

Electrical Circuits II Lab 6 Online – Two Port Network Analysis

Objectives

Analyzing two-port network using LTspice and generating Parameter matrix for the two-port network.

Preparation

Complete the following steps before starting to work on the experiments in this lab:

- 1) Complete Lab 5 and associated report.
- 2) Complete lecture, homework, and videos in FEC Chapter 14 “Two-port network

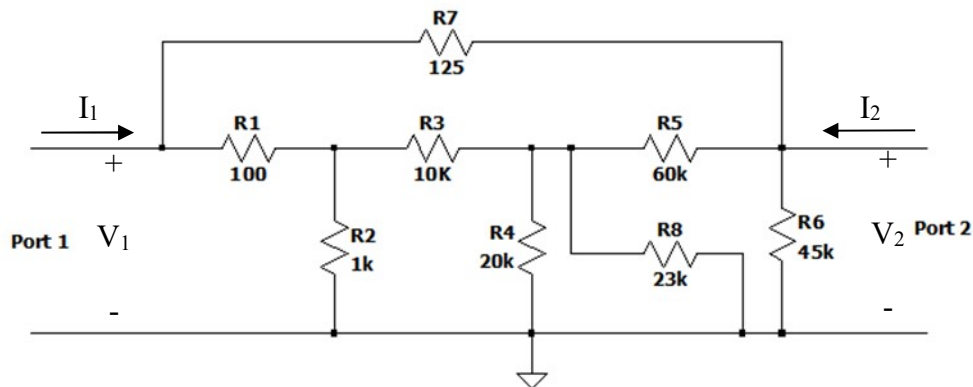
Experiment 1

Two-port network parameters may be calculated using black box approach. In this approach, a 1 volt DC supply is applied to one port and I_1 , V_1 , I_2 and V_2 is measured. Repeat the same process for the other port. You can generate 4 equations by applying these two sets of values to the following network system of equations. Next, the 4 equations can be used to find the four Z parameters.

$$V_1 = z_{11}I_1 + z_{12}I_2$$

$$V_2 = z_{21}I_1 + z_{22}I_2$$

Implement the following circuit in LTspice and apply the black box approach to find all four Z parameters:



Write the Z parameter equations and matrix using the values found in this experiment.

Experiment 2

Design the simplest two port network possible that would have the same Z parameter values as the circuit in experiment one within 1%.

Experiment 3

Implement your design from experiment two using LTspice and apply the black box approach to generate the four Z parameters. Compare these Z parameter values with the ones from experiment one.

Report Requirements

This lab and associated report must be completed individually. All reports must be computer printed (Formulas and Diagrams may be hand drawn) and at minimum:

For each experiment include:

- Clear problem statement in your words.
- Answer to any specific experiment questions (if any)
- Identify the theory or process and associated calculations
- Documents resulting circuit schematics from LTspice, simulation output and additional tables, timing diagram or chart required by the experiment.

For the whole report include:

- A Cover page with your name, class, lab and completion date.
- A Lessons Learned section which summarizes your learning from this lab in 5 sentences or more.
- A New Experiment section that has description of a new experiment and the experiment's results. Experiment should be related to material covered in class but not simply variation of the existing lab experiments.