ENGR 065 Circuit Theory

Laboratory 6

Superposition

Objectives

- Study and verify the principle of superposition.

Equipment and components

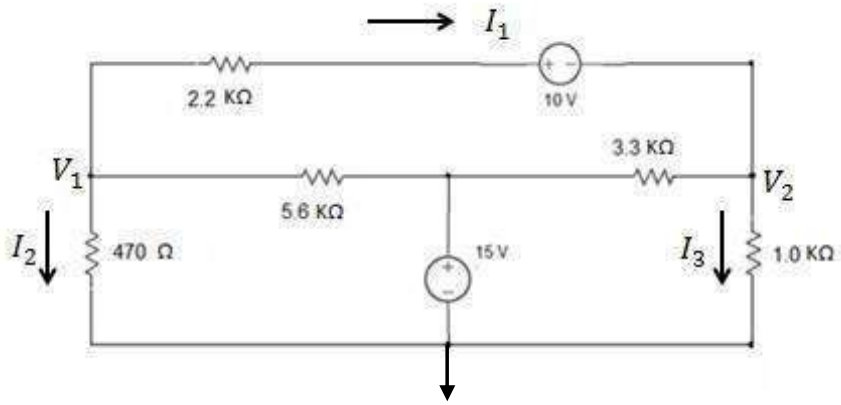
- 2x Digital multimeter
- 2x power supply
- 1x Breadboard
- Cables and connecting wires as needed
- Resistors: 470 Ω, 1 kΩ, 2.2 kΩ, 3.3 kΩ, 5.6 kΩ

Preliminary Work

- Pre-lab: Calculate and fill up the tables by using superposition for the circuit shown below.
- Use a separate sheet to show your work and staple to your handout. Clearly indicate units for your solutions.

Procedure

1. Construct the circuit shown below using the parts in your kit before turning the power on.



2. Adjust the power supply to the values indicated by the circuit.
3. With the circuit built and the voltages of the power supplies set correctly, turn on the power supplies and measure the currents and voltages shown in the circuit. Fill in the table with correct units.

	I_1	I_2	I_3	V_1	V_2
Theoretical Value	-3.6183 mA	5.82 mA	0.707 mA	2.679 V	0.71 V
Measured Value	-3.74 mA	5.94 mA	0.63 mA	2.719 V	0.780 V

4. Remove the 10 V source (and replace it with a short circuit). Measure the currents and voltages shown in the circuit.

	I_1	I_2	I_3	V_1	V_2
Theoretical Value	-0.68 mA	3.1 mA	2.92 mA	1.51 V	2.96 V
Measured Value	-0.67 mA	3.11 mA	2.97 mA	1.45 V	2.958 V

5. Place the 10 V source back in the circuit. Remove the 15 V source (and replace it with a short circuit). Repeat step 3.

	I_1	I_2	I_3	V_1	V_2
Theoretical Value	-2.9 mA	2.7117 mA	-2.25 mA	1.27 mA	-2.26 V
Measured Value	-3.06 mA	2.82 mA	-2.34 mA	1.315 V	-2.329 V

6. From the measured values filled out in the table above, what would you conclude?

7. For I_1 and V_1, calculate the percent error using your measured and your calculated values.
   a. When both sources are in place

      I_1% error: 2..2664 %
      V_1% error: 3.9735 %

   b. When only 10 V source is in place

      I_1% error: 1.47058 %
      V_1% error: 3.75 %

   c. When only 15 V source is in place

      I_1% error: 5.517 %
      V_1% error: 3.54330 %

   d. What might account for any differences in measured versus calculated values?

The multimeter that is being used could have a measuring error and the physical component may experience power loose during transference along with precariously integrated circuit resistors may contributed to the margin of error.

8. If one of the resistors is replaced with an LED, which behaves like a nonlinear resistor, would the principle of superposition still apply? Explain.

As long as the model is a linear circuit, even when replacing a resistor with an LED, the principle of super position will still applied; however, in the case that the LED dictates that model of the circuit as non-linear, the other means must be considered to simply and compute the circuit.

9. **Clean up and put everything in their original places before leaving labs!**

Questions and conclusions

- Summarize your findings and explanations in response to the questions posed in this lab.