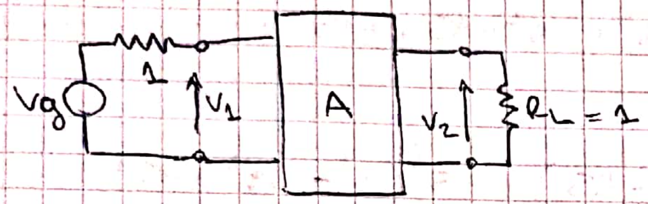
TAREA SEMANAL 13



Bessel de 3er orden Pasabajos

$$H_B(s) = \frac{1}{\cosh + \operatorname{senh}} \quad \wedge \quad \operatorname{cotgh} = \frac{\cosh}{\operatorname{senh}} = \frac{1}{s} + \cfrac{1}{\cfrac{3}{s} + \cfrac{1}{\cfrac{5}{s}}}$$

$$\operatorname{cotgh} = \frac{1}{s} + \frac{5 \cdot s}{15 + s^2} = \frac{15 + s^2 + 5s^2}{15s + s^3} = \frac{\cosh}{\operatorname{senh}}$$

$$\boxed{H_B(s) = \frac{\overbrace{15}^{k \text{ para } 0\,dB \text{ en } s=0}}{s^3 + 6s^2 + 15s + 15}}$$

◦ Parámetros S: S_{21}: transferencia directa

$$|S_{21}|^2 = 1 - |S_{11}|^2 \quad \text{o} \quad \left\{ |S_{11}|^2 = 1 - |S_{21}|^2 \right\}$$

Busco S_{11} para luego conseguir Zin y sintetizarla

↳ primero busco S_{21}

$$|S_{21}|^2 = H_B(s) \cdot H_B(-s) = \frac{15}{s^3 + 6s^2 + 15s + 15} \cdot \frac{15}{-s^3 + 6s^2 - 15s + 15}$$

$$|S_{21}|^2 = \frac{225}{-s^6 + (\cancel{6-6})s^5 + (36-15-15)s^4 + (\cancel{15-15}-\cancel{90+90})s^3 + (90+90-225)s^2 + (\cancel{225-225})s + 225}$$

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

Escaneado con CamScanner

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

$$S_{11}(s) = \frac{P}{Q} \qquad Q = s^3+6s^2+15s+15$$

Busco P:

$$s^2\left(-s^4+6s^2-45\right) = -s^2\left(s^4+6s^2+45\right)$$

$$\left(s^2+x\,s+\sqrt{45}\right)\left(s^2-x\,s+\sqrt{45}\right) = s^4-6s^2+45$$

$$\vdots$$

$$\left(\sqrt{45}-x^2+\sqrt{45}\right)\cancel{s^2} = -6\cancel{s^2}$$

$$-x^2 = -6-2\sqrt{45} = -6-6\sqrt{5}$$

$$\boxed{|x| = 4{,}406}$$

Entonces: $P = s\left(s^2+4{,}406\,s+\sqrt{45}\right)$

$$S_{11}(s) = \frac{s\left(s^2+4{,}406\,s+\sqrt{45}\right)}{s^3+6s^2+15s+15} \Bigg\} \quad Z_{in} = \frac{1+S_{11}}{1-S_{11}} = \frac{1+\frac{N}{D}}{1-\frac{N}{D}}$$

$$Z_{in}(s) = \frac{D+N}{D-N} = \frac{Q+P}{Q-P}$$

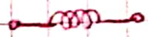
$$Z_{in} = \frac{s^3+4{,}406s^2+\sqrt{45}s+s^3+6s^2+15s+15}{\cancel{s^3}+6s^2+15s+15-\cancel{s^3}-4{,}406s^2-\sqrt{45}s}$$

$$\boxed{Z_{in} = \frac{2s^3+10{,}406s^2+21{,}7s+15}{1{,}594s^2+8{,}29s+15}}$$

Ahora debo sintetizar.

② Método de Cauer II
↓
genera red escalera.

$$\begin{array}{l|l} 2s^3+10{,}406s^2+21{,}7s+15 & 1{,}594s^2+8{,}29s+15 \\ -\;2s^3+10{,}401s^2+18{,}81s+0 & 1{,}254\,s \end{array}$$



$$\begin{array}{l|l} 1{,}594s^2+8{,}29s+15 & 2{,}89s+15 \\ -\;1{,}594s^2+8{,}27s+0 & 0{,}55\,s \end{array}$$

$$\begin{array}{l|l} 2{,}894s+15 & 15 \\ -\;2{,}89s+0 & 0{,}1926\,s \end{array}$$

$$\begin{array}{l|l} 15 & 15 \\ 0 & 1 \end{array}$$

Red Sintetizada: