RESISTOR NETWORKS

The purpose of this first laboratory assignment is to review fundamental concepts and to extend your DC circuit analysis skills. The assignment draws from the first four chapters of your text and guides you through the production of a your own reference on the analysis of circuits containing resistor networks, ideal voltage sources, and ideal current sources. Resistor networks are not very exciting to build, so much of our work will be theoretical. A secondary goal of this assignment is to introduce you to the Berkeley Spice circuit simulation program in a context in which you can easily verify results by hand.

Fundamental Quantities, Devices, and Concepts

Collect definitions for the following fundamental physical quantities, devices, and concepts.

Charge, Current, Voltage, Ground, Energy, Power, Resistance, Conductance, Resistor, Ideal Voltage Source, Ideal Current Source, Passive Sign Convention, Node, Essential Node, Branch, Loop, Mesh, and Planar Circuit.

Also consider what is meant by the phrases ``voltage across device X" and ``voltage at point A."

I don't expect you to come up with these on your own, but acknowledge [1] the resources you use. We will discuss these in class.

Ohm's Law

``Ohmic'' devices show a linear relationship between applied voltage and current,

$$v = iR. \tag{1}$$

This is known as **Ohm's Law** and applies to standard resistors and wires, among other things.

Experiment : Light bulbs are often thought of as resistors, but they are rumored to be nonlinear. That is, they are alleged to be non ohmic. Test this hypothesis experimentally with the light bulb supplied. (Lew will provide requested equipment, if we own it.) Choose a resistor (from one of the resistor boxes on the table at the west end of the lab) of similar resistance to the light bulb, and test it as well for comparison.

Give a written description of your experiment and results.

Kirchoff's Laws...

1. **...Stated**

   Construct, in your own words, statements of Kirchoff's Laws. (Acknowledge the resources you use.)

2. **...Applied to Voltage and Current Dividers**

   Apply Kirchoff's Laws to the circuits shown in Figure 1 to derive equations for the voltages v_1 and v_2 across the resistors in the ``voltage divider" circuit (a) and for the currents $i_1$ and $i_2$ through the resistors in the ``current divider" circuit (b).

3. **...Applied to a Circuit with Two Loops**

   Design and solve a problem involving a circuit containing resistors, a single ideal voltage supply, and two loops. We will exchange problems as an exercise in class.

Source: http://webpages.ursinus.edu/lriley/ref/circuits/node2.html