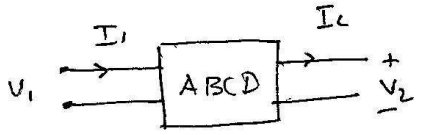
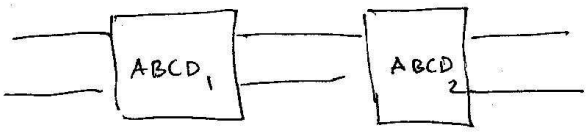
Clase #4

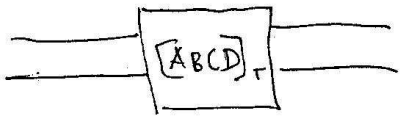


$$V_1 = AV_2 + BI_2$$

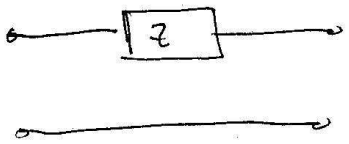
$$I_1 = CV_2 + DI_2$$



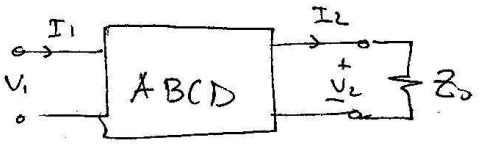
$$[ABCD]_1 \times [ABCD]_2 = [ABCD]_{TOTAL}$$



$$\Longrightarrow [S]_{TOT}$$



$$\Longleftrightarrow \begin{bmatrix} 1 & Z \\ 0 & 1 \end{bmatrix}$$



$$V_2 = Z_0 I_2$$

$$I_2 = \frac{V_2}{Z_0} = Y_0 V_2$$

$$V_1 = A V_2 + B I_2$$

$$I_1 = C V_2 + D I_2$$

$$V_1 = V_2 (A + B Y_0)$$

$$I_1 = V_2 (C + D Y_0)$$

Recordar:

$$a_1 = \frac{V_1 + Z_0 I_1}{2\sqrt{Z_0}} = \frac{V_2 (A + B Y_0) + Z_0 V_2 (C + D Y_0)}{2\sqrt{Z_0}}$$

$$b_1 = \frac{V_1 - Z_0 I_1}{2\sqrt{Z_0}} = \frac{V_2 (A + B Y_0) - Z_0 V_2 (C + D Y_0)}{2\sqrt{Z_0}}$$

$$S_{11} = \frac{b_1}{a_1} = \frac{A + B Y_0 - C Z_0 - D}{A + B Y_0 + C Z_0 + D}$$

Ejemplo: línea Transmisión

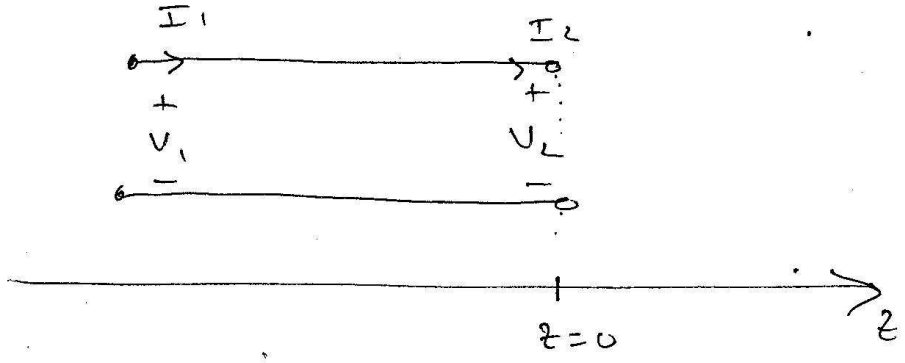
$$[S] = \begin{bmatrix} 0 & e^{-j\beta l} \\ e^{-j\beta l} & 0 \end{bmatrix}$$

$$A = \frac{(1+S_{11})(1-S_{22}) + S_{12}S_{21}}{2S_{21}}$$

$$= \frac{(1)(1) + e^{-j2\beta l}}{2e^{-j\beta l}}$$

$$= \frac{1}{2}\left[e^{+j\beta l} + e^{-j\beta l}\right] = \frac{1}{2}(2\cos\beta l)$$

$$\Rightarrow \begin{bmatrix} \cos\beta l & jZ_0\tan\beta l \\ jY_0\sin\beta l & \cos\beta l \end{bmatrix}$$



$$V = V_0^+ e^{-j\beta z} + V_0^- e^{+j\beta z}$$

$$I = I_0^+ e^{-j\beta z} + I_0^- e^{+j\beta z} = 0 \quad (\text{open})$$

$$A = \left.\frac{V_1}{V_2}\right|_{I_2=0}$$

$\therefore \quad I_0^+ = -I_0^-$

Since $Z_L = \infty$

$\Gamma_L = 1 \angle 0^\circ$

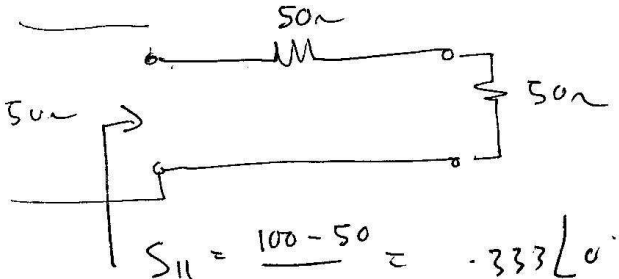
$\frac{V_0^-}{V_0^+} = 1 \Rightarrow V_0^+ = V_0^-$

$V_2 = V_0^+ e^{0} + V_0^+ e^{0} = 2V_0^+$

$V_1 = V_0^+ e^{j\beta l} + V_0^- e^{-j\beta l}$

$V_1 = \frac{V_2}{2} e^{+j\beta l} + \frac{V_2}{2} e^{-j\beta l}$

$A = \frac{V_1}{V_2} = \frac{1}{2}\left(e^{+j\beta l} + e^{-j\beta l}\right) = \cos\beta l$



$S_{11} = \frac{100-50}{100+50} = .333 \angle 0^\circ$

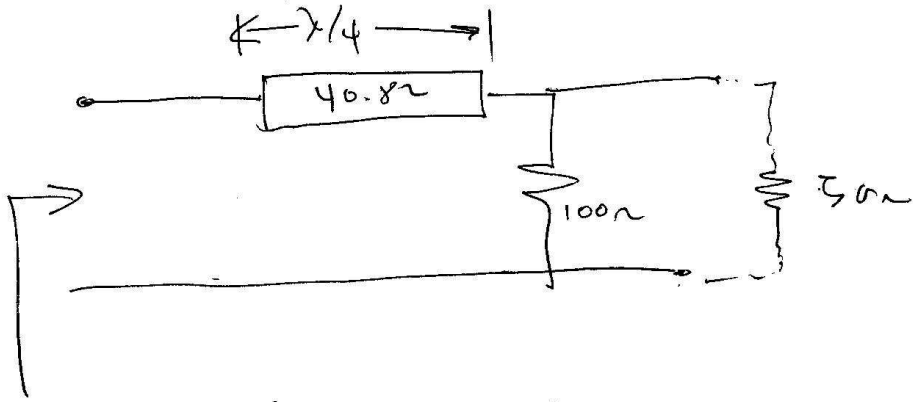
$$V_1 = V_1^+ + V_1^- = V_1^+ (1 + S_{11}) = 1.33 V_1^+$$

$$V_2 = \cancel{V_2^+}^{0} + V_2^- = V_2^- = \frac{V_1 (50)}{50 + 50}$$

$$= \frac{V_1^+ (1.33)(50)}{100}$$

$$S_{21} = \frac{V_2^-}{V_1^+} = 0.665 V_1^+$$

(2)

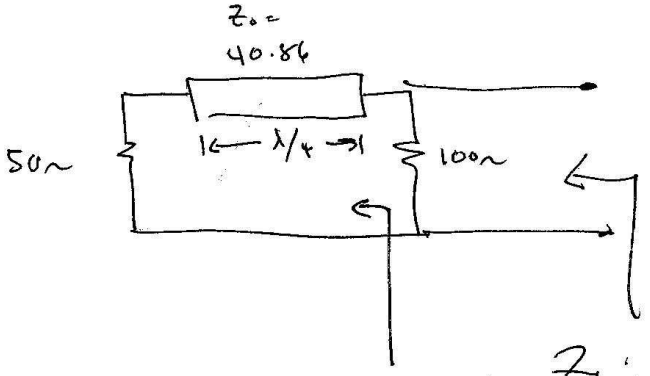


$$Z_{in} = \frac{Z_0'}{Z_L} = \frac{(40.82)^2}{(50 \| 100)} \simeq 50\Omega$$

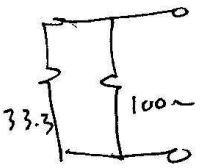
$$\| \; 33.3\Omega$$

$$S_{11} = 0$$

S_{22}



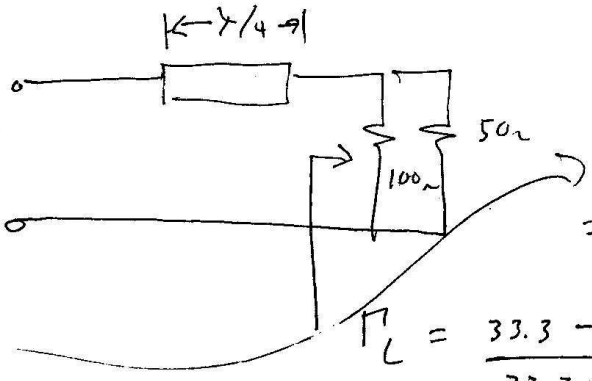
$$Z_0^2/Z_L = \frac{(40.86)^2}{50} = 33.3\Omega$$



$33.3\Omega \parallel 100 = 25\Omega$

$$S_{22} = \frac{25-50}{25+50} = -\frac{1}{3} = \frac{1}{3}\angle 180^\circ$$

S_{21}



$$S_{21} = \frac{V_2^-}{V_1^+} = \frac{0.9V_0^+}{j1.1V_0^+} = 0.818\angle -90^\circ$$

$$\Gamma_L = \frac{33.3-40.86}{33.3+40.86} = -0.1$$

$$V_2 = V(z=0) = V_0^+(1+\Gamma_L) = 0.9V_0^+ = V_2^-$$

$$V_1 = V_0^+\left(e^{+j90^\circ} + (0.1)e^{-j90^\circ}\right) = V_0^+(j + j0.1) = V_0^+(1.1j)$$

$$= V_1^+(1+S_{11}) = V_1^+(1) = V_0^+(1.1j) \Rightarrow V_1^+ = j1.1V_0^+$$