

ELEC 2110

# Electric Circuit Analysis

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Section 002

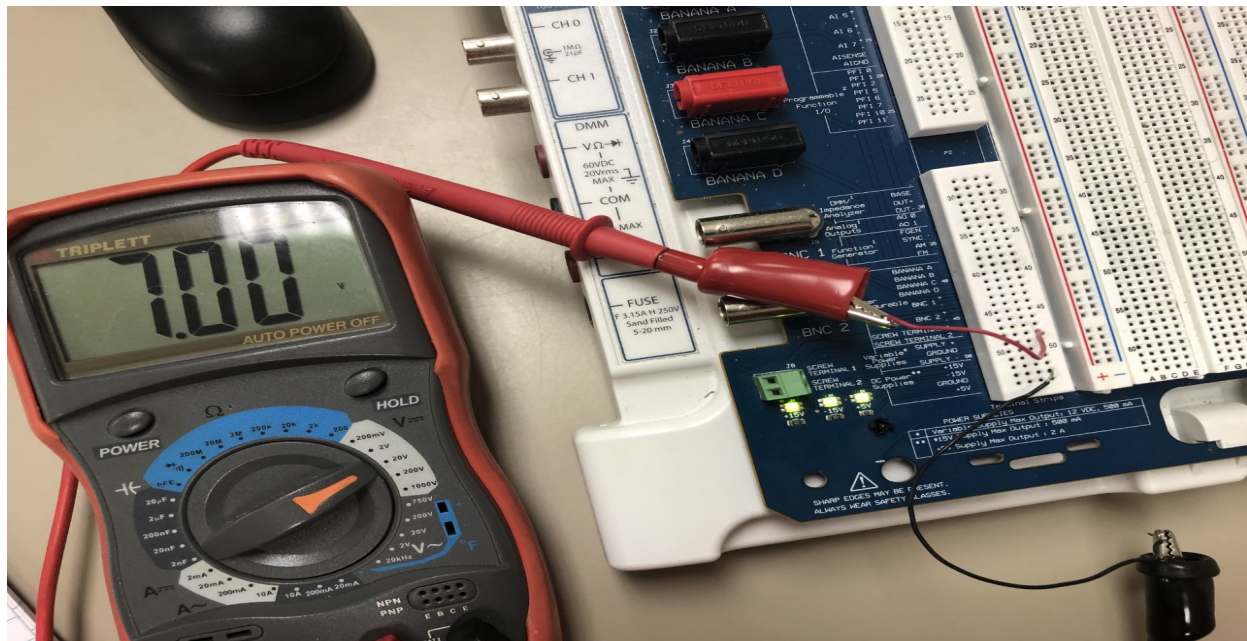
More Practice with DC Circuits

## Introduction

This lab is for the student to get even more practice with testing and analyzing DC circuits. The student will create 4 circuits and analyze these circuits to find voltage, current, and resistance. The student will also gain more knowledge on tools inside the NI Elvis board.

## Exercise 1

Prior to starting exercise 1, the student will locate and open “Variable Power Supplies” in the NI Elvis’ menu. Then, go to the side labeled “Supply+” and turn the voltage to 7.00V



(1)

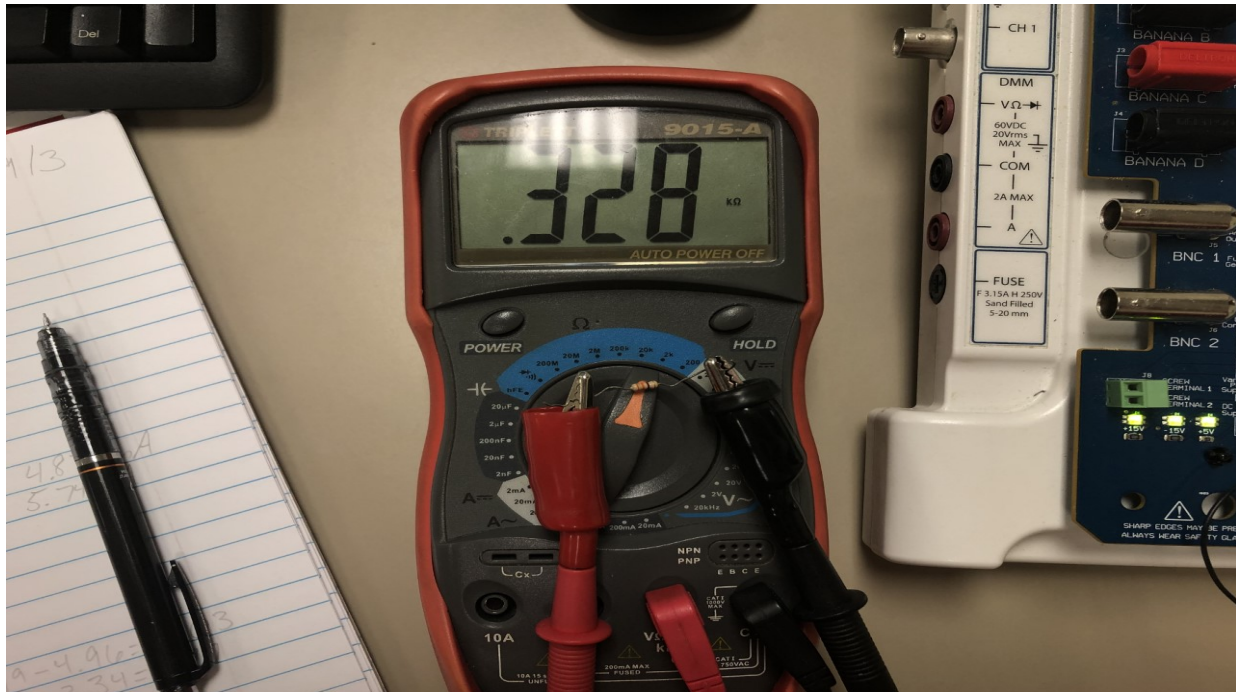
This is a Multimeter measurement of Supply+ (variable supply) showing 7.00V.

### Summary Table

Supply+ (Variable Supply)	5V Supply
7.00V	5.00V

## Exercise 2

Exercise 2 was checking the Actual vs. Theoretical values of R1-R7. All values should be 330 Ohms.



(2)

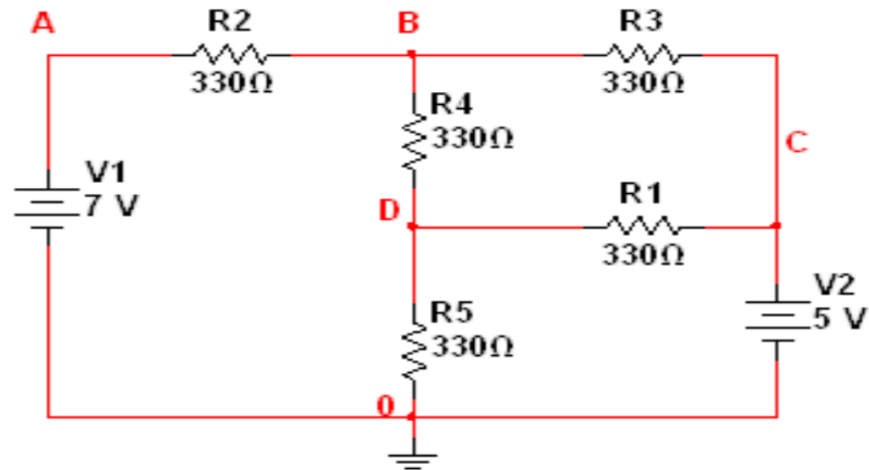
Measuring of R1 at 328 Ohms.

Summary Table

Resistors	Theoretical (Ohm's)	Actual (Ohm's)
R1	330	328
R2	330	322
R3	330	328
R4	330	327
R5	330	323
R6	330	327
R7	330	345

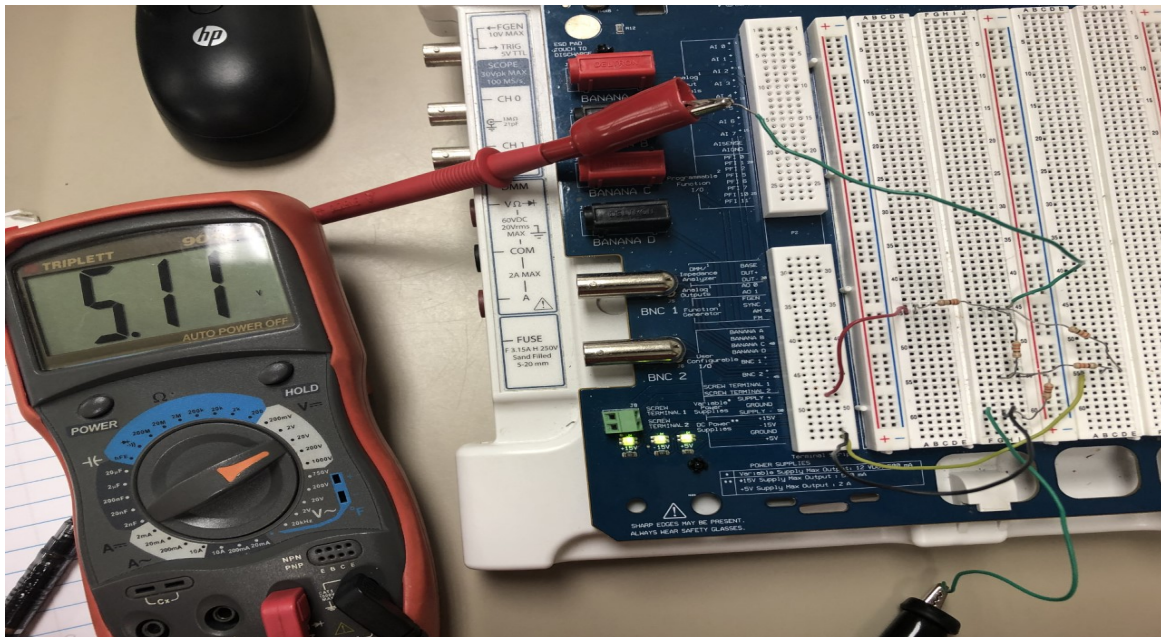
### Exercise 3

The student will now look at circuit 1. Measure  $V_a$ ,  $V_b$ ,  $V_c$ ,  $V_d$ ,  $V_{ac}$ , and  $V_{bd}$ . Then verify Kirchoff's Law using  $V_a$ ,  $V_c$ , and  $V_{ac}$ , and again with  $V_b$ ,  $V_d$ , and  $V_{bd}$ . Then measure  $I_{dc}$  and calculate  $I_{ab}$ .



(3)

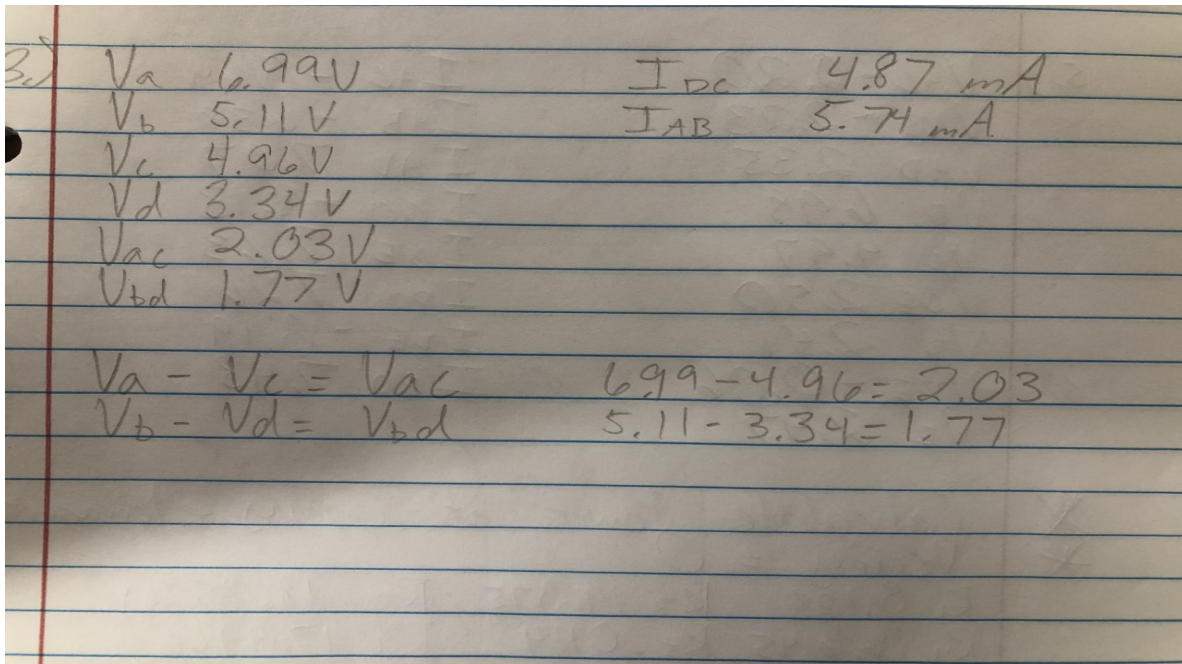
This is Circuit 1 for the student to create and analyze.



(4)

Measuring of  $V_b$ .





(5)

Recordings of data for Exercise 3.

Summary Table

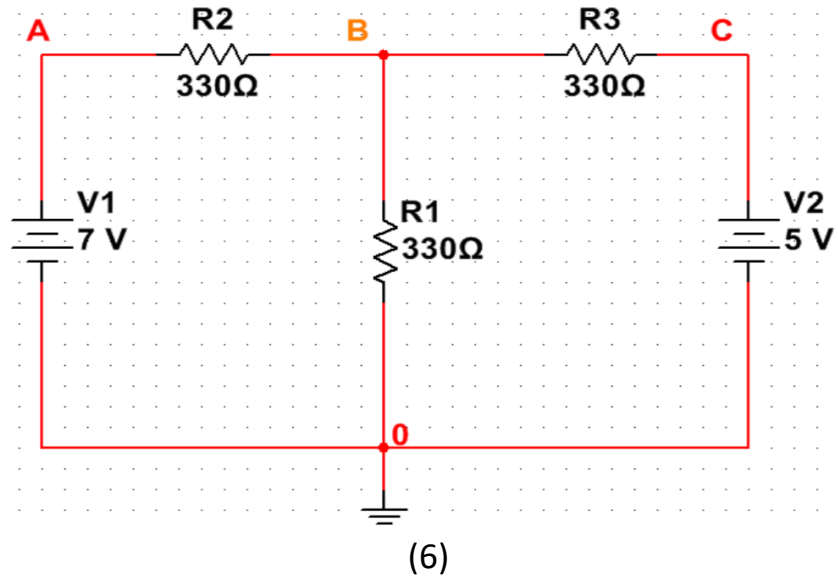
Va	6.99V
Vb	5.11V
Vc	4.96V
Vd	3.34V
Vac	2.03V
Vbd	1.77V
Idc	4.87mA

Then the student is asked to verify Kirchoff's Law for Va, Vc, and Vac; and again, for Vb, Vd, and Vbd. Also, find lab.

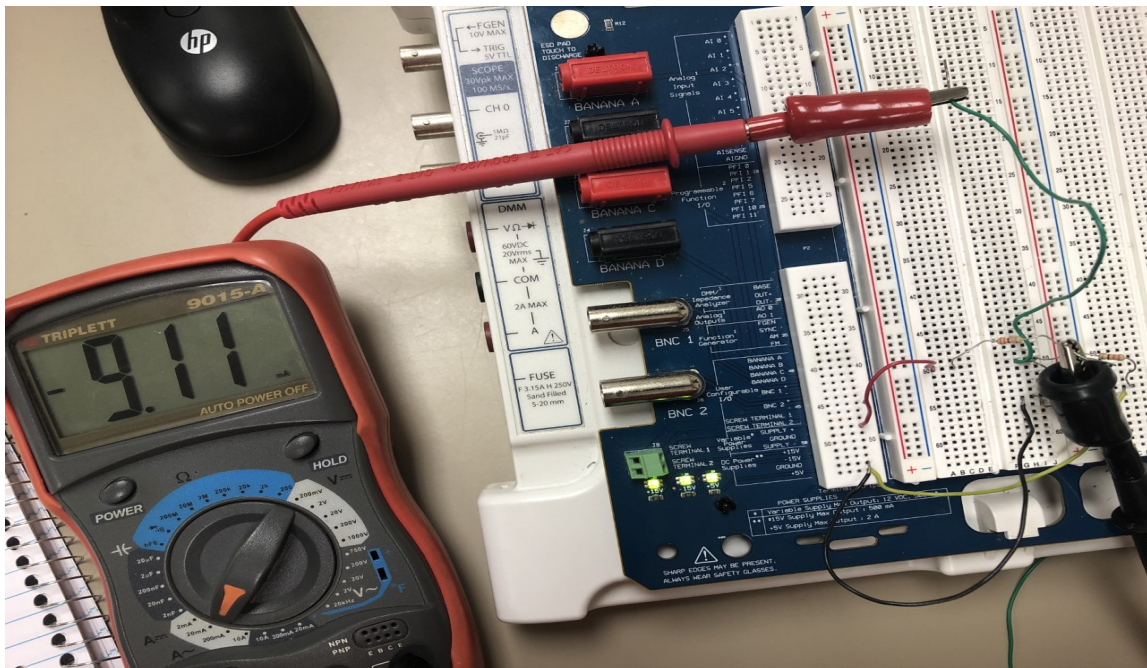
Va-Vc= Vac	6.99-4.96= 2.03V
Vb-Vd= Vbd	5.11-3.34= 1.77V
lab	5.74mA

## Exercise 4

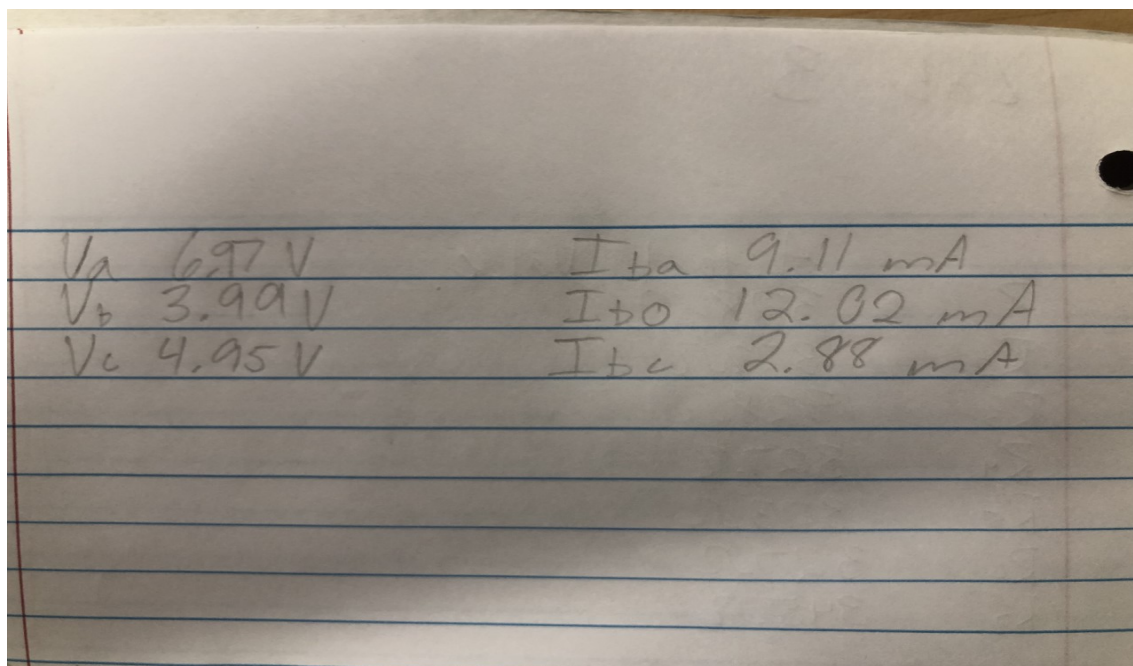
The student is asked to once again breadboard a circuit, and measure voltages. Measure  $V_a$ ,  $V_b$ ,  $V_c$ ,  $I_{ba}$ ,  $I_{bo}$ , and  $I_{bc}$ .



This is the circuit (circuit 2) that the student will breadboard and measure.



This is the measurement of  $I_{ba}$  in circuit 2.



(8)

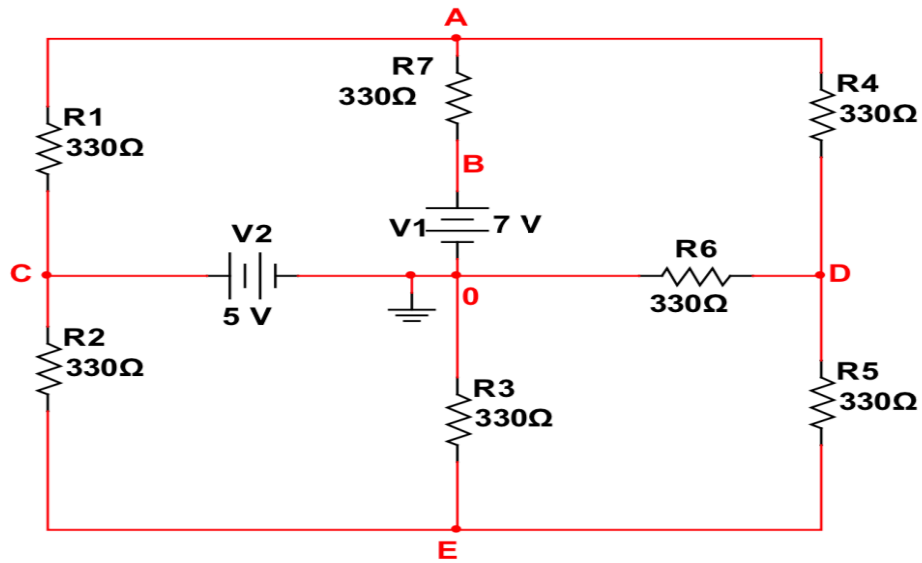
All measurements of exercise 4.

Summary Table

V <sub>a</sub>	6.97V
V <sub>b</sub>	3.99V
V <sub>c</sub>	4.95V
I <sub>ba</sub>	9.11mA
I <sub>bo</sub>	12.02mA
I <sub>bc</sub>	2.88mA

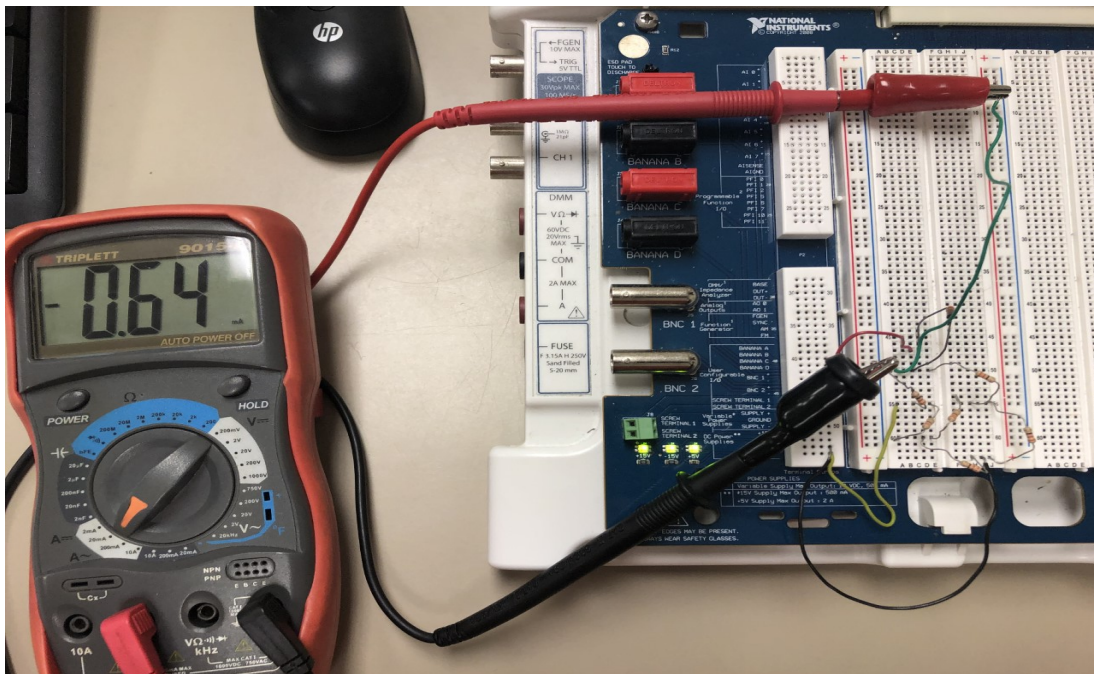
## Exercise 5

Students will breadboard this circuit and take more measurements. After taking these measurements, students will calculate the power absorbed by each element in the circuit, then verify that the sum of the power absorbed equals 0.



(9)

Circuit for student to recreate.



(10)

Measurement of  $I_{ac}$ .



Handwritten measurements on lined paper:

5.) $V_{AC} = 0.20$	$I_{AC} = 0.64$
$V_{AB} = 2.23$	$I_{AB} = 6.38$
$V_{AD} = 2.35$	$I_{AD} = 7.07$
$V_B = 6.98$	$I_{CO} = 8.13$
$V_C = 4.97$	$I_{CE} = 7.63$
$V_{CE} = 2.50$	$I_{DO} = 7.26$
$V_D = 2.41$	$I_{DE} = 0.19$
$V_{DE} = 0.06$	$I_{EO} = 7.43$
$V_E = 2.47$	

(11)

All measurements of exercise 5.

Summary Table

<b>Vac</b>	-0.20	<b>Iac</b>	-0.64
<b>Vab</b>	-2.23	<b>Iab</b>	-6.38
<b>Vad</b>	2.35	<b>Iad</b>	7.07
<b>Vb</b>	6.98	<b>Ico</b>	-8.13
<b>Vc</b>	4.97	<b>Ice</b>	7.63
<b>Vce</b>	2.50	<b>I<sub>do</sub></b>	7.26
<b>Vd</b>	2.41	<b>I<sub>de</sub></b>	-0.19
<b>Vde</b>	-0.06	<b>I<sub>eo</sub></b>	7.43
<b>Ve</b>	2.47	-----	-----

The student is then asked to calculate power of every element.

Power Table

R1 = 0.128mW	R2 = 19.075mW	R3 = 18.3521mW
R4 = 16.6145mW	R5 = 0.0114mW	R6 = 17.4966mW
R7 = 14.2274mW	V1 = -44.5324mW	V2 = -40.4061mW

$0.128 + 19.075 + 18.3521 + 16.6145 + 0.0114 + 17.4966 + 14.2274 - 44.5324 - 40.4061 = 0.9665$

(calculation error leads to power not being equal to exact 0)

## Conclusion

Lab 3 tasked the student with getting to know Dc circuits even more than before. Using Ohm's Law, Kirchhoff's Law, and some nodal analysis, the student breadboarded multiple circuits. Breadboarding was also a very important part of this Lab, since some of the main concepts were getting the student to successfully create the circuit. Getting better at breadboarding circuits is very important when learning how circuits work and why they work how they do.

## Bibliography

1. Photo of circuit layout and measurement finding if Supply+ was set to 7V
2. Photo of measurement of R1 resistor
3. Picture of circuit obtained in Lab manual Lab 3 for exercise 3
4. Photo of circuit layout and measurement finding  $V_b$  in exercise 3
5. Handwritten table of all measurements in exercise 3
6. Picture of circuit obtained in Lab manual Lab 3 for exercise 4
7. Photo of circuit layout and measurement finding  $I_{ba}$  in exercise 4
8. Handwritten table of all measurements in exercise 4
9. Picture of circuit obtained in Lab manual Lab 3 for exercise 5
10. Photo of circuit layout and measurement finding  $I_{ac}$  in exercise 5
11. Handwritten table of all measurements in exercise 5