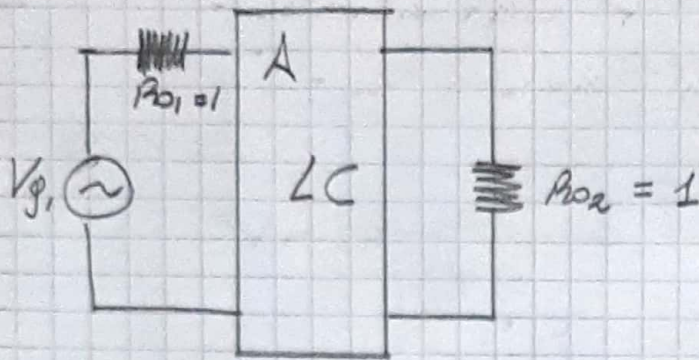


Tarea semanal 13: Síntesis doblemente conjugados



$$|S_{21}|^2 + |S_{11}|^2 = 1 \quad \text{Darlington para no disipativos}$$

a) Bessel de tercer orden

$$T(s) = \frac{1}{\sinh(s) + \cosh(s)} \quad ; \quad \coth(s) = \frac{\cosh(s)}{\sinh(s)}$$

$$\coth(s) = \frac{1}{s} + \frac{1}{3/s + s/5} = \frac{1}{s} + \frac{5s}{15 + s^2}$$

$$\coth(s) = \frac{6s^2 + 15}{s^3 + 15s} \Rightarrow T(s) = \frac{15}{s^3 + 6s^2 + 15s + 15}$$

$$|T(s)|^2 = T(s) \cdot T(-s) = \frac{15}{s^3 + 6s^2 + 15s + 15} \cdot \frac{15}{-s^3 + 6s^2 - 15s + 15}$$

$$|S_{21}|^2 = |T(s)|^2$$

$$|S_{11}(s)|^2 = 1 - |S_{21}(s)|^2 = \frac{-s^6 + 6s^4 - 45s^2}{-s^6 + 6s^4 - 45s^2 + 225}$$

$$\text{con python } S_{11}(s) = \frac{s(s^2 + 2\sqrt{3} \cdot \sqrt{3} \cdot \cos(\frac{\pi}{6})s + 3\sqrt{3})}{s^3 + 6s^2 + 15s + 15}$$

$$\Rightarrow S_{11}(s) = \frac{s^3 + 4,406s^2 + 6,708s}{s^3 + 6s^2 + 15s + 15}$$

$$Z_1 = \frac{1 + S_{11}}{1 - S_{11}} = \frac{2s^3 + 10,406s^2 + 21,708s + 15}{s^2 + 1,594s + 3,292 + 15}$$



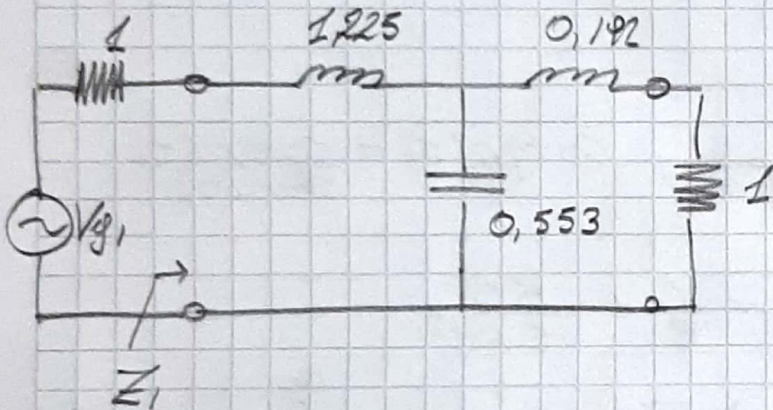
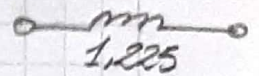
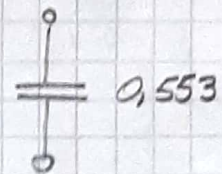
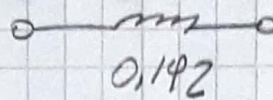
b)

$$\begin{array}{r} 2s^3 + 10,406s^2 + 21,708s + 15 \\ - 2s^2 + 10,406 + 13,825s + 0 \\ \hline \end{array} \quad \begin{array}{r} s^2 1,594 + 58,292 + 15 \\ 1,255s \\ \hline \end{array}$$

$$\begin{array}{r} s^2 1,594 + 58,292 + 15 \\ - 2,883s + 15 \\ \hline s^2 1,594 + 58,292 + 0 \end{array} \quad \begin{array}{r} 2,883s + 15 \\ 0,553s \\ \hline \end{array}$$

$$\begin{array}{r} 2,883s + 15 \\ - 2,883s + 15 \\ \hline 15 \end{array} \quad \begin{array}{r} 15 \\ 0,1925 \\ \hline \end{array}$$

$$\begin{array}{r} 15 \quad | \quad 15 \\ 0 \quad | \quad 15 \\ \hline \end{array}$$



$$\omega_0^2 = 15$$