EECE 280 - Lab #1
Series & Parallel Resistive Circuits

In this lab you will gain experience with:
1. Using lab equipment including the power supply & multimeter.
2. Designing series and parallel resistive circuits.
3. Soldering components to a prototyping board.

Requirements
1. Tools & component kit
2. Prototyping board
3. Power & ground banana plug cables
4. DIP socket
5. Pencil

Background Information
1. For graphite: \( \rho = 7.84 \mu \Omega m \)

Lab Preparation
1. Build the circuit specified in “B)” on your breadboard using the components provided and the resistors from your kit.
2. Build your 4 custom banana plug cables.
3. Solder the circuit into a prototyping board. For the resistors indicated, do not solder the resistors directly into your board. Instead, solder a DIP socket into your board and plug the resistors into the DIP socket. Each group member must prepare their own.
4. There is a simple document explaining how to get started using Matlab on the Tools webpage. To create a Matlab script, create a text file with a “.m” extension that contains all the Matlab commands you would like executed. You can use your Matlab script to do all of the calculations in this lab and in all of the labs that you do. Unlike using a calculator, this allows you to check your work and fix any problems without repeating the whole calculation. Big time saver!

Lab Procedure

A) Lab Equipment
1. Use the continuity tester on your multi-meter to determine which terminals on your lab equipment are internally connected to each other. Make sure that all of the equipment is turned off but that both sides of your power supply are enabled. Indicate all internal connections on the attached “Continuity Table”.
2. Set your power supply to 5V (turn current to maximum). Connect a 1K\( \Omega \) resistor to it.
3. Use the multimeter to measure the voltage across the resistor and the current through the resistor. Record the values.
4. Set your power supply to 100mA (maximum voltage). Connect a $10\Omega$ resistor to it.

5. Use the multimeter to measure the voltage across the resistor and the current through the resistor. **Record the values.**

6. **Compute how much current you can safely drive through the $10\Omega$ resistor.** Note that you are using a 1/4 W resistor.

7. **What happens if you exceed the maximum current specification of the resistor?** Put on your safety glasses and try it. Do not touch the resistor until after you have turned off the power supply.

**B) Series & Parallel Circuits**

1. Build TWO versions of the following circuit. Build one on your breadboard and solder a second one into a prototyping board. Each group member must solder a separate circuit to a prototyping board.

2. Solder a DIP socket onto your prototyping board for R1-R6. Solder R7-R10 directly into your prototyping board.

3. **On both circuits, measure and record the voltage at each node (Node1-Node7) when VCC = 5V.** There should not be any significant differences between the two circuits. Identify and fix any problems.

4. For the remainder of this lab, use the soldered circuit.

5. **Measure and record the current through resistors R1-R6.**

6. Predict the current through the right side of the circuit. Explain your prediction.

7. Between which two nodes would you expect the lowest voltage. Measure it and record the value.

8. **Calculate the theoretical value of the voltage at Node 1.**

9. **Calculate the percentage error between your theoretical and measured values.**

10. **What is the tolerance of your resistors? Is your measured error within the tolerance of your resistors? Prove it.**

**C) Graphite Resistor**

1. Pencil lead is made from a material similar to graphite which has the resistivity ($\rho$) listed above. Sharpen both ends of a pencil. **Measure and record its resistance for 3 different pencil lengths.** Use your data to compute the resistivity ($\rho$) of the material. Hint: take an average over the three data samples.

**Demonstration**

1. The soldered circuit and banana cables made by group member #1.

2. The soldered circuit and banana cables made by group member #2.

3. A randomly selected voltage from the breadboard circuit.

4. A randomly selected current from one soldered circuit.
## Continuity (Internal Connectivity)

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