

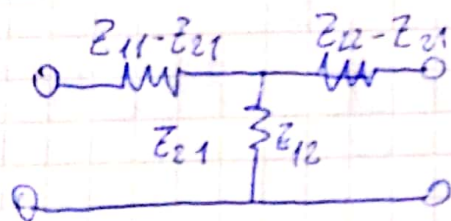
Tarea semanal 14

1) Atenuador de 30 dB intercalado con un coaxial de 75 ohms = Z_0

BW = cs \rightarrow respuesta plana ($\beta = 0$)

$$2_{dB} = 30 dB \rightarrow 2_{nep} = 3,454 = \gamma$$

$$T = \begin{pmatrix} \cosh \gamma & \sinh \gamma Z_0 \\ \frac{\sinh \gamma}{Z_0} & \cosh \gamma \end{pmatrix} = \begin{pmatrix} 15,83 & 1184,81 \\ 0,21 & 15,83 \end{pmatrix}$$



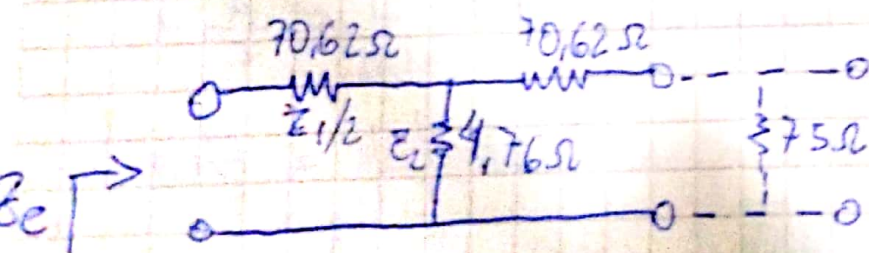
$$\begin{cases} V_1 = A(V_2) + B(-I_2) \\ I_1 = C(V_2) + D(-I_2) \end{cases}$$

$$\left. \frac{V_1}{I_2} \right|_{I_2=0} = Z_{12} = Z_{21} \quad \left. \frac{V_2}{I_1} \right|_{I_1=0} = Z_{21}$$

necesario por Imp. imagen iguales $Z_{12} = \frac{1}{C} = 4,76 \Omega$

$$Z_{11} = Z_{22}$$

$$Z_{11} = \frac{D}{C} = 75,38$$



$$Z_e = \frac{Z_1}{2} + \left(\frac{1}{Z_2} + \frac{Z_1/2 \cdot Z_2}{Z_1 + Z_2} \right)^{-1} = 75,23 \checkmark$$

~~AAKKK~~ $\frac{1}{75 \Omega}$ Verifico la atenuación en LTSpice

$$2) \quad Z_{I1} = 75 \Omega$$

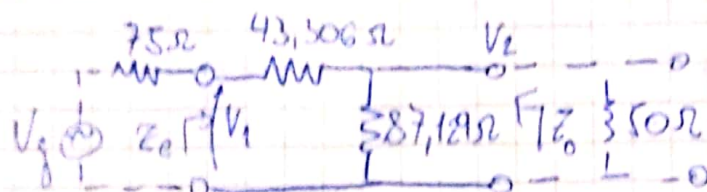
$$Z_{I2} = 50 \Omega$$

$$ATT = 5,72 \text{ dB} \rightarrow 0,6585$$

$$T = \begin{pmatrix} \cosh \gamma \sqrt{\frac{Z_{I1}}{Z_{I2}}} & \sinh \sqrt{Z_{I1} Z_{I2}} \\ \frac{\sinh \gamma}{\sqrt{Z_{I1} Z_{I2}}} & \cosh \gamma \sqrt{\frac{Z_{I2}}{Z_{I1}}} \end{pmatrix} = \begin{pmatrix} 1,5 & 43,306 \\ 0,0115 & 1 \end{pmatrix}$$

$$Z_{11} = \frac{A}{C} = 130,435 \Omega \quad Z_{21} = \frac{1}{C} = 87,129 \Omega$$

$$Z_{22} = \frac{D}{C} = \frac{86,957 \Omega}{87,129} \quad Z_{12} = \frac{AD - BC}{C} = 87,129 \Omega$$



$$Z_c = 43,306 \Omega + \left(\frac{1}{50 \Omega} + \frac{1}{87,129} \right)^{-1} = 75,07 \checkmark$$

$$V_g = 0 \quad Z_0 = 87,129 \parallel (75 \Omega + 43,306 \Omega) = 50,17 \checkmark$$

→ Porque no tomamos 75 Ohms?

$$2_{dB} = 20 \log \left(\frac{43,306 \times (87,129/50)}{87,129/50} \right) + 10 \log \left(\frac{50}{75} \right) = 5,71 \text{ dB}$$

3,71 veces

c) No se puede ya que el acople de impedancias trae implícita una atenuación

d) Siguiendo el procedimiento anterior, si queremos 80 dB de atenuación, obtenemos que la Z en derivación es $0,012 \Omega$ (realizable)

Se opta por 3 bloques que atenuen 20 dB con $Z_0 = 75 \Omega$ y una última que atenuen 20 dB y adapte

$$L_{dB} = 20 \text{ dB} \Rightarrow \gamma = 2,303$$

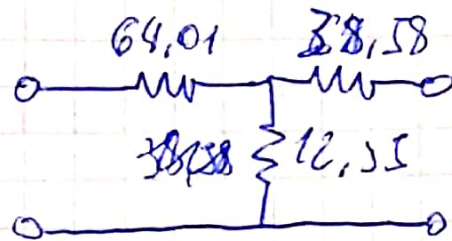
Acoplador

$$\Gamma = \begin{pmatrix} 6,187 & 303,253 \\ 0,081 & 4,125 \end{pmatrix}$$

$$Z_2 = Y_0 = 12,35$$

$$Z_{11} = 76,36 \Omega \Rightarrow Z_1 = 64,01 \Omega$$

$$Z_{22} = 50,93 \Rightarrow Z_2 = 38,58 \Omega$$



Los primeros 3 bloques con $Z_0 = 75 \Omega$ y $\gamma = 2,303$

$$\Gamma = \begin{pmatrix} 5,052 & 371,407 \\ 0,066 & 5,052 \end{pmatrix} \rightarrow$$

$$Z_1 = Z_3 = 61,39$$

$$Z_2 = 15,15$$

