Remember to have your lab TA sign and date each page of your lab notebook before you leave. The write-up for this lab should provide a very brief description of the laboratory exercise, including diagrams of all circuits and a description of procedures, plus a typed abstract on a separate page which 1) states the objectives of the exercise, 2) describes methods, 3) concisely summarizes results, and 4) summarizes general conclusions drawn from the results. Your grade will be based upon conciseness, grammar, and spelling. **Late work will not be accepted.**

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### 0. Laboratory preparation

Before coming to the laboratory, devote some preparation time with your partner to determining the i-v curves for a few, simple series & parallel networks of resistors and diodes, and the predicting the current waveforms when sinusoidal AC voltage is applied to them. By doing so, you will save lots of time in the lab.

### 1. Purpose of this laboratory exercise

In this laboratory exercise, each team will be given three (3) boxes containing simple networks consisting of up to two signal diodes (no zeners) and up to two resistors (no capacitors or inductors). You will perform appropriate AC & DC measurements on these boxes to identify the components within, to determine the network topography, and to estimate resistor values. For these networks, you may use a dc multimeter to advantage, but when you use it, remember that it has polarity & voltage magnitude that must be taken into account! Determine the polarity first before you start working with them. Another, more general method is to use an oscilloscope to compare voltage and current waveforms. This information is useful in determining network configurations and resistor values. Use the same current detection scheme employed in Lab #2 and shown below.

![Network Diagram](image)

Note that $v_R(t)/R_m = i(t)$. You must choose $R_m$ large enough so that the voltage $v_R$ is displayed cleanly on the scope without significant noise yet small enough so as to maintain the condition: $|v_R| << |v_S|$. 

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II. Procedure

Please follow the procedures outlined in the steps below:

A. First, at the top of separate pages of your spiral laboratory notebook, record the identifying numbers or letters of the boxes you have been assigned to keep track of which one you are working with and to avoid confusion later when doing the write-up.

B. Select one of the boxes and perform some initial tests to ascertain the general nature of the network, that is, series and/or parallel diode connections, etc. For your initial tests, it may be best to use sinusoidal voltage of ~10 V peak. If there is any ambiguity, perform further qualitative tests to identify the network. After you think you know what is inside the box, try lower voltages to take advantage of the fact that a silicon diode requires ~0.7 V forward bias before it starts conducting.

C. Check with the TA to determine if your hypothesis is correct.

D. If it is correct, then proceed with appropriate oscilloscope waveform tests to verify the topography and to determine the resistor values. If your guess is incorrect, try to figure out what you did wrong and then repeat your tests. Do not be afraid to ask for help if you get stuck.

E. Repeat the process for the other networks, proceeding from step B above, again making sure to check with your TA to determine if you have guessed the circuit topography correctly before trying to determine component values.

Record the precision of all voltage, current, and resistance readings. You will use these to establish the precision of your estimates for the resistor values.

III. Abbreviated Write-up

The first page of the write-up should show the schematics of each of the unknown networks. Include the values of the components AND the precision of your estimates (in ±%) on each schematic. In the pages following the schematics, provide a concise laboratory write-up, describing your test procedures and any analyses performed. It is recommended that you include some curve traces in your report to support your claim about the circuit topology. If you found it necessary to adapt your procedures, explain why. Be sure to provide full justification for all estimates of precision! Do not forget to prepare and submit one-page abstract on a separate sheet.