TAREA SEMANAL 14

Diseñe un atenuador de Banda ancha que permita atenuar 30dB intercalado en un cable coaxial de 75Ω.

a) obtenga una red que satisfaga los requerimientos

Para Atenuar Necesito $\gamma = \alpha$

~~$30dB = 20 \lg(\Delta v) \Rightarrow \Delta v = 31,62 \Rightarrow \frac{V_2}{V_1} = 0,0316$~~

~~$\frac{V_1}{V_2} = e^{\gamma} = 31,62 \Rightarrow \gamma = 3,45 = \alpha$~~

$$\frac{\alpha \, dB}{8,69 \, dB/nepper} = \alpha \quad \therefore \quad \alpha = \frac{30 \, dB}{8,69 \, dB/nepper}$$

$$\boxed{\alpha = 3,45 \, nepper}$$

Como solamente debo Atenuar $\gamma = \alpha + j\underbrace{\beta}_{0} \quad \therefore \quad \gamma = \alpha = 3,45 \, nepper$

$$T = \begin{pmatrix} Ch(\alpha) & Sh(\alpha) \cdot Z_0 \\ \frac{Sh(\alpha)}{Z_0} & Ch(\alpha) \end{pmatrix} = \begin{pmatrix} 15,8 & 15,76 \cdot 75\Omega \\ \frac{15,76}{75\Omega} & 15,8 \end{pmatrix}$$

$$T = \begin{pmatrix} 15,8 & 1182,3 \\ 0,21 & 15,8 \end{pmatrix} \longrightarrow$$ esto lo puedo convertir A parámetros Z

$$\begin{cases} V_1 = V_2 \cdot A + (-I_2) \cdot B \\ I_1 = V_2 \cdot C + (-I_2) D \end{cases}$$

$$Z_{11} = \left. \frac{V_1}{I_1} \right|_{I_2 = 0} = A/C$$

$$Z_{21} = \left. \frac{V_2}{I_1} \right|_{I_2 = 0} = 1/C \qquad \begin{matrix} V_1 = V_2 \cdot A \\ I_1 = V_2 \cdot C \end{matrix}$$

$$Z_{22} = \left. \frac{V_2}{I_2} \right|_{I_1 = 0} = D/C$$

$$Z_{12} = \left. \frac{V_1}{I_2} \right|_{I_1 = 0} \quad \begin{matrix} V_1 = V_2 \cdot A + (-I_2) \cdot B \\ 0 = V_2 \cdot C + (-I_2) \cdot D \end{matrix} \Rightarrow V_1 = I_2 \left(\frac{AD}{C} - B \right)$$

$$\frac{AD - BC}{C}$$

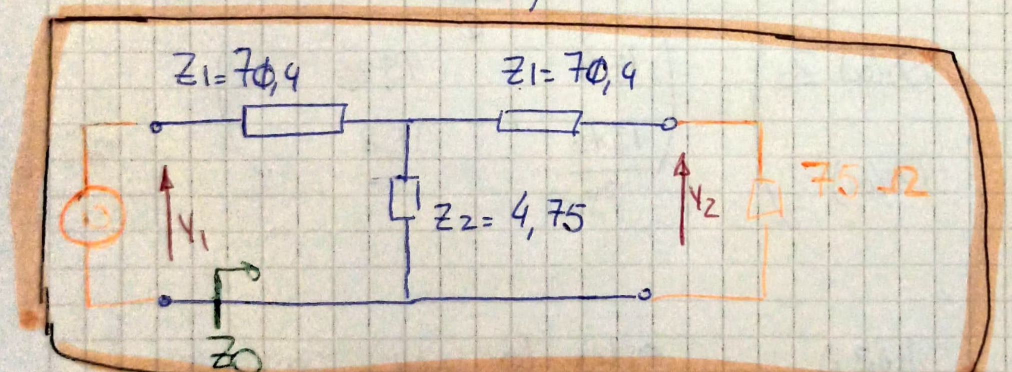
$$\cancel{Z = \begin{pmatrix} A/C & AD/C - B \\ 1/C & D/C \end{pmatrix}} \quad ; \quad T = \begin{pmatrix} 15{,}76 & 1182{,}73 \\ 0{,}21 & 15{,}76 \end{pmatrix}$$

$$\cancel{Z = \begin{pmatrix} 75{,}0476 & 0{,}0204 \\ 4{,}761 & 75{,}0476 \end{pmatrix}}$$

Yo calculaba en fracciones

$$T = \begin{pmatrix} 15{,}8 & 1182{,}73 \\ 0{,}21 & 15{,}8 \end{pmatrix} \longrightarrow Z = \begin{pmatrix} 75{,}15 & 4{,}7559 \\ 4{,}7559 & 75{,}15 \end{pmatrix}$$

Ahora si .... => lo puedo llevar a una ~~[illegible]~~ red



$$\cancel{\frac{V_2}{V_1} = \frac{(70{,}4+75) /\!/ 4{,}75}{70{,}4 + (70{,}4+75) /\!/ 4{,}75} = 61{,}32\ mV \Rightarrow 20 \log\left(\frac{V_2}{V_1}\right) =}$$

$$10 \log \frac{P_2}{P_1} = 10 \log \frac{V_2^2/Z_0}{V_1^2/Z_0} = 10 \log \left(\frac{V_2}{V_1}\right)^2 = 20 \log (V_2/V_1)$$

Si $Z_{i2} = Z_{i1} \Rightarrow \alpha_{pot} = \alpha_{tensión}$

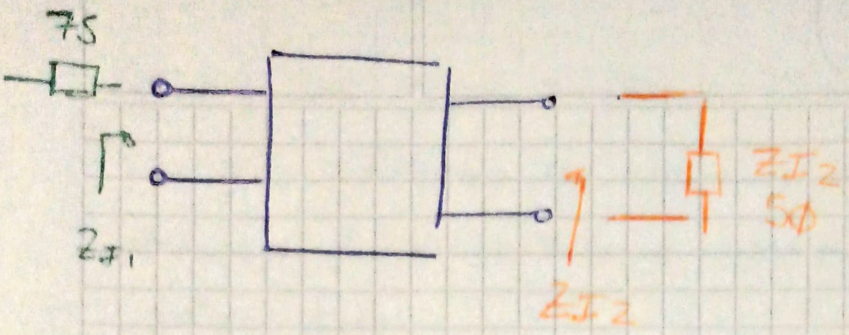
$$V_2/V_1 = \frac{\left[\left(70{,}4+75\right)^{-1}+4{,}75^{-1}\right]^{-1}}{70{,}4+\left[\left(70{,}4+75\right)^{-1}+4{,}75^{-1}\right]^{-1}} = \frac{4{,}599}{70{,}4+4{,}599} = 0{,}0613$$

$20 \log (V_2/V_1) = -24{,}24 \text{ dB} \Rightarrow$ ESTÁ MAL

$$\frac{V_2}{V_1} = \frac{\left(\left(70{,}4+75\right)^{-1}+4{,}75^{-1}\right)^{-1}}{70{,}4+\left(\left(70{,}4+75\right)^{-1}+4{,}75^{-1}\right)^{-1}} \cdot \frac{75}{75+70{,}4}$$

$$\frac{4{,}599}{70{,}4+4{,}599} \cdot \frac{75}{75+70{,}4} = 0{,}0317$$

$$\Rightarrow \boxed{20 \log (V_2/V_1) = -29{,}96 \text{ dB}}$$



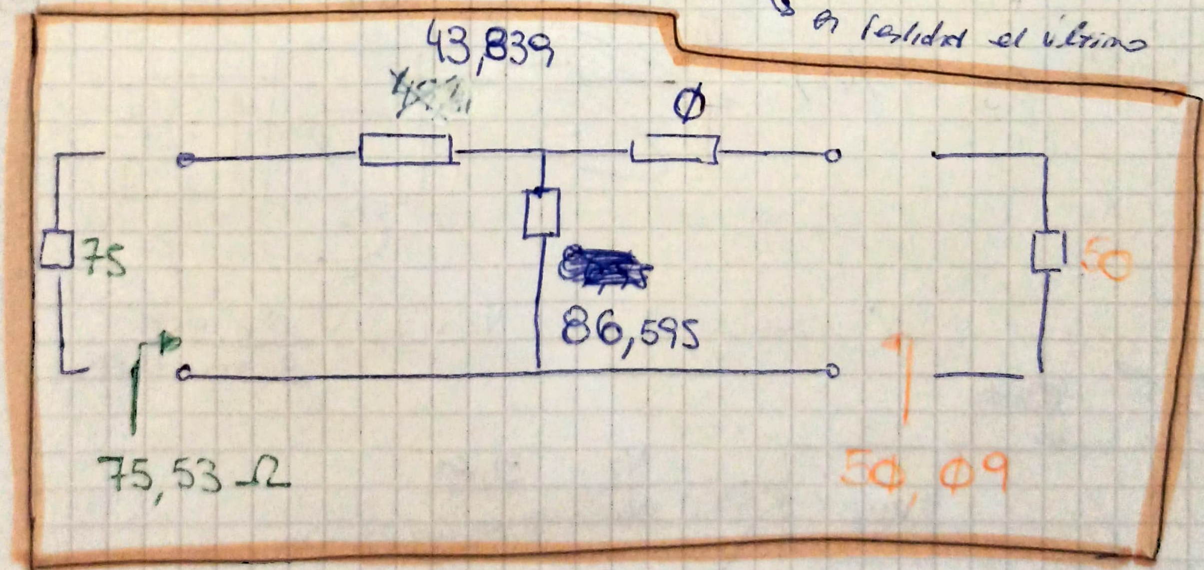
Necesito que me presente lo de las flechas

$$T = \begin{pmatrix} Ch(\gamma)\cdot\sqrt{Z_{I1}/Z_{I2}} & Sh(\gamma)\cdot\sqrt{Z_{I1}\cdot Z_{I2}} \\ \dfrac{Sh(\gamma)}{\sqrt{Z_{I1}\cdot Z_{I2}}} & Ch(\gamma)\cdot\sqrt{\dfrac{Z_{I2}}{Z_{I1}}} \end{pmatrix}$$

$$\gamma = \alpha + j\beta \Big|_{\beta = 0} = \frac{5{,}72\ dB}{8{,}686\ dB/neper} = 0{,}6585$$

$$T = \begin{pmatrix} 1{,}5 & 43{,}3 \\ 0{,}0115 & 1 \end{pmatrix} \Rightarrow Z = \begin{pmatrix} 130{,}43 & \overset{\cong 86{,}95}{87{,}13} \\ 86{,}95 & 86{,}95 \end{pmatrix}$$

en realidad el último



$$\alpha = 10 \log \left(\frac{V_2^2 \cdot Z_{F2}}{V_1^2 \cdot Z_{F1}} \right)$$

$$\cancel{10 \log \left[\frac{31{,}69}{31{,}69 +} \right.}$$

$$\alpha = 10 \log \left(\frac{\frac{V_1^2}{Z_{F1}}}{\frac{V_2^2}{Z_{F2}}} \right) = 20 \log \left(\frac{V_1}{V_2} \right) + 10 \log \left(\frac{Z_{F2}}{Z_{F1}} \right)$$

$$+ 10 \log (50/75)$$

$$V_2 = V_1 \cdot \frac{86{,}955}{86{,}955 + 43{,}839} \Rightarrow \frac{V_1}{V_2} = \cancel{1{,}504} \; 1{,}5041$$

$$V_2 = V_1 \cdot \frac{86{,}955}{86{,}955 + 43{,}839}$$

$$\frac{V_1}{V_2} =$$

$$\alpha = (-5{,}948) + (-1{,}76)$$

$$\alpha = -7{,}7$$

$$\alpha = 7{,}48 - 1{,}76$$

$5{,}72$

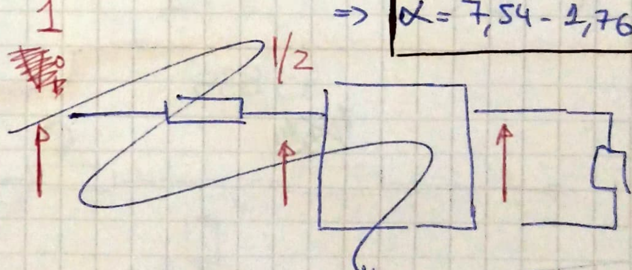
$$20 \log (V_1/V_2)$$

$$\frac{V_2}{V_1} = \frac{86{,}595 // 50}{(86{,}595//50) + 43{,}839}$$

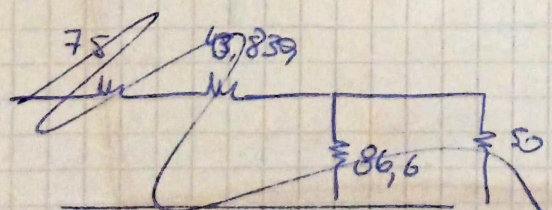
$$\frac{V_1}{V_2} = 2{,}38 \;\therefore\; 20 \log (V_1/V_2) =$$

$$= 7{,}54$$

$$\Rightarrow \boxed{\alpha = 7{,}54 - 1{,}76 = 5{,}78}$$



$$V_2 = V_1 \cdot \frac{86{,}955}{86{,}955 + 43{,}839}$$



$$\frac{V_2}{V_1} = \frac{31{,}69}{31{,}69 + 43{,}839 + 75}$$

$$\frac{V_1}{V_2} = 4{,}74 \Rightarrow 20 \log (V_1/V_2) =$$

No es posible acoplar sin atenuar, vimos que en la atenuación del cuadripolo obtenemos una atenuación de tensión y otra atenuación debido al salto de impedancia. Además son circuitos pasivos estos

~~Por~~

Para 80dB tendríamos

$$\alpha = \frac{80\ dB}{8,689} = 9,2070$$

$$T = \begin{pmatrix} 6123,0078 & 81,64 \\ 306.150,38 & 4082,0052 \end{pmatrix}$$

$$Z = \begin{pmatrix} 0,02 & 0,0001 \\ 0,00326 \times 10^{-3} & 0,0133 \end{pmatrix}$$

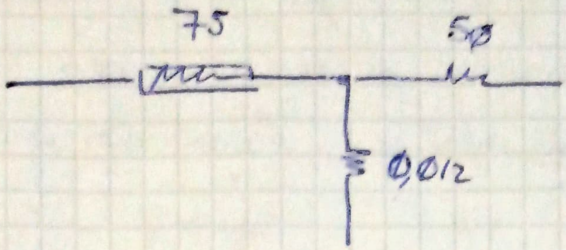
esto debería coincidir pero en realidad es irreal

$$T = \begin{pmatrix} 6123,0078 & 306.150,3857 \\ 81,64 & 4082,0052 \end{pmatrix}$$

$$Z = \begin{pmatrix} 75,00\ldots & 0,00427 \\ 0,0122 & 50 \end{pmatrix}$$

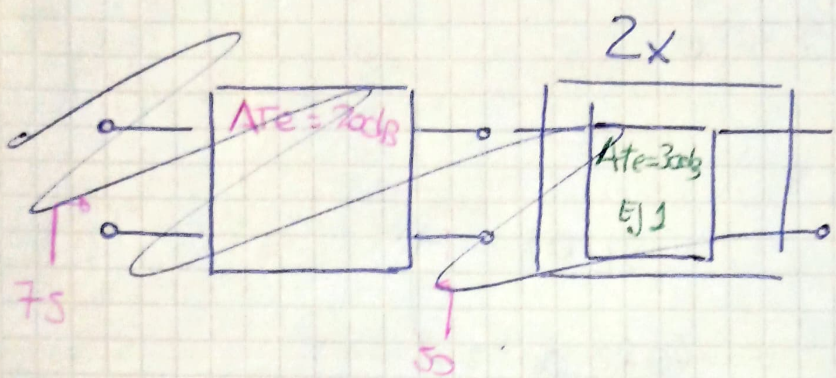
deberían coincidir es por decimales

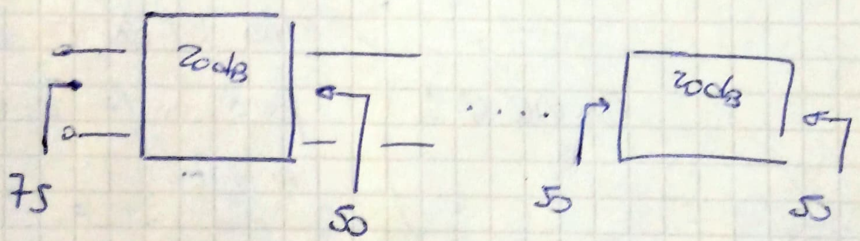
La cuestión es que es irrealizable porque



=> ES IRREALIZABLE

Esto lo puedo resolver haciendo



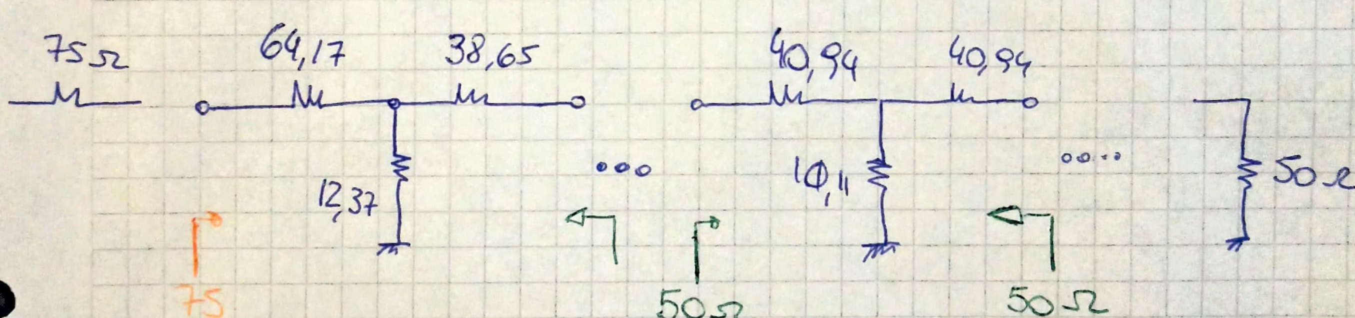


$$\alpha = \frac{20\ dB}{8{,}686\ dB/nepper} = 2{,}30255\ \text{nepper}$$

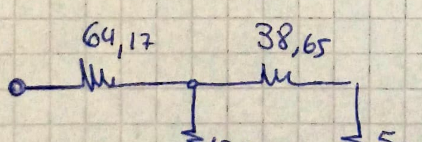
$$T_1 = \begin{pmatrix} 6{,}1847 & 303{,}115 \\ 0{,}0808 & 4{,}123 \end{pmatrix} \qquad T_2 = \begin{pmatrix} 5{,}0498 & \cancel{4{,}949}\ 247{,}49 \\ 0{,}0989 & 5{,}0498 \end{pmatrix}$$

$$Z_1 = \begin{pmatrix} 76{,}54 & 12{,}47 \\ 12{,}37 & 51{,}02 \end{pmatrix} \qquad \begin{pmatrix} 51{,}05 & 10{,}11 \\ 10{,}11 & 51{,}05 \end{pmatrix}$$

Tomo este



Verifico en Spice



$$A_t = 10 \log (P_1/P_2)$$

$$10 \log \left(\frac{V_1^2/Z_{I1}}{V_2^2/Z_{I2}} \right)$$

$$10 \log \left(\left(\frac{V_1}{V_2}\right)^2 \right) + 10 \log \left(\frac{Z_{I2}}{Z_{I1}} \right)$$

$$V_2 = V_1 \cdot \frac{12{,}37 // (38{,}65+50)}{12{,}37 // (38{,}65+50) + 64{,}17} \cdot \frac{50}{50+38{,}65}$$

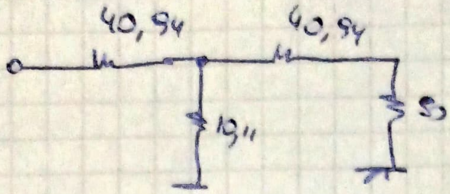
$$\frac{V_1}{V_2} = 12{,}25$$

$$20 \log (V_1/V_2) + 10 \log (Z_{I2}/Z_{I1})$$

$$21{,}76 + (-1{,}76) \Rightarrow \boxed{A_t = 20\ dB}$$

$AT = 20 \log (V_1/V_2) + 10 \log (1)$

$\Delta T =$



$\cancel{\frac{V_2}{V_1} = 5,499} \cdot \frac{50}{50+49,94}$

$AT =$

$$\frac{V_2}{V_1} = \frac{(50+40,94) // 10,11}{40,94 + (50+49,94) // 10,11} \cdot \frac{50}{50+40,94}$$

$$\boxed{20 \log (V_1/V_2) = 20\ dB = AT}$$