

Northern University Of Bangladesh

Experiment No-3: verification of superposition theorem

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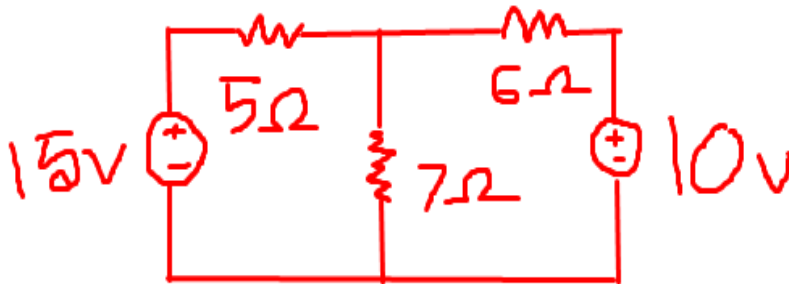
Result and Discussion:

Superposition theorem: The superposition theorem states that a circuit with multiple voltage and current sources is equal to the sum of simplified circuits using just one of the sources.

There are three steps to solve the superposition theorem.

- 1) Step 1: Replace all of the power sources except one. Replace voltage sources with a short circuit (wire) and current sources with an open circuit (break).
- 2) Step 2: Calculate the voltages and currents due to each individual source. Step 3:
- 3) Repeat steps 1 and 2 for each power supply.

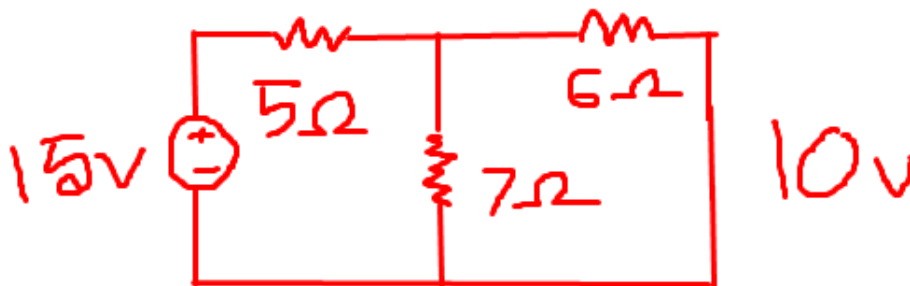
Let's consider this circuit



Let's find what will be the voltage across 7 Ω resistor

Here are two voltage source 15 V and 10 V three resistors 5 Ω, 6 Ω and 7 Ω

Now let's active 15 V and inactive 10 V and calculate voltage across 7 Ω resistor



Equivalent resistance of this circuit is $R_{eq} = (6\ \Omega \parallel 7\ \Omega) + 5\ \Omega$

$$= 8.23\ \Omega$$

$$I = 15\text{ V} / 8.23\ \Omega$$

$$= 1.82\text{ A}$$

$$I_{7\Omega} = I \times 6 / (6 + 7)$$

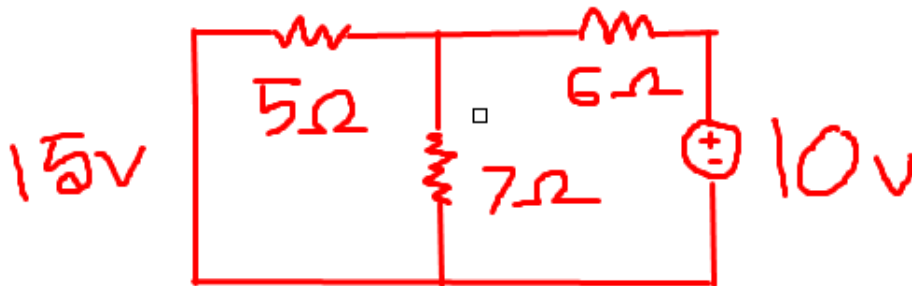
$$= 1.82 \times 6 / (6 + 7)$$

$$= 0.84\text{ A}$$

$$V_{7\Omega} = I_{7\Omega} \times 7$$

$$= 5.88\text{ V}$$

Now let's active 10 V and inactive 15 V and calculate voltage across 7 Ω resistor



Equivalent resistance of this circuit is $R_{eq} = (5\ \Omega \parallel 7\ \Omega) + 6\ \Omega$

$$= 8.917\ \Omega$$

$$I = 10\text{ V} / 8.917\ \Omega$$

$$= 1.124\text{ A}$$

$$I_{7\Omega} = I \times 5 / (5 + 7)$$

$$= 1.124 \times 5 / (5 + 7)$$

$$= 0.468\text{ A}$$

$$V_{7\Omega} = I_{7\Omega} \times 7$$

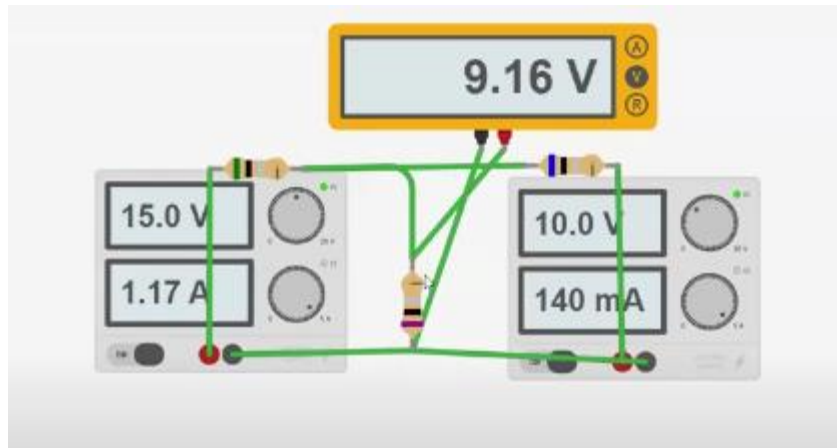
$$= 3.276\text{ V}$$

$$\text{Total voltage } V_T = 5.88 + 3.276$$

$$= 9.156 \text{ V}$$

$$\approx 9.16 \text{ V}$$

According to superposition theorem if both voltages 15V and 10V will work at a time then the voltage of 7Ω will be 9.156 V.



Here also voltage is 9.16 V. So it can be said superposition theorem is verified.