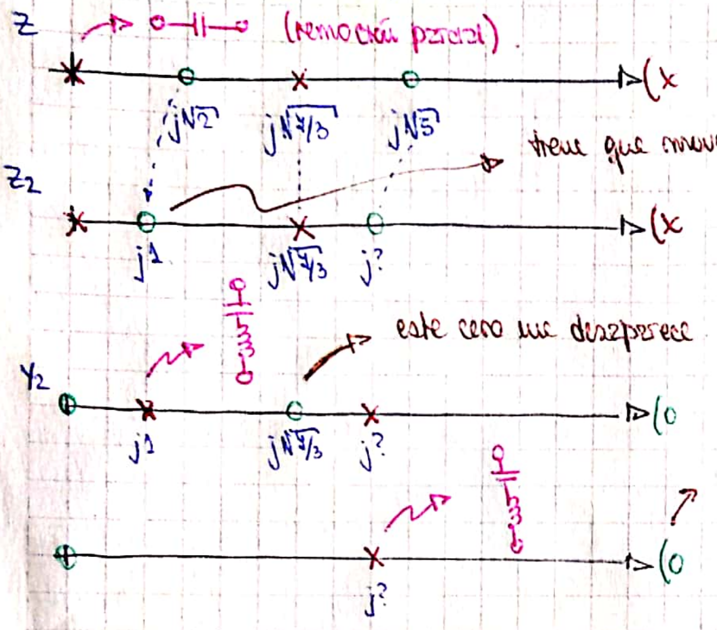
$$Z(s) = \frac{(s^2+2)(s^2+5)}{3s\,(s^2+4/3)}$$



L_2 y C_2 resuenan a 1 r/s.

$\boxed{L_2 C_2 = 1}$

condición a cumplir



tiene que moverse a j1 por la condición de resonancia $L_2C_2 = 1$.

este cero me desaparece

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CÁLCULOS: $\quad Z = Z_1 + Z_2 \Rightarrow Z_2 = Z - Z_1$

$$Z_2\Big]_{\substack{s=j1\\ s^2=-1}} = 0 = \left[Z - Z_1\right]_{s^2=-1} = \left[Z - \frac{k_0'}{s}\right]_{s^2=-1}$$

$$\boxed{k_0' = \left[Z \cdot s\right]_{s^2=-1} = \frac{(s^2+2)(s^2+5)}{3s(s^2+4/3)} \cdot s = \frac{(1)(4)}{3(-1+4/3)} = 1}$$

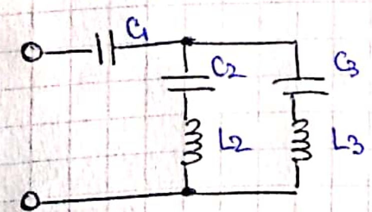
$$Z_2 = \frac{(s^2+2)(s^2+5)}{3s(s^2+4/3)} - \frac{1}{s} = \frac{s^4+7s^2+10}{3s^3+4s} - \frac{1}{s} = \frac{s^4+7s^2+10-3s^2-4}{3s^3+4}$$

$$Z_2 = \frac{s^4+4s^2+3}{3s^3+4s} = \frac{(s^2+1)(s^2+3)}{3s^3+4s} \Rightarrow Y_2 = \frac{3s\,(s^2+4/3)}{(s^2+1)(s^2+3)}$$

$$\boxed{2k_2 = \lim_{s^2\to -1} Y_2\,\frac{s^2+1}{s} = \lim_{s^2\to -1} \frac{3\cancel{s}(s^2+4/3)}{\cancel{(s^2+1)}(s^2+3)}\,\frac{\cancel{(s^2+1)}}{\cancel{s}} = \frac{3(-1+4/3)}{(-1+3)} = 2}$$

$$Y_4 = \frac{3s^3+4s}{s^4+4s^2+3} - \frac{2s}{s^2+1} = \frac{3s^3+4s-2s(s^2+3)}{s^4+4s^2+3} = \frac{3s^3+4s-2s^3-6s}{s^4+4s^2+3} = \frac{s^3+s}{s^4+4s^2+3}$$

$$Y_4 = \frac{s}{s^2+3} \Rightarrow \boxed{2k_3 = 1}$$



$C_1 = 1$

$$C_2 = \frac{2k_2}{\omega_2^2} = \frac{2}{1} = 2$$

$$L_2 = \frac{1}{2k_2} = \frac{1}{2}$$

cumple condición de resonancia

$$C_3 = \frac{2k_3}{\omega_3^2} = \frac{1}{3}$$

$$L_3 = \frac{1}{2k_3} = 1.$$

NOTA