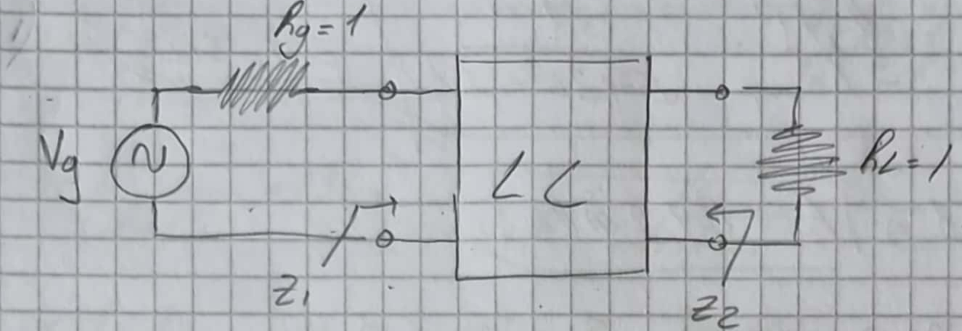
Tarea Semanal 13



1) $T(s) = \dfrac{k}{\text{senh}(s) + \cosh(s)}$; $\text{cotgh}(s) = \dfrac{\cosh(s)}{\text{senh}(s)}$

$$\text{cotgh}(s) = \frac{\cosh(s)}{\text{senh}(s)} = \frac{1}{s} + \frac{1}{\frac{3}{s} + \frac{1}{\frac{5}{s}}} = \frac{1}{s} + \frac{1}{\frac{3}{s} + \frac{s}{5}} = \frac{1}{s} + \frac{1}{\frac{15+s^2}{5s}}$$

$$\text{cotgh}(s) = \frac{1}{s} + \frac{5s}{s^2+15} = \frac{s^2+15+5s^2}{s^3+15s} = \frac{6s^2+15}{s^3+15s}$$

$$\therefore \text{cotgh}(s) = \frac{\cosh(s)}{\text{senh}(s)} = \frac{s(s^2+20)}{(s^2+15)} \Rightarrow \cosh(s) = 6s^2+15$$

$$\text{senh}(s) = s^3+15s$$

$$\therefore T(s) = \frac{k}{(s^3+15s)+(6s^2+15)} = \frac{15}{s^3+6s^2+15s+15}$$; $k=15$, para que $T(0)=1$

$Z_1 = \dfrac{1+S_{11}}{1-S_{11}}$; $|S_{11}|^2 = 1 - |S_{21}|^2$; $|S_{21}|^2 = S_{21}(s) \cdot S_{21}(-s) = T(s) \cdot T(-s)$

Obtengo Z_1, calculando $|S_{21}|^2$ de ahí $|S_{11}|^2$, luego S_{11} y finalmente Z_1. Todo con python, porque el cálculo analítico se pone pesado.

$$\therefore \boxed{Z_1(s) = \frac{2s^3 + 10{,}406s^2 + 21{,}708s + 15}{1{,}594s^2 + 8{,}292s + 15}}$$

Sintetizo removiendo polos en infinito, por Cauer.

2) $2s^3+10{,}406s^2+21{,}703s+15 \;\big|\; 1{,}594s^2+8{,}292s+15$

$-\;\; 2s^3+10{,}406s^2+18{,}825s+0 \qquad 1{,}255s$

$0 \qquad 0 \qquad 2{,}883s+15$

$1{,}594s^2+8{,}292s+15 \;\big|\; 2{,}883s+15$

$-\;\; 1{,}594s^2+8{,}292s+0 \qquad 0{,}553s$

$0 \qquad 0 \qquad 15$

$2{,}883s+15 \;\big|\; 15$

$-\;\; 2{,}883s+0 \qquad 0{,}192s$

$0 \qquad 15$

$15 \;\big|\; 15$

$0 \qquad 1$