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

. A picture containing indoor, table, sitting, wall

Description automatically generated

(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.

A picture containing indoor, table, wall

Description automatically generated

(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 Va, Vb, Vc, Vd, Vac, and Vbd. Then verify Kirchoff’s Law using Va, Vc, and Vac, and again with Vb, Vd, and Vbd. Then measure Idc and calculate Iab.

A map with text

Description automatically generated

(3)

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

A close up of a computer

Description automatically generated

(4)

Measuring of Vb.

A picture containing building

Description automatically generated

(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 Iab.

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

Exercise 4

The student is asked to once again breadboard a circuit, and measure voltages. Measure Va, Vb, Vc, Iba, Ibo, and Ibc.

A close up of a map

Description automatically generated

(6)

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

A desk with a computer mouse on a table

Description automatically generated

(7)

This is the measurement of Iba in circuit 2.

A picture containing wall

Description automatically generated

(8)

All measurements of exercise 4.

Summary Table

|  |  |
| --- | --- |
| Va | 6.97V |
| Vb | 3.99V |
| Vc | 4.95V |
| Iba | 9.11mA |
| Ibo | 12.02mA |
| Ibc | 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.

A close up of a map

Description automatically generated

(9)

Circuit for student to recreate.

A close up of a keyboard

Description automatically generated

(10)

Measurement of Iac.

A close up of a door

Description automatically generated

(11)

All measurements of exercise 5.

Summary Table

|  |  |  |  |
| --- | --- | --- | --- |
| **Vac** | -0.20 | **Iac** | -0.64 |
| **Vab** | -2.23 | **Iab** | -6.38 |
| **Vad** | 2.35 | **Iad** | 7.07 |
| **Vb** | 6.98 | **Ico** | -8.13 |
| **Vc** | 4.97 | **Ice** | 7.63 |
| **Vce** | 2.50 | **Ido** | 7.26 |
| **Vd** | 2.41 | **Ide** | -0.19 |
| **Vde** | -0.06 | **Ieo** | 7.43 |
| **Ve** | 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, Kirchoff’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 the 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 Vb 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 Iba 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 Iac in exercise 5
11. Handwritten table of all measurements in exercise 5