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| **Reg. No** | 2019-EE-383 |
| **Marks / Grade** |  |

**EXPERIMENT NO. 8 SUPERPOSITION THEOREM**

# Objectives:

To verify the superposition theorem through an experiment.

# Equipment:

Resistors DMM

Breadboard

DC power supply Connecting wires

# Prerequisite:

Before coming to the lab, students must study and practice the superposition theorem, and also review the concepts relating Kirchhoff’s voltage and current laws.

# Theory:

The superposition theorem allows us to determine the voltage across (or current through) a circuit element due to several energy sources, connected within the circuit and acting simultaneously, by analysing the effect of each source acting alone, and then summing (superimposing) those effects to know the overall voltage across (or current through) that particular circuit element.

**Safety Precautions**

* Look at each exercise carefully before connecting the circuits.
* Make sure all power is off before connecting or disconnecting components.
* Ask your Instructor to check the circuit before turning on the power.
* When measuring voltage or current, make sure the DMM is correctly set for what you need to measure.



## Figure 8.1: Example circuit to test the validity of the superposition theorem

**Procedure:**

1. Calculate the voltage across and current through the 10kΩ resistance *R2* using superposition. Let *v = v1 + v2* and *i = i1 +i2*, where the subscripts 1 and 2 denote the variables associated with the 10V and 5V source respectively. Record the calculated values in Table 8.1.
2. Construct on breadboard the circuit shown in Fig. 8.1. Measure the voltage across and current through the 10kΩ resistance *R2*. Be sure to turn off the power whenever you move wires in the circuit. Record the voltage (*v*) and current (*i*) values in Table 8.1.
3. Replace the 5V source with a short-circuit and leave the 10V source intact. The resultant circuit is shown in Fig. 8.2. Measure the voltage across and current through the 10kΩ resistance *R2*. Record the voltage (*v1*) and current (*i1*) values in Table 8.1.



**Figure 8.2: The circuit with only 10V source considered**

1. Replace the 10V source with a short-circuit and leave the 5V source intact. The resultant circuit is shown in Fig. 8.3. Measure the voltage across and current through the 10kΩ resistance *R2*. Record the voltage (*v2*) and current (*i2*) values in Table 8.1.



**Figure 8.3: The circuit with only 5V source considered**

1. Verify if the measurements are in accordance to the superposition theorem i.e.

*v = v1 + v2* and *i = i1 +i2*.

# Observations:

|  |  |  |
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| **Voltage / Current** | **Calculation results** | **Measurement results** |
| ***v1 =*** |  | 26.84V |
| ***v2 =*** |  | 15.78V |
| ***v =*** |  | 42.6V |
| ***i1 =*** |  | 1.5mA |
| ***i2 =*** |  | 0.4mA |
| ***i =*** |  | 1.9mA |

## Table 8.1: Data to test the validity of the superposition theorem

**Task:** Find *iR3* using superposition principle using the concepts covered in the course theory.













