ECE 403 **HW #2 – Ver. 1.00 January 6, 2016** **Spring 2016**

Univ. of Illinois **Feb 2, Disc: Feb 9, Due: Feb 11** **Prof. Allen**

Topic of this homework: Experimental measurements of a 2-port network. The first objective is become familiar with the computer measurement system. This is a lab study where you will use the computer and sound card to measure the 2-port properties of simple electrical networks.

Deliverable: Show your work, and then you must write a short report (a few pages long) that outlines what you found and how you did the analysis. I would like a paper copy, with your name on it, stapled. Please, **No** files.doc, no emailed homework.

Due Date: If you hand it in late, you will get zero credit. Some credit is better than NO credit.

Note: This homework will be discussed in class on Disc: Feb 9, so you need to be there.

Each person is to do there own final writeup, but obviously you can discuss it as much as you like between yourselves. However, your crossing the line if you share computer files. The general rule is, "look but don't touch." In other words, you need to process all the words you write through your eyes and your fingers. When ever you use material from someone else, you must give them credit. I give Wikipedia credit. I get at least some of my ideas for this homework from Wikipedia.

2-port Network Measurements and Analysis

This assignment will require making measurements on several different electrical 2-port networks, and then doing some simple analysis on them. You will need to learn how to measure the response using the computer system, and analyze the resulting files using simple Matlab tools.

Your results must be clearly explained in a short report, with figures and equations that shows your analysis and explains your conclusions.

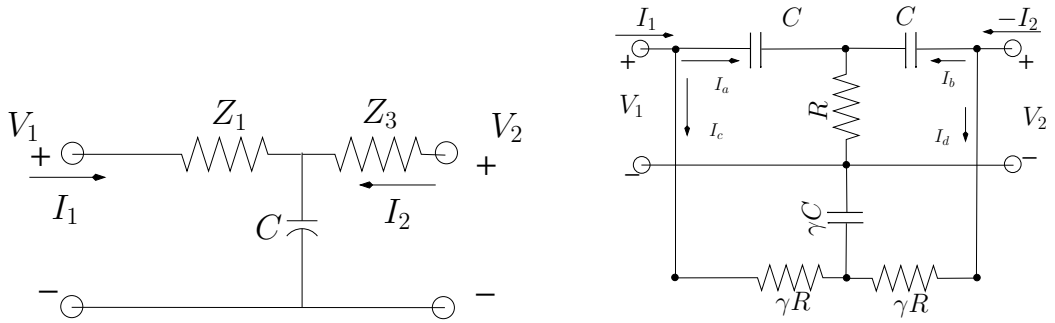

Figure 1: **Left:** *This RC-lowpass circuit is meant to be trivial to analyize. The resistors are in kilo-ohms. Let* $Z_1 = 10$ *k*Ω *and* $C = 0.1$ μ*Fd.* **Right:** *This 3-element (R and C) circuit is called a Twin-T. It is far more interesting than the first circuit. Try to figure out how it works. You can look it up on Google, or wikipedia for help. The values of C and R will be pick by the TA, and the circuit will be pre-configured for you. Do the analysis in terms of C and R. First analyize each of the parallel circuits, and then add the currents together (e.g.,* $I_1 = I_a + I_c$*) to get the total current, and thus the final matrix representation. Factor* γ *is normally 2.*

To Do:

1. Find the impedance matrix and the ABCD matrix for the circuits of Fig. 1.
2. For the two circuits: measure the input impedance and transfer function, in both directions, and then from the measurements, compute the impedance matrix elements.