KHULNA UNIVERSITY OF ENGINEERING & TECHNOLOGY
KUET

SESSIONAL REPORT

Course No. EEE-1108

Department Of Computer Science and Engineering

Experiment No. 03

Name of the Experiment Verification of Superposition theorem

Remarks

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Year 1st

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1.0 Objectives:

By performing this experiment, various things will be known. The purpose of the experiment are -

1. To gather knowledge about superposition theorem.
2. To know the connection of the circuit.
3. To describe about applying superposition theorem to both current and voltage levels.
4. To become familiar with its unique ability to separate the impact of each source on the quantity of interest.
5. To verify superposition theorem and be able to apply it.

2.0 Introduction:

The superposition theorem is undoubtedly one of the most powerful in the electric field states, "The current through, or voltage across, any element of a network is equal to the algebric sum of the currents or voltages produced independently by each source."

In other words, this theorem allows us to find a solution for a current or voltage using only one source at a time. Once we have the solution for each source, we can combine the results to obtain the total solution. The term algebraic in the above theorem appears because the current resulting from the sources of the network can have different directions, just as the resulting voltages can have opposite polarities. As we can consider electrical current as electrical quantity, it can be easily assumed that total current follows through the branch is nothing but the summation of all individual currents continued by the each individual voltage or current source. This conception mathematically represents the superposition theorem.

3.0 Apparatus Required:

SL	Name of Apparatus	Specifications	Quantity
1	DC Power Supply	0-30V	2
2	Ammeter	0-1A	1
3	Tumbler Switch	6A-220V	3
4	Connecting Wires	—	as required
5	Volt Meter	0-50V	1
6	Rheo stat	21.5Ω, 63.4Ω; 101.4Ω	3

4.0 Experimental Setup:

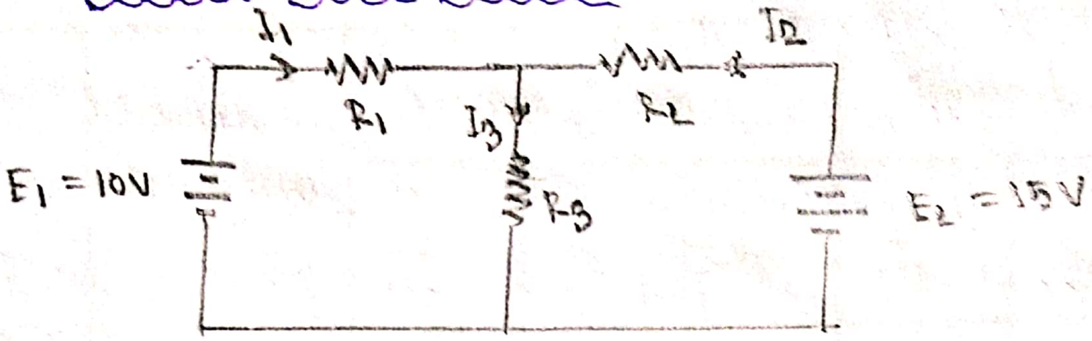

Fig. 4.1 : E_1 (active) and E_2 (active)

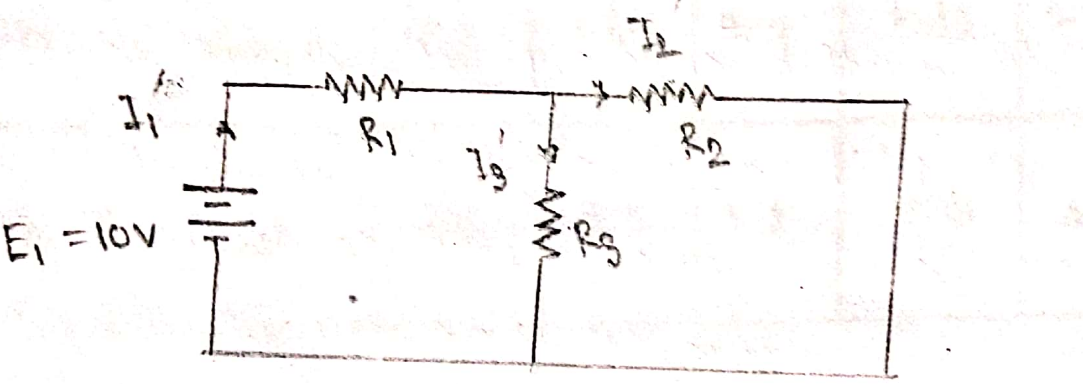

Fig. 4.2: E_1 (active) and E_2 (inactive)

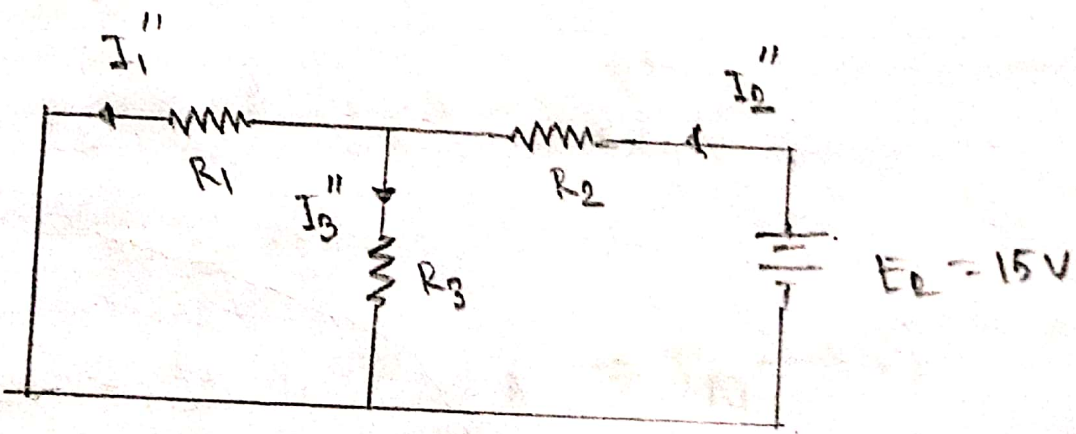

Fig. 4.3: E_1 (inactive) and E_2 (active)

5.0: Experimental Data Table:

SL	Source condition	Voltage (Volt)			Current I (A)		
		V_1	V_2	V_3	I_1	I_2	I_3
01	E_1 active E_2 inactive	3.5	6.5	6.5	0.16	0.06	0.10
02	E_1 inactive E_2 active	3.4	1.6	3.4	0.15	0.17	0.03
03	E_1 active E_2 active	0.1	5.2	9.8	0.01	0.08	0.08

6.0 Calculation:

When E_1 is in the circuit. (10V)

$$R_T = 21.5 + \left(\frac{1}{63.4} + \frac{1}{101.4}\right)^{-1} \Omega$$

$$= 60.0094 \Omega$$

$$I_{AB_1} = \frac{E_1}{R_T} = \frac{10}{60.0094} A \Rightarrow I_{AB} = 0.167$$

$$I_{BC_1} = \frac{R_3}{R_2 + R_3} \times I_{AB_1} = \frac{101.4}{101.4 + 63.4} \times 0.167 = 0.1027 A$$

$$I_{BD_1} = \frac{R_2}{R_2 + R_3} \times I_{AB_1} = \frac{63.4}{101.4 + 63.4} \times 0.167 = 0.06\ A$$

When E_2 is in the circuit (15V)

$$R_T = R_2 + \left(\frac{1}{R_1} + \frac{1}{R_2}\right)^{-1}$$

$$= 63.4 + \left(\frac{1}{21.5} + \frac{1}{101.4}\right)^{-1} = 81.138\ \Omega$$

$$I_{BC_2} = \frac{E_2}{R_T} = \frac{15}{81.138} = 0.17\ A$$

$$I_{AB_2} = \frac{101.4 \times 0.17}{21.5 + 101.4} = 0.15\ A$$

$$I_{BD_2} = \frac{21.5 \times 0.17}{101.4 + 21.5} = 0.03\ A$$

Calculated currents:

$I_{AB} = 0.01A$ $I_{BC} = 0.08A$, $I_{BD} = 0.08A$

Percentage of error:

$$\%E = \frac{I_m - I_c}{I_m} \times 100\%$$

$$\% E_{AD} = \frac{0.01 - 0.01}{0.01} \times 100\%$$

$$= 0\%$$

$$\% E_{BC} = \frac{0.11 - 0.08}{0.11} \times 100\%$$

$$= 27.27\%$$

$$\% E_{BD} = \frac{0.08 - 0.07}{100} \times 100\%$$

$$= 12.5\%$$

7.0 Discussion :

They were some errors which were found in the experiment but it ~~didn't~~ hadn't created a big difference between calculated value and measured value. The error values were 0%, 27.27%, 12.5% in respect. The cause of these errors was the temperature effect as ~~well~~ well as the fractional values in the ammeter. The value of the resistance might have changed due to temperature. The procedure could have been slight better

8.0 Conclusion: By completing this experiment we came to know about the verification of superposition theorem ~~Various~~ The theory allowed us to obtain a solution of measuring current and voltage at a time combining the result of both perspective. Though there was a slight errors during the produre being done, we verified the superposition theorem properly.

9.0 References:

1. "Introductory Circuit Analysis" — Robert L Boylested

2. Google 3. wikipedia