

# Laboratory 6

## Superposition

### Objectives

- Study and verify the principle of superposition.

### Equipment and components

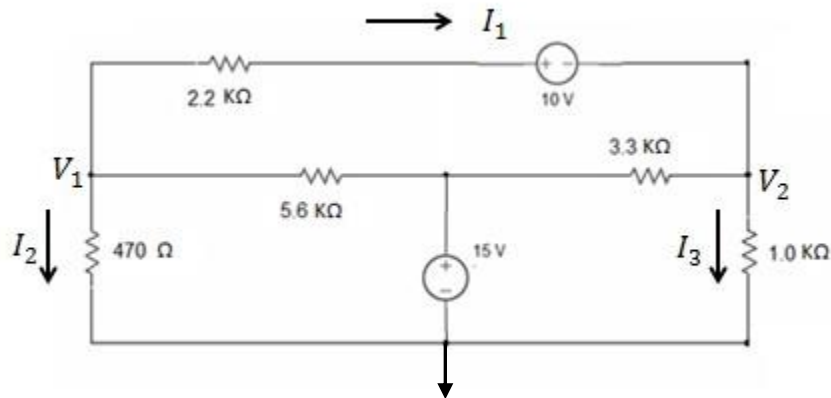
- 2x Digital multimeter
- 2x power supply
- 1x Breadboard
- Cables and connecting wires as needed
- Resistors: 470  $\Omega$ , 1 k $\Omega$ , 2.2 k $\Omega$ , 3.3 k $\Omega$ , 5.6 k $\Omega$

### 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

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



- Adjust the power supply to the values indicated by the circuit.
- 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					
Measured Value					

- 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					
Measured Value					

- 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					
Measured Value					

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.
- When both sources are in place

$I_1$ % error:

$V_1$ % error:

- When only 10 V source is in place

$I_1$ % error:

$V_1$ % error:

- When only 15 V source is in place

$I_1$ % error:

$V_1$ % error:

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

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.

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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.