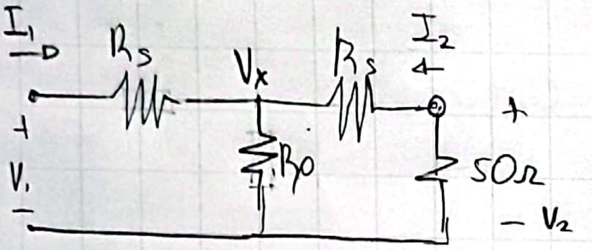
Subject: Date:

$R_s = 8.56$ $R_p = 141.8$ impedancia de Referencia de 50Ω

$|S_{11}|, |S_{21}| = ?$



$$\begin{bmatrix} V_1^- \\ V_2^- \end{bmatrix} = \begin{bmatrix} S_{11} & S_{12} \\ S_{21} & S_{22} \end{bmatrix} \begin{bmatrix} V_1^+ \\ V_2^+ \end{bmatrix}$$

$$S_{11} = \frac{V_1^-}{V_1^+}\Big|_{V_2^+=0} \qquad S_{12} = \frac{V_1^-}{V_2^+}\Big|_{V_1^+=0}$$

$$S_{21} = \frac{V_2^-}{V_1^+}\Big|_{V_2^+=0} \qquad S_{22} = \frac{V_2^-}{V_2^+}\Big|_{V_1^+=0}$$

If $V_2^+ = 0$

$V_1 = V_1^+ + V_1^- = V_1^+(1+\Gamma_1)$

$$S_{11} = \Gamma_1 = \frac{Zi_1 - Z_0}{Zi_1 + Z_0} \qquad \dots Zi_1 = R_s + [R_p \,||\, (R_s+50)]$$

$$= R_s + \left[\frac{(R_s+50)(R_p)}{R_s+50+R_p}\right]$$

$$S_{11} = \frac{R_s + \left[\frac{(R_s+50)(R_p)}{R_s+50+R_p}\right] - 50}{R_s + \left[\frac{(R_s+50)(R_p)}{R_s+50+R_p}\right] + 50} = \frac{8.56 + \left[\frac{8303.808}{200.36}\right] - 50}{8.56 + \left[\frac{8303.808}{200.36}\right] + 50}$$

$$= \frac{8.56 + 41.44 - 50}{8.56 + 41.44 + 50} = 4.4398e^{-5} \qquad |S_{11}| = 4.4398e^{-5}$$

$$|S_{11}| = -20\log_{10}(4.4398e^{-5})$$
$$= 87.05 \text{ dB}$$

$$S_{21} = \frac{V_2^-}{V_1^+} = \frac{V_2}{V_1/(1+\Gamma_1)} = (1+\Gamma_1)\frac{V_2}{V_1}$$

$$V_2 = \frac{50 V_x}{R_s+50}; \quad V_x = \frac{V_1[R_p // (R_s+50)]}{R_s + [R_p // (R_s+50)]}; \quad \frac{V_2}{V_1} = \frac{50[R_p // (R_s+50)]}{(R_s+50)\{R_s + [R_p // (R_s+50)]\}}$$

Revisar como sacar dB
Revisar como opera con grados

$R_s = 8.56 \quad R_p = 141.8$

$$\frac{V_2}{V_1} = \frac{50\,[R_p // (R_s+50)]}{(R_s+50)\{R_s + [R_p // (R_s+50)]\}} \quad \dots \quad S_{21} = (1+\Gamma_1)\frac{V_2}{V_1}$$

$$= \frac{50\left(\frac{R_p(R_s+50)}{R_p+R_s+50}\right)}{(R_s+50)\left[R_s + \frac{R_p(R_s+50)}{R_p+R_s+50}\right]} = 0.7077$$

$$S_{21} = (1 - S_{11}) \, 0.7077 = 0.7076$$

$$\simeq -20\log_{10}(0.7076) = 3.003 \text{ dB}$$

$$S = \begin{bmatrix} 0.05\angle 180^\circ & 0.9\angle 45^\circ \\ 0.9\angle 45^\circ & 0.1\angle -90^\circ \end{bmatrix}$$

a) es reciproca por que $S_{21} = S_{12}$

b) $\sum_{K=1}^{N} S_{Ki} S_{Ki}^* = 1$, $\left.\begin{array}{l} |\overset{0.05}{S_{11}}|^2 + |\overset{0.9}{S_{12}}|^2 = 0.8125 \\ |\overset{0.9}{S_{21}}|^2 + |\overset{0.1}{S_{22}}|^2 = 0.82 \end{array}\right\}$ No cumple la condicion. Tiene perdidas

c) $V^- = SV^+ \therefore V_1^- = S_{11}V_1^+ + S_{12}V_2^+ \longrightarrow \frac{V_1^-}{V_1^+} = S_{11} + S_{12}\frac{V_2^+}{V_1^+}$

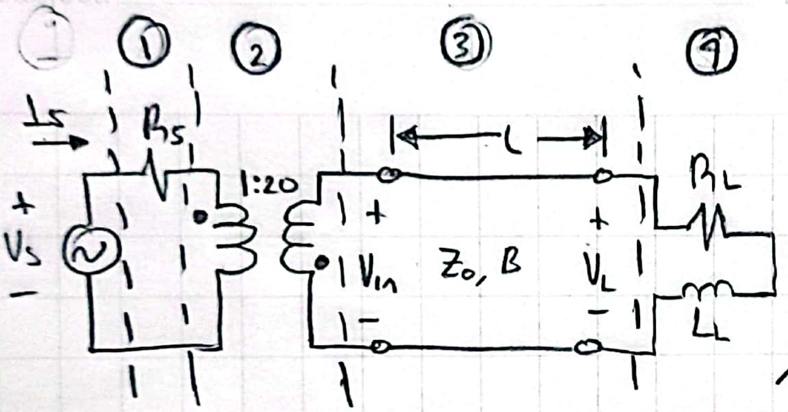
$V_2^- = S_{21}V_1^+ + S_{22}V_2^+ \longrightarrow \frac{V_2^-}{V_2^+} = S_{21}\frac{V_1^+}{V_2^+} + S_{22}$

es abierto por lo tanto hay full reflection

$$\Gamma_2 = \frac{V_2^-}{V_2^+} = \frac{Z_L - Z_0}{Z_L + Z_0} = 1$$

$$1 = S_{21}\frac{V_1^+}{V_2^+} + S_{22} \rightarrow 1 - S_{22} = S_{21}\frac{V_1^+}{V_2^+} \rightarrow S_{21} = \frac{V_2^+(1-S_{22})}{V_1^+}$$

$$\therefore \frac{V_2^+}{V_1^+} = \frac{S_{21}}{(1-S_{22})} \qquad \text{en el punto } 1 \rightarrow \frac{V_1^-}{V_1^+} = S_{11} + S_{12}\left(\frac{S_{21}}{1-S_{22}}\right)$$



$B = \omega / V_p$

$l = 380K$

$Z_0 = 75\Omega$

$W = 120\Omega$

$V_p = 0.36$

$Z_L = R_L + j\omega L_L$

$$\begin{bmatrix} A & B \\ C & D \end{bmatrix} = \underbrace{\begin{bmatrix} 1 & R_S \\ 0 & 1 \end{bmatrix}}_{1} \underbrace{\begin{bmatrix} -\frac{1}{20} & 0 \\ 0 & -20 \end{bmatrix}}_{2} \underbrace{\begin{bmatrix} \cos\beta l & jZ_0 \sin\beta l \\ j\frac{1}{Z_0}\sin\beta l & \cos\beta l \end{bmatrix}}_{3} \underbrace{\begin{bmatrix} 1 & 0 \\ \frac{1}{Z_L} & 1 \end{bmatrix}}_{4} \Bigg| \begin{bmatrix} V_L \\ 0 \end{bmatrix}$$

$$\begin{bmatrix} A & B \\ C & D \end{bmatrix} = \begin{bmatrix} A_T & B_T \\ C_T & D_T \end{bmatrix} \begin{bmatrix} V_L \\ 0 \end{bmatrix}$$

$V_s = A_T V_L \rightarrow V_L = \frac{V_s}{A_T}$

$I_s = C_T V_L \rightarrow I_L = \frac{V_L}{Z_L}$