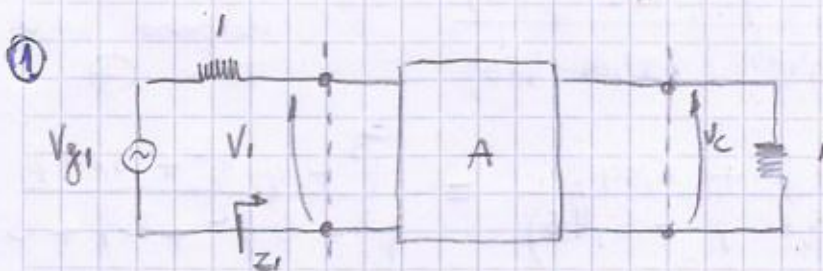


TAREA SEMANAL #16Aproximación de Bessel ( $m=3$ )

$$H(s) = \frac{P(s)}{Q(s)} = \frac{1}{s \cosh(s) + \cosh(s)}$$

$$m=3 \quad \cosh(s) = \frac{\cosh(s)}{\sinh(s)} = \frac{1}{s} + \frac{1}{\frac{3}{s} + \frac{s}{5}} = \frac{6s^2 + 15}{s^3 + 15s}$$

$$\rightarrow \left[ H_{B3}(s) = \frac{15}{s^3 + 6s^2 + 15s + 15} \right]$$



$$S_{11} = \frac{Z_1 - R_0}{Z_1 + R_0}$$

$$Z_1 = \frac{1 + S_{11}}{1 - S_{11}}$$

$$|S_{21}|^2 = |H_{B3}(s)|^2$$

$$|S_{21}|^2 + |S_{11}|^2 = 1$$

$$|S_{11}|^2 = 1 - |S_{21}|^2$$

$$|H_{B3}(s)|^2 = H(s) \cdot H(-s)$$

$$\begin{aligned} |H_{B3}| &= \frac{15}{s^3 + 6s^2 + 15s + 15} \cdot \frac{15}{-s^3 + 6s^2 - 15s + 15} \\ &= \frac{225}{-s^6 + 6s^5 - 15s^4 + 15s^3 - 6s^2 + 36s - 90 + 90s^2 - 15s^3 + 90s - 225s^2 + 225s} \dots \\ &= \frac{225}{-s^6 + 6s^4 + 45s^2 + 225} = - \frac{225}{s^6 - 6s^4 + 45s^2 - 225} \end{aligned}$$



$$\left[ |S_{21}(f)|^2 = - \frac{225}{f^6 - 6f^4 + 45f^2 - 225} \right]$$

$$|S_{11}(f)|^2 = 1 - |S_{21}(f)|^2$$

$$= 1 + \frac{225}{f^6 - 6f^4 + 45f^2 - 225} = \frac{f^6 - 6f^4 + 45f^2}{f^6 - 6f^4 + 45f^2 - 225}$$

$$\left[ |S_{11}(f)|^2 = \frac{f^2 (f^4 - 6f^2 + 45)}{f^6 - 6f^4 + 45f^2 - 225} \right] \begin{matrix} \text{num} \\ \text{den} \end{matrix}$$

• ENTONCES OBTENIR  $S_{11}(f)$   $\rightarrow |S_{11}(f)|^2 = S_{11}(f) \cdot S_{11}(-f)$

$$S_{11}(f) = \frac{f (f + 3,2 + j1,36) (f + 2,2 - j1,36)}{(f + 2,32) (f + 1,84 + j1,75) (f + 1,84 - j1,75)}$$

mpv. Roots ( )  $\leftarrow$   
Mcquinto (ou les)  
Zéros  $\oplus$

$$S_{11}(f) = \frac{f (f^2 + 4,4f + 6,69)}{(f + 2,32) (f^2 + 3,68f + 6,45)} = \frac{f^3 + 4,4f^2 + 6,69f}{f^3 + 6f^2 + 15f + 15}$$

$$\left[ S_{11}(f) \approx \frac{f^3 + 4,4f^2 + 6,7f}{f^3 + 6f^2 + 15f + 15} \right]$$

• SACO  $z_1$   $\rightarrow z_1 = \frac{1 + S_{11}}{1 - S_{11}}$   $\leftarrow$  Se simpl. el Denominator

$$z_{11} = \frac{2f^3 + 10,4f^2 + 21,7f + 15}{1,6f^2 + 8,3f + 15}$$

$$\left[ z_1(f) = \frac{5}{4} \cdot \frac{f^3 + 5,2f^2 + 10,85f + 7,5}{f^2 + 5,19f + 9,4} \right]$$



⑦ SINTETIZO Z1 Por CAVOR

$$\begin{array}{r}
 \cancel{2\Omega^3} + \cancel{10\Omega^2} + 21,7\Omega + 15 \\
 - \cancel{2\Omega^3} + \cancel{10,3\Omega^2} + 18,75\Omega \\
 \hline
 295\Omega + 15
 \end{array}$$

$$16\Omega^2 + 8,3\Omega + 15,1$$

$$1,25\Omega$$

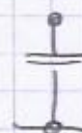
mm

Así se simplifica

$$\begin{array}{r}
 \cancel{16\Omega^2} + \cancel{8,3\Omega} + 15 \\
 - \cancel{16\Omega^2} + \cancel{8,1\Omega} \\
 \hline
 15
 \end{array}$$

$$295\Omega + 15$$

$$0,54\Omega$$



$$3,45\Omega + 15$$

$$15$$

$$3,45\Omega$$

$$15$$

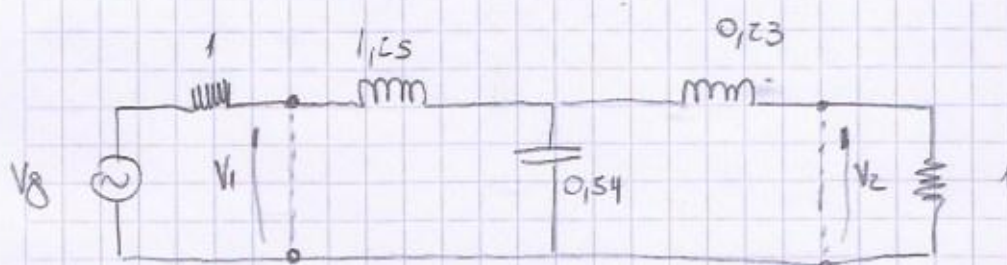
$$0,23\Omega$$

mm

$$15 \quad 15$$

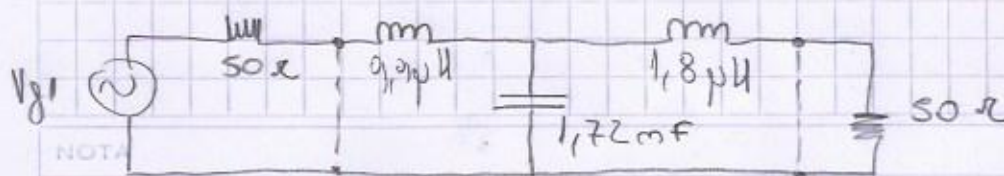


• Z<sub>ed</sub> SINTETIZADA



④ EN SAL → EN LA BANDA DE PASO (DC) SE ENCUENTRA ADON. TADO EN. A MEDIDA QUE SE AUMENTA LA FRECUENCIA, SE AUMENTA LA BANDA DE RECHAZO Y AUMENTA LA DESVIACIÓN.

⑤ Des Normalización  $R\omega = 2\pi \cdot 10^6 \frac{r}{s}$   $Rz = 50\Omega$



NOTA