4.7 (a.)

$$Z = \frac{Z_A}{2Z_A + Z_B}\begin{bmatrix} (Z_A + Z_B) & Z_A \\ Z_A & (Z_A + Z_B) \end{bmatrix}$$

$$Y = \frac{1}{Z_A Z_B}\begin{bmatrix} (Z_A + Z_B) & -Z_A \\ Z_A & (-Z_A + Z_B) \end{bmatrix}$$

(b.)

$$Z = \frac{1}{Y_A Y_B}\begin{bmatrix} (Y_A + Y_B) & Y_A \\ Z_A & (Y_A + Y_B) \end{bmatrix}$$

$$Y = \frac{Y_A}{2Y_A + Y_B}\begin{bmatrix} (Y_A + Y_B) & -Y_A \\ -Y_A & (Y_A + Y_B) \end{bmatrix}$$

4.9 $V_1^+ = 14.1 \angle 45^o$ $\quad V_1^- = 14.1 \angle -45^o$

$V_2^+ = 2.83 \angle -45^o$ $\quad V_2^- = 2.83 \angle -135^o$

$Z_{in,1} = 50 \angle -90^o$ $\quad Z_{in,2} = 50 \angle -90^o$

4.10 (a.)

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

(b.)

$$S = \begin{bmatrix} \frac{3(1 - e^{-j2\beta l})}{9 - e^{-j2\beta l}} & \frac{8e^{-j2\beta l}}{9 - e^{-j2\beta l}} \\ \frac{8e^{-j2\beta l}}{9 - e^{-j2\beta l}} & \frac{3(1 - e^{-j2\beta l})}{9 - e^{-j2\beta l}} \end{bmatrix}$$

4.16 (a.) Network is not lossless

(b.) Network is reciprocal

(c.) $RL = 20$ dB

(d.) $IL = 8.0$ dB

(e.) $\Gamma = 0.19 \angle 90^o$

4.18

$$S = \begin{bmatrix} \frac{Z_{o2} - Z_{o1}}{Z_{o1} + Z_{o2}} & \frac{2\sqrt{Z_{o1}Z_{o2}}}{Z_{o1} + Z_{o2}} \\ \frac{2\sqrt{Z_{o1}Z_{o2}}}{Z_{o1} + Z_{o2}} & \frac{Z_{o1} - Z_{o2}}{Z_{o1} + Z_{o2}} \end{bmatrix}$$

4.21
$$Z = \begin{bmatrix} -jZ_o \cot\beta l & -jZ_o \csc\beta l \\ -jZ_o \csc\beta l & -jZ_o \cot\beta l \end{bmatrix}$$

4.24 $V_L = 1\angle -90^\circ$ V

4.30
$$\frac{P_2}{P_1} = \frac{|S_{12}|^2 (1 - |\Gamma_2|^2)}{|1 - S_{23}^2 \Gamma_2 \Gamma_3|^2 - |S_{12}^2 \Gamma_2|^2}$$

$$\frac{P_3}{P_1} = \frac{|S_{12}|^2 |S_{23}|^2 |\Gamma_2|^2 (1 - |\Gamma_3|^2)}{|1 - S_{23}^2 \Gamma_2 \Gamma_3|^2 - |S_{12}^2 \Gamma_2|^2}$$