Voltage Divider Module Writeup

Daniel Lucero[1]

[1]California State University, Chico

March 26, 2018

I. Purpose:

To practice the following: building circuits, building VI's with LabVIEW, use of measurement instruments, experience with voltage dividers, and to show ohmic and non-ohmic relationships of voltage versus current.

II. Procedure:

Part one was to build the circuit provided by the diagram, measure voltages and currents through each component, and then compare theoretical calculations of voltages and currents with the measured ones.

Part two was to build the circuit provided with a resistor of our choice, and a variable power supply. Plot a function of voltage versus current, and determine the resistance of our chosen resistor from the slope of our plot. Then to repeat this with instead a light bulb in place of the resistor, and comment on our observations.

Part three was to build a voltage divider with the requirements that the input voltage be 5 volts, output voltage be 2 volts, and that it draw somewhere between 50mA to 100mA. After building the circuit, test it out, and measure the output voltage.

Next we use a varying load in the form of a decade box, and record output voltages as we step down resistance values. Lastly we hook up a trimpot, which can be used as a variable voltage divider, and observe what sort of linear response we can expect from varying the load resistance.

III. Data:

Part 1)

Theoretical Voltages, Resistances, and Currents (Determined by the Mesh method and Ohm's Law) :

$R_1 = 100$ Ohms, $I_{R1} = 11.29$ mA, $V_{r1} = 1.129$ V

$R_2 = 68$ Ohms, $I_{R2} = 11.29$ mA + 16.21 mA, $V_{R2} = 1.87$ V

$R_3 = 150$ Ohms, $I_{R3} = 16.21$ mA, $V_{R3} = 2.432$ V

$R_4 = 43$ Ohms, $I_{R4} = 16.21$ mA, $V_{R4} = 0.697$ V

Measured Currents and Voltages:

$V_{r1} = 1.1287$ V , $I_{R1} = 10.701$ mA

$V_{R2} = 1.8711$ V , $I_{R2} = 10.701$ mA + 16.27 mA

$V_{R3} = 2.4225$ V, $I_{R3} = 16.27$ mA

$V_{R4} = 0.7017$ V, $I_{R4} = 16.27$ mA

Part 2)

The resistor chosen was a 200 Ohm resistor, and its measured resistance was 200.123 Ohm's. Plot's of the voltage vs current for the bulb and the resistor are below in figures 2 and 3.

The slope of the Resistor plot was calculated to be,

- $0.0049044082 \ \frac{I}{V} \ = \ \frac{1}{R}$, $R \ = \ 203.90 \ Ohms$

which is very close within the specified resistance of the chosen resistor (200 Ohms).

Part 3)

The Circuit designed consisted of the components and values listed below,

$R_1 = 390$ Ohms

$R_2 = 300$ Ohms

$R_L = 2000$ Ohms

$V_{in} = 5$ V

in which produced an output voltage of 2.00 V.

A decade box was used to vary the load resistance upon the circuit, and the following data was recorded, and it appears that the

voltage responds linearly to variable resistances that are low, around 150 Ohms and below.

R(load) Ohms	V(out)
10 k	2.13
5k	2.10
2.5k	2.03
1.25k	1.91
625	1.70
300	1.39
150	1.03
70	0.65
30	0.33
20	0.23
10	0.126

Figure 1: Decade Box Data

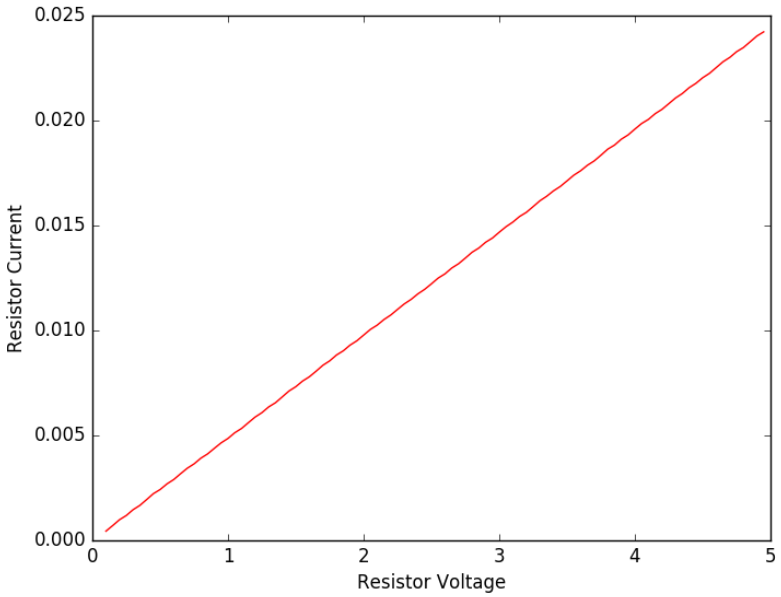

Figure 2: This is a caption

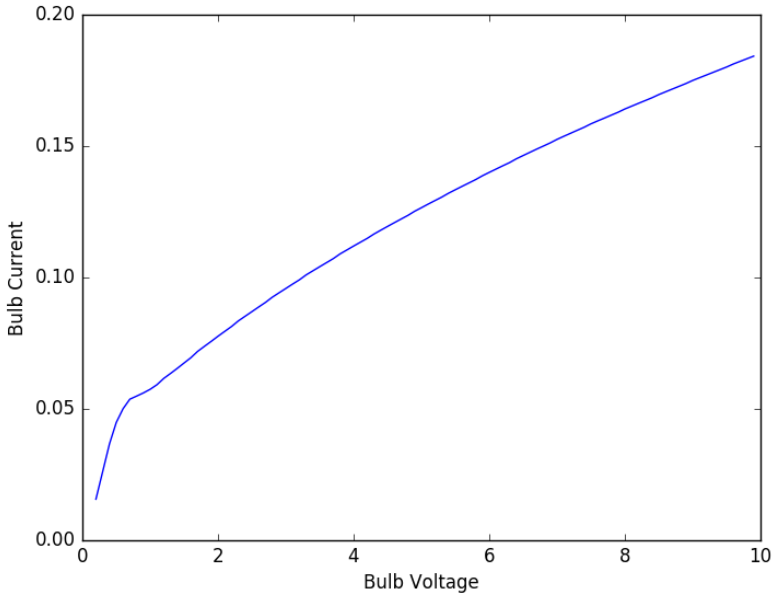

Figure 3: This is a caption