Sintetizar un cuadripolo que cumpla:

$$Y_{11} = \frac{I_1}{V_1}\Big|_{V_2=0} = \frac{3s\,(s^2+7/3)}{(s^2+2)\,(s^2+5)}.$$

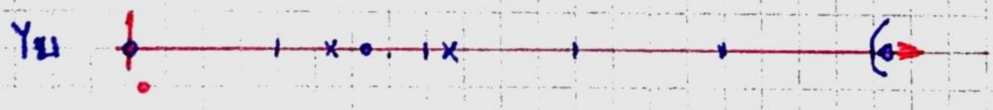
$$Y_{21} = \frac{I_2}{V_1}\Big|_{V_2=0} = \frac{s\,(s^2+1)}{(s^2+2)\,(s^2+5)}.$$

Para esto tenemos que sintetizar Y_{11}, teniendo en cuenta que debemos respetar los ceros de Y_{21}.

Analizo Y_{11}:

Ceros: $0,\ j\sqrt{7/3} = j\,1{,}52,\ j\infty$.

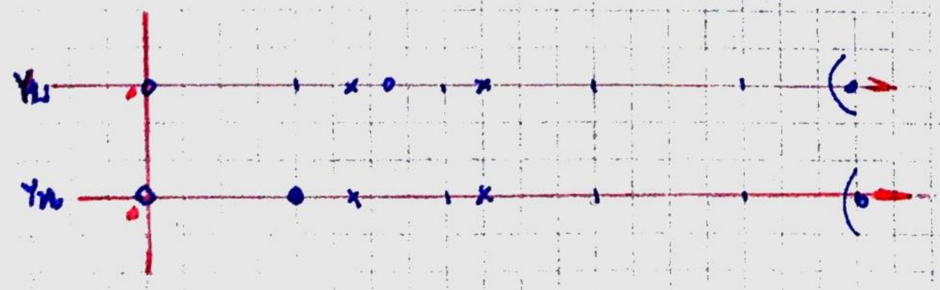
Polos: $j\sqrt{2},\ j\sqrt{5}$.



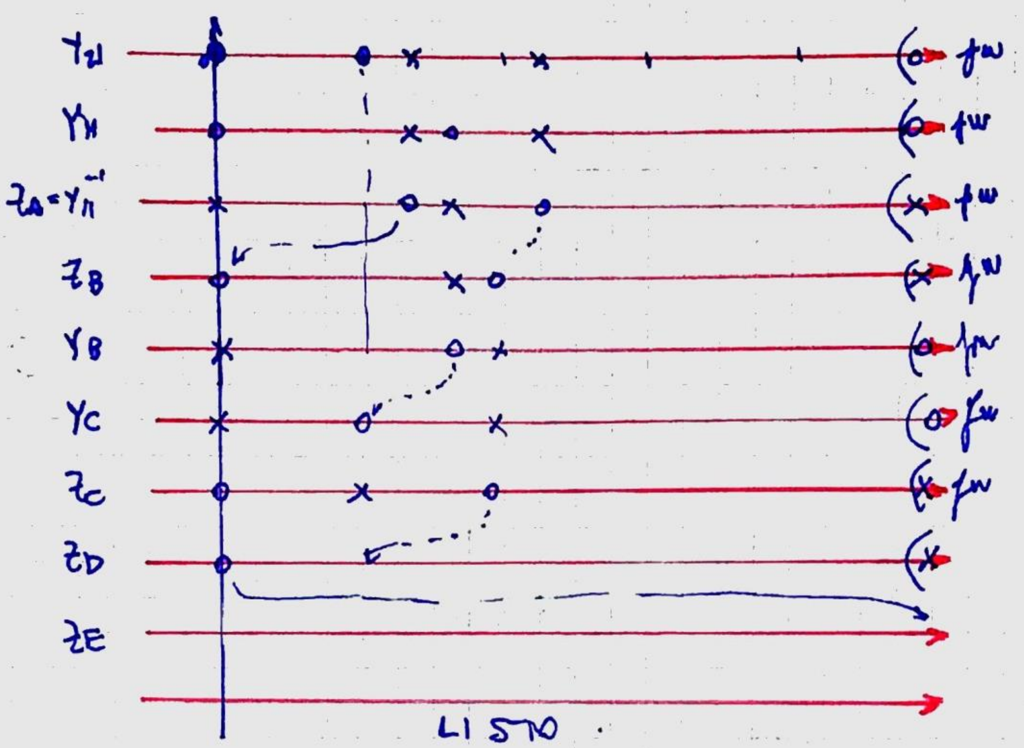
. Es FRP.

. Se puede sintetizar mediante dipolo no disipativo.

. Tenemos que remover singularidades en Y_{11} consiguiendo un polo en $0,\ j1,\ j\infty$.



Síntesis gráfica:



PASOS:

1) Invierto.
2) Remuevo en cero.
3) Invierto.
4) Remuevo parcialmente p/obtener un cero en $j1$.
5) Invierto.
6) Remuevo en 1.
7) Remuevo en ∞.

$$Z_A = \frac{(s^2+2)(s^2+5)}{3s(s^2+7/3)}$$

$$\lim_{s\to 0} Z_A \cdot s = \lim_{s\to 0} \frac{(s^2+2)(s^2+5)}{3(s^2+7/3)} = \frac{10}{7} \to \text{Capacitor en serie}$$

$7/10$.

$$Z_B = Z_A - \frac{10}{7s} = \frac{(s^2+2)(s^2+5)}{3s\left(s^2+\frac{7}{3}\right)} - \frac{10}{7s}$$

$$Z_B = \frac{(s^2+2)(s^2+5) - 3 \cdot 10/7\left(s^2+\frac{7}{3}\right)}{3s\left(s^2+\frac{7}{3}\right)}$$

$$Z_B = \frac{s^4+7s^2+10-\frac{30}{7}\left(s^2+\frac{7}{3}\right)}{3s\left(s^2+7/3\right)}$$

$$Z_B = \frac{s^4+s^2\,\frac{19}{7}}{3s\left(s^2+\frac{7}{3}\right)} = \frac{\left(s^2+\frac{19}{7}\right)s^2}{3\cancel{s}\left(s^2+\frac{7}{3}\right)} = \frac{s\left(s^2+\frac{19}{7}\right)}{3\left(s^2+7/3\right)}$$

$$Y_B = \frac{3s\left(s^2+7/3\right)}{s^4+s^2\,\frac{19}{7}} = \frac{3\left(s^2+7/3\right)}{s\left(s^2+\frac{19}{7}\right)}$$

$$\lim_{s^2\to -1} Y_B = \lim_{s^2\to -1} \cancel{Y_C}^{\,0} + \lim_{s^2\to -1} \frac{k_0}{s}$$

$$\cancel{\to k_0 = \lim_{s^2\to -1} \frac{Y_B}{s} = \lim_{s^2\to -1} \frac{3s^2\left(s^2+7/3\right)}{s^4+s^2\,\frac{19}{7}+100}}$$

$$k_0 = \lim_{s^2\to -1} Y_B \cdot s = \lim_{s^2\to -1} \frac{3\left(s^2+7/3\right)}{\left(s^2+\frac{19}{7}\right)} = \frac{7}{3} \to \text{Inductor}\quad L = \frac{1}{7/3}$$

$3/7$

- Busco Y_C:

$$Y_C = Y_B - \frac{7}{s3} = \frac{3\left(s^2+7/3\right)}{s\left(s^2+\frac{19}{7}\right)} - \frac{\frac{7}{3}}{s} = \frac{3s^2+7-\frac{7}{3}s^2-\frac{19}{3}}{s\left(s^2+19/7\right)}$$

$$Y_C = \frac{2/3\, s^2 + \frac{2}{3}}{s\left(s^2 + \frac{19}{7}\right)} = \frac{2}{3}\,\frac{(s^2+1)}{s\left(s^2+\frac{19}{7}\right)}.$$

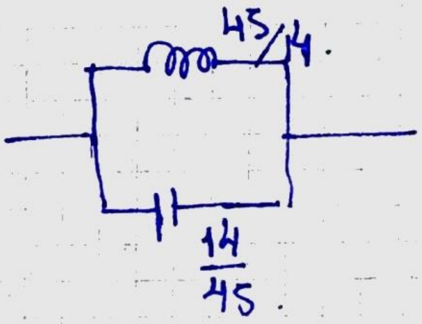
$$Z_C = \frac{3}{2}\,\frac{s\left(s^2+\frac{19}{7}\right)}{(s^2+1)}.$$

• Removemos en 1.

$$\lim_{s^2\to -1} Z_C = \frac{2K_1 s}{s^2+1}.$$

$$2K_1 = \lim_{s^2\to -1} Z_C \cdot \frac{(s^2+1)}{s} = \lim \frac{3}{2}\left(s^2+\frac{19}{7}\right)$$

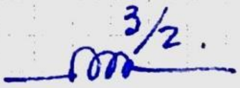
$$2K_1 = \frac{45}{14}.$$



Removemos en infinito:

$$\lim_{s\to\infty} Z_C = \lim_{s\to\infty} K_\infty s.$$

$$K_\infty = \lim_{s\to\infty} \frac{Z_C}{s} = \frac{3}{2}. \rightarrow \text{Inductor en serie.}$$



Circuito: