AMERICAN INTERNATIONAL UNIVERSITY BANGLADESH

408/1, Kuratoli, Khilkhet, Dhaka 1229, Bangladesh

Lab Exp Name: **Verification of superposition Theorem for DC Circuit**

Lab Report No: **03.** Date of Submission: 04 – 07 – 22

Course Title: **Introduction to Electrical Circuit Lab**

Course Teacher: **DR.MD. HASAN IMAM** Section: **M**

Semester: Summer **2021-22** Group No: **01.**

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3	RIDDHO, MD SOHANUR ROHAMAN	22-46800-1	Discussion
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circuit-diagram:

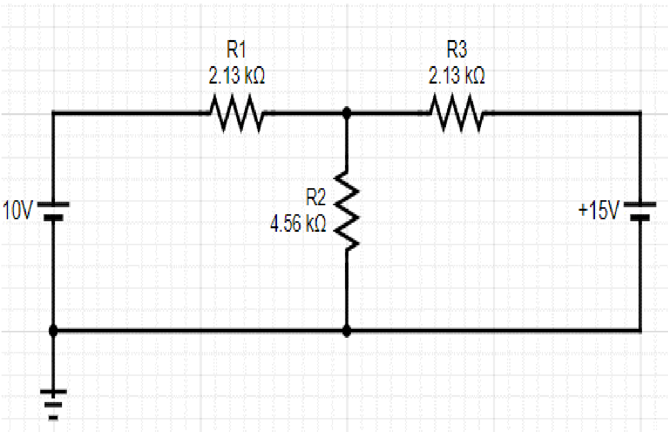

Fig-1 for +10V & +15V

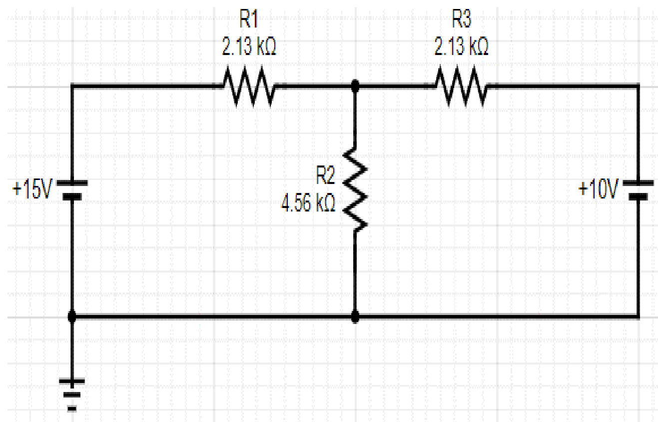

Fig-2 for +15V & +10V

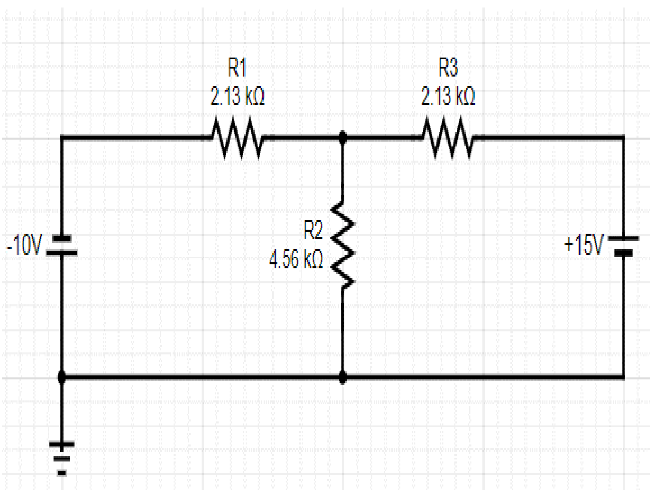

Fig-3 for -10V & +15V

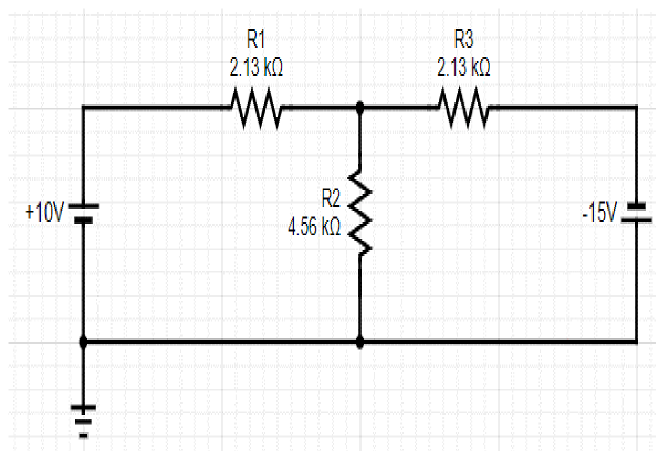

Fig-4 for +10V & -15V

Data Table

E_1	E_2	I_{R2}	I_{R2E1}	I_{R2E2}
+10V	***+15V***	2.19mA	0.86mA	1.30mA
+15V	***+10V***	2.19mA	1.30mA	0.86mA
-10V	***+15V***	0.41mA	-0.86mA	1.30mA
+10V	***-15V***	0.41mA	0.86mA	-1.30mA

Calculation

for +10V & +15V

R1 = 2.13 kΩ

R2 = 4.56 kΩ

R3 = 2.13 kΩ

For, E_1=10v

$R_t = R_1 + R_2 \| R_3 = 2.13 + 4.56\|2.13 = 3.58$

$I = V / R_T = 10/3.58 = 2.79$ mA

$I_{R2E1} = \frac{R_3 \times I}{R_3 + R_2} = \frac{2.13\times2.79}{2..13+4.56} = 0.87\ mA$ [Experimental current is, I_{R2E2}= 0.86 mA]

For, E_1=15v

$R_t = R_3 + R_1 \| R_2 = 2.13 + 2.13\|4.56 = 3.58$

$I = V / R_T = 15/3.58 = 4.19$ mA

$I_{R2E2} = \frac{R_1 \times I}{R_1 + R_2} = \frac{2.13\times4.19}{2..13+4.56} = 1.33\ mA$ [Experimental current is, I_{R2E2}= 1.33 mA]

Total

$I_{R2} = I_{R2E1} + I_{R2E2} = 0.87 + 1.33 = 2.20$ [Experimental current is, I_{R2}= 2.19 mA]

for +15V & +10V

For, E_1=15v

$R_t = R_1 + R_2 \| R_3 = 2.13 + 4.56 \| 2.13 = 3.58$

$I = V / R_T = 15/3.58 = 4.19$ mA

$I_{R2E1} = \frac{R_3 \times I}{R_3 + R_2} = \frac{2.13 \times 4.19}{2..13 + 4.56} = 1.33\ mA$ [Experimental current is, I_{R2E1}= 1.30 mA]

For, E_2=10v

$R_t = R_3 + R_1 \| R_2 = 2.13 + 2.13 \| 4.56 = 3.58$

$I = V / R_T = 10/3.58 = 2.79$ mA

$I_{R2E1} = \frac{R_1 \times I}{R_1 + R_2} = \frac{2.13 \times 2.79}{2..13 + 4.56} = 0.87\ mA$ [Experimental current is, I_{R2E2}= 0.86 mA]

Total

$I_{R2} = I_{R2E1} + I_{R2E2} = 1.33 + 0.87 = 2.20$ [Experimental current is, I_{R2}= 2.19 mA]

for -10V & +15V

For, E_1= -10v

$R_t = R_1 + R_2 \| R_3 = 2.13 + 4.56 \| 2.13 = 3.58$

$I = V / R_T = -10/3.58 = 2.79$ mA

$I_{R2E1} = \frac{R_3 \times I}{R_3 + R_2} = \frac{2.13 \times 2.79}{2..13 + 4.56} = -0.87\ mA$ [Experimental current is, I_{R2E2}= -0.86 mA]

For, E_1=15v

$R_t = R_3 + R_1 \| R_2 = 2.13 + 2.13 \| 4.56 = 3.58$

$I = V / R_T = 15/3.58 = 4.19$ mA

$I_{R2E2} = \frac{R_1 \times I}{R_1 + R_2} = \frac{2.13 \times 4.19}{2..13 + 4.56} = 1.33\ mA$ [Experimental current is, I_{R2E2}= 1.30 mA]

Total

$I_{R2} = I_{R2E1} + I_{R2E2}$ = (- 0.87) + 1.33 = 0.46 [Experimental current is, I_{R2}= 0.41 mA]

for +10V & -15V

For, E_1=10v

$R_t = R_1 + R_2 \| R_3$= 2.13 + 4.56||2.13 = 3.58

$I = V / R_T$ = 10/3.58 = 2.79 mA

$I_{R2E1} = \frac{R_3 \times I}{R_3 + R_2} = \frac{2.13 \times 2.79}{2..13 + 4.56} = 0.87\ mA$ [Experimental current is, I_{R2E2}= 0.86 mA]

For, E_1= -15v

$R_t = R_3 + R_1 \| R_2$= 2.13 + 2.13||4.56 = 3.58

$I = V / R_T$ = -15/3.58 = -4.19 mA

$I_{R2E2} = \frac{R_1 \times I}{R_1 + R_2} = \frac{2.13 \times (-4.19)}{2..13 + 4.56} = -1.33\ mA$ [Experimental current is, I_{R2E2}= -1.30 mA]

Total

$I_{R2} = I_{R2E1} + I_{R2E2}$ = 0.87 + (-1.33) = 0.46 [Experimental current is, I_{R2}= 0.41 mA]

Discussion & Conclusion:

1. Superposition theorem in a DC Circuit State that the current "the total current in any part of a linear circuit equals the algebraic sum of the currents produced by each source.
2. In fig-1 the voltage source are 10v & 15v, in fig-2 the voltage source are 15v & 10v, in fig-3 the voltage source are -10v & 15v, in fig-1 the voltage source are 10v & -15v.
3. The circuit was implemented carefully where necessary. While measuring current Digital multimeter was placed in series with the branch of the circuit where the current is to be measured, multimeter was in ammeter mode.
4. For calculate I_{R2E1} We need to sort E_2. Then calculate the total resistance ($R_1 + R_2 \| R_3$). Then calculate the total current(I) for E_1. After that using this formula ($\frac{R_3 \times I}{R_3 + R_2}$) we find I_{R2E1}. For calculate I_{R2E2} We need to sort E_1. Then calculate the total resistance ($R_3 + R_1 \| R_2$). Then calculate the total current(I) for E_2. After that using this formula ($\frac{R_1 \times I}{R_1 + R_2}$) we find I_{R2E2}. After add $I_{R2E1} + I_{R2E2}$ We found I_{R2}.
5. In this experiment, we saw that, the experimental value and the theoretical value has a small difference, it can be held for so many reasons- that can be the register we have used its value not exact as same as given value of register, wire's internal register.