Justin Lee, Jacob Alspaw, Quinn Foley
ENGR 210
Lab #3

1)

ENGR 210: Intro to Circuits and Instrumentation — Spring 2015

Lab 3 Pre-Lab Assignment [3pts]

Date: Sept 15th, 2015 Bench #: 15 Lab Section: Tues 7-9

Student Names (Print): Quinn Foley CaseID: qrf

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The pre-lab assignment is used to check your preparedness for the lab. Complete 1 pre-lab per group. To receive credit, a Lab TA must approve your pre-lab.

Problem 1:

Identify the following 4 I-V curves from the list below:

- LED
- Low resistance
- High resistance
- Light bulb

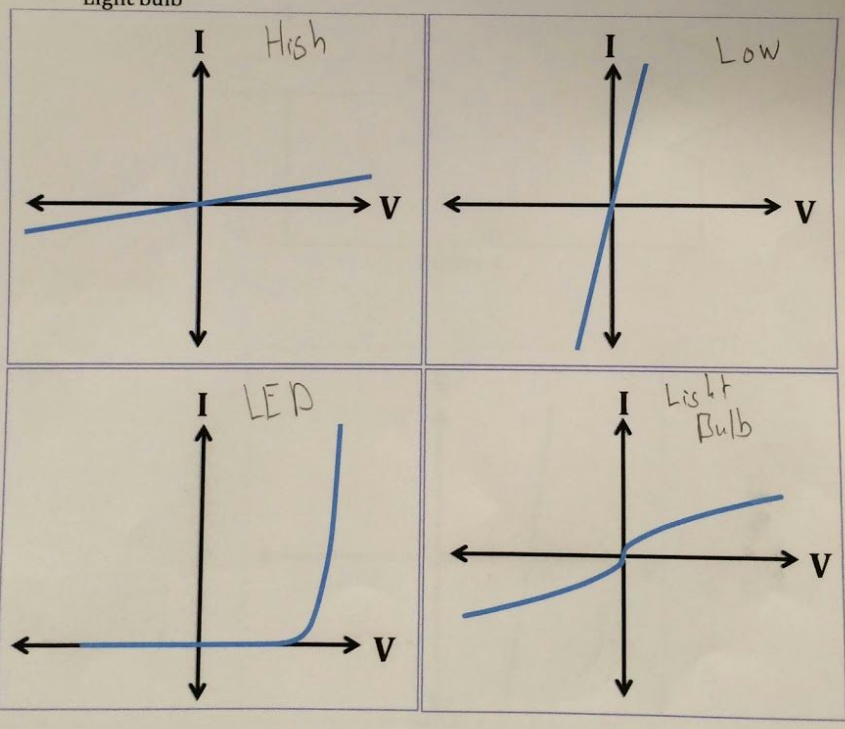

Figure 1: I-V Curves

Problem 2:

Reference: Textbook, section 1.5 "Voltage and Power"

In the circuit drawn in Figure 2, identify whether the power of V1 and R1 is positive or negative. The I-V curve for V1 is shown in Figure 3. Circle the region of the I-V curve where V1 is operating (i.e., which quadrant). **Remember the passive sign convention.

P_{V1}: neg

P_{R1}: pos

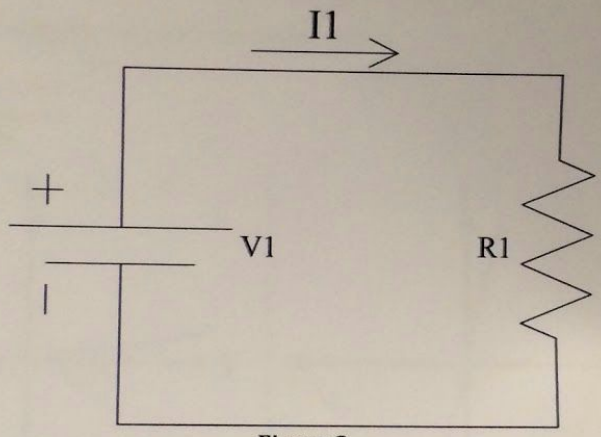

Figure 2

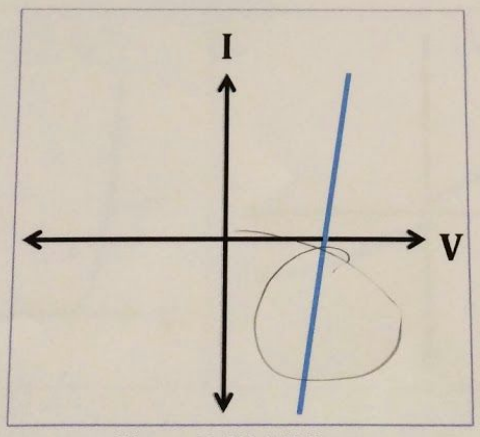

Figure 3: V1 I-V Curve

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A Black Box 4551 Input Voltage: 3.98 V

R	V_R	V_{BB}	I_R	I_{BB}
2.2 kΩ	0.433V	3.55V	0.200 mA	
10 kΩ				
680 kΩ	0.158V	3.83V	0.226 mA	
2.2 kΩ				
1 kΩ	0.217V	3.76V	0.220 mA	
0.[illegible] Ω				

Selected 2.2kΩ to vary V

V	V_{BB}	I_{BB}
2		0.038 mA
4		0.202 mA
6		0.357 mA
8		0.522 mA
10		0.690 mA
0		-0.122 mA

∴ We can conclude the black box contains a source

Open circuit with black box: 0.149 mA also no voltage and switched leads: -.149 m

B black box 6610.

Resistance 98.77 kΩ

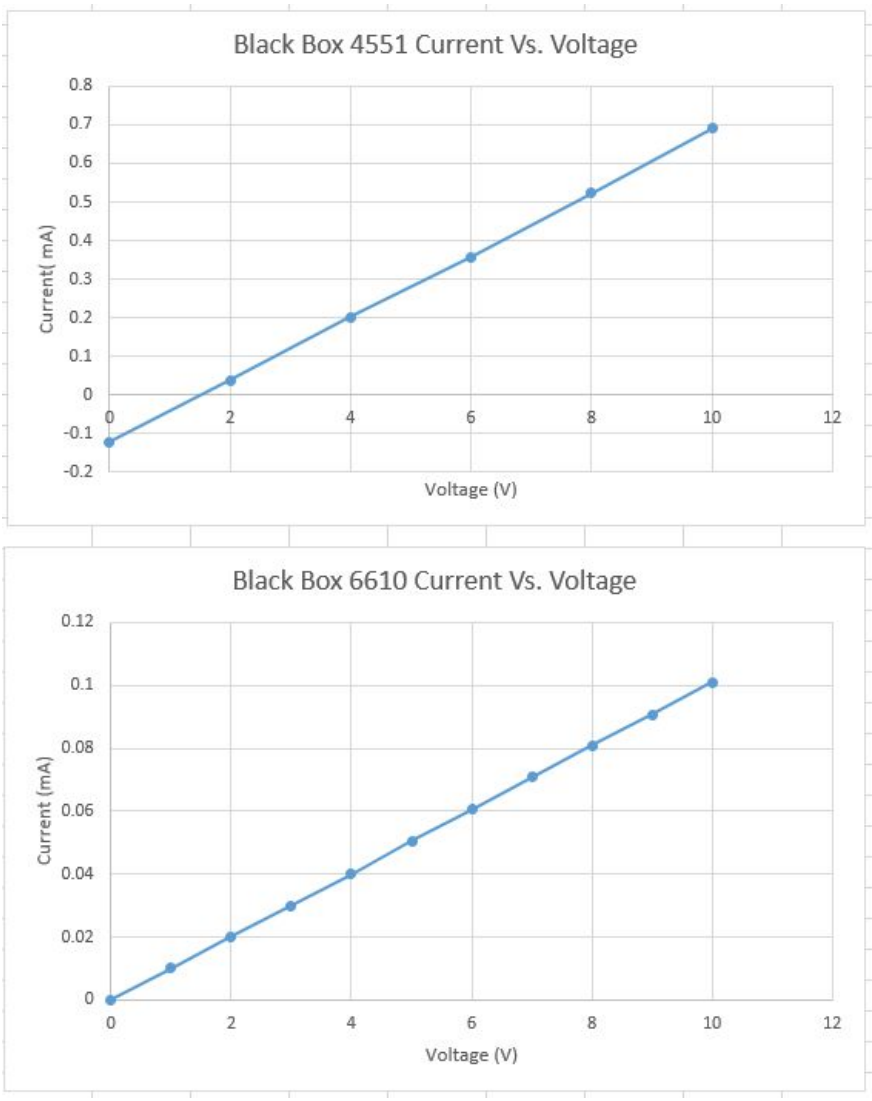
Not current or voltage source bc: No current & No voltage

Measured in series with a 100 kΩ: V_1 = 5.01 & V_2 = 4.44 with 10 V supply

100kΩ = 99.8 kΩ

V	I	V	I
0	0	1	.0100 mA
2	.0200 mA	3	.0300 mA
4	.0400 mA	5	.0505 mA
6	0.0606 mA	7	.0.709 mA
8	.0.809 mA	9	.0.907 mA
10	0.101 mA		

3)



Black Box 4551: We concluded that this black box contains a current source. We began by measuring IV that is shown above and we concluded that it was some sort of a source based on the fact that current was being emitted with an input of 0 volts and the resistance was unmeasurable. From there we measured open and short circuits for this box. In a short circuit we found a current, but didn't find a voltage. When we measured the open circuit it has a current of 0.149 mA Ergo we concluded it was a current source.

Black Box 6610: Firstly, we began by measuring the resistance of the box. We found a value of 98.77 KOhms. We thought this was eerily close to a 100 KOhms resistor with an uncertainty of +/- 5%. We then measured the IV data over the box and found the plot of the data to be

consistent with that of a resistor. Due to its linear fit and its initial current of 0 amps with an input of 0 volts we were able to eliminate the possibility of other similar components.

4) No, when a diode is placed in opposing directions (their leads are not directed the same way), current is restricted, effectively opening the circuit along this branch. Thus, with respect to the open circuit, no voltage or current measurements could be taken to conclude the cause is this setup. If either of the diodes were flipped from the picture, then we would be able to take measurements to conclude there is at least one diode in the circuit. However, we would not be able to tell the extent of how many diodes were present. If both diodes were flipped, then current would be restricted again, opening the circuit and preventing any useful measurements.

5) Measuring the voltage directly across the black box gives a more accurate measurement as the voltmeter would be measuring the voltage drop specifically across that component of the circuit. This method is used to eliminate some of the discrepancy/uncertainty in any other part of the circuit which will not be factored in when measuring the voltage.

6) You can tell the difference by shorting the terminals in the black box and measuring the voltage across the terminals concurrently. A voltage source will produce very low current and high voltage, while a current source will produce very low voltage and high current.