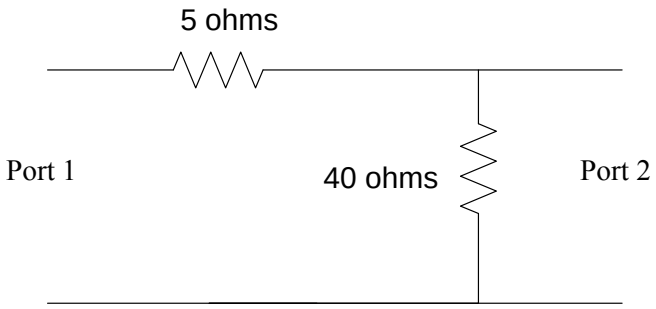
ELC 4383 – RF/Microwave Circuits I

Chapter 4 Supplemental Homework

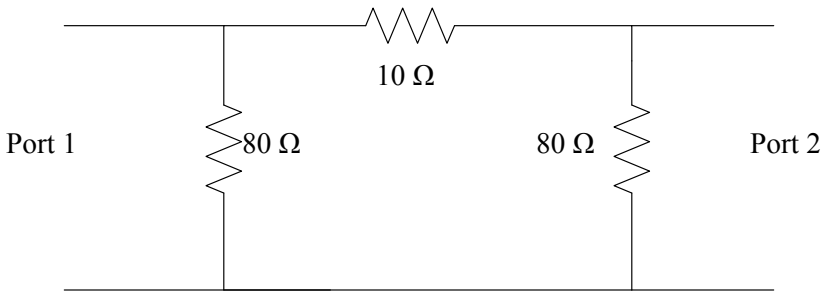
S4.1. Consider the two-port network given below:



(a) Find S_{11} for $Z_0 = 50\ \Omega$.

(b) Find S_{21} for $Z_0 = 50\ \Omega$.

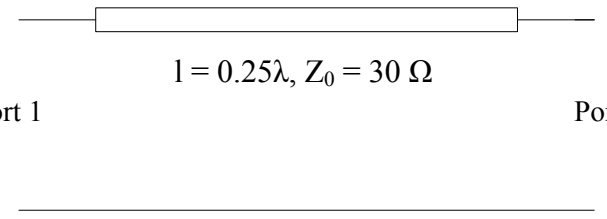
S4.2. Consider the two-port network given below:



(a) Find S_{11} for $Z_0 = 50\ \Omega$.

(b) Find S_{21} for $Z_0 = 50\ \Omega$.

S4.3. Consider the following two-port network:



(a) Find S_{11}, referenced to $Z_0 = 50\ \Omega$.

(b) Find S_{21}, referenced to $Z_0 = 50\ \Omega$.

S4.4. Consider a two-port network with S-parameters (taken with respect to $Z_0 = 50\ \Omega$) given as follows:

$$[S] = \begin{bmatrix} 0.3\angle 0^\circ & 0.6\angle 50^\circ \\ 0.6\angle 50^\circ & 0.3\angle 0^\circ \end{bmatrix}$$

(a) Is the network reciprocal? Why or why not?

(b) Is the network lossless? Show that your answer is correct based on the mathematical equation identities regarding S-parameters for lossless networks.

(c) What is the input reflection coefficient looking into port 1 if a 100 Ω resistor is connected as the load to port 2?

S4.5. Consider a two-port network with S-parameters (taken with respect to $Z_0 = 50\ \Omega$) given as follows:

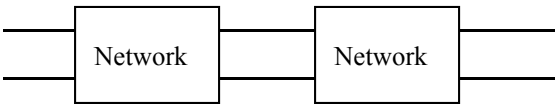
$$[S] = \begin{bmatrix} 0.2\angle 90^\circ & 0.2\angle 0^\circ \\ 0.9\angle 100^\circ & 0.2\angle -90^\circ \end{bmatrix}$$

(a) Is the network reciprocal? Why or why not?

(b) Is the network lossless? Show that your answer is correct based on the mathematical equation identities regarding S-parameters for lossless networks.

(c) What is the input reflection coefficient looking into port 1 if a 20 Ω resistor is connected as the load to port 2?

S4.6. Consider a problem in which two two-port networks, each possessing the given S-parameters, are placed in cascade:



The S-Parameters for each individual network (with $Z_0 = 50\ \Omega$) are:

$S_{11} = 0.1$

$S_{12} = 0.9$

$S_{21} = 0.9$

$S_{22} = 0.1$

Find the ABCD matrix for the cascade combination of the networks.