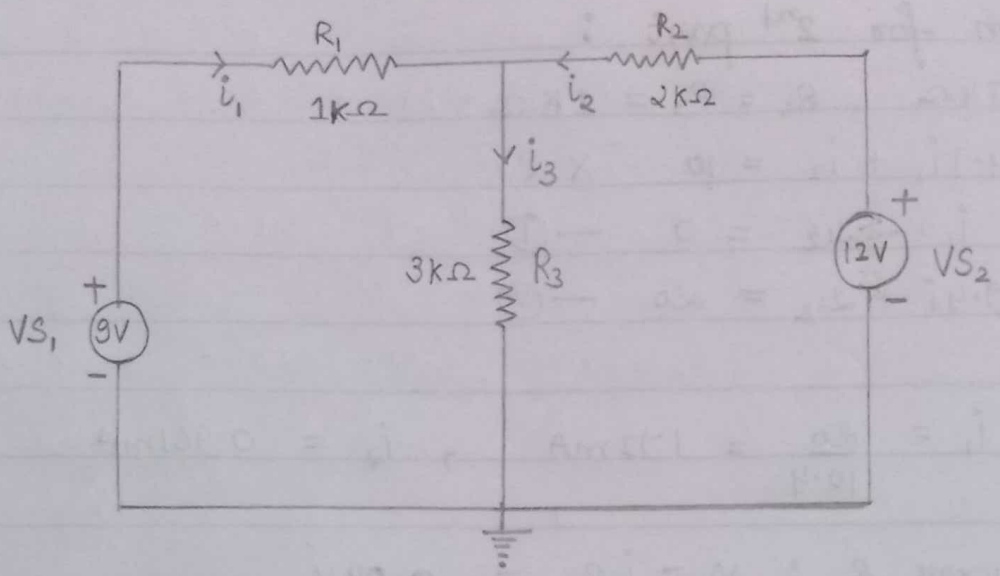
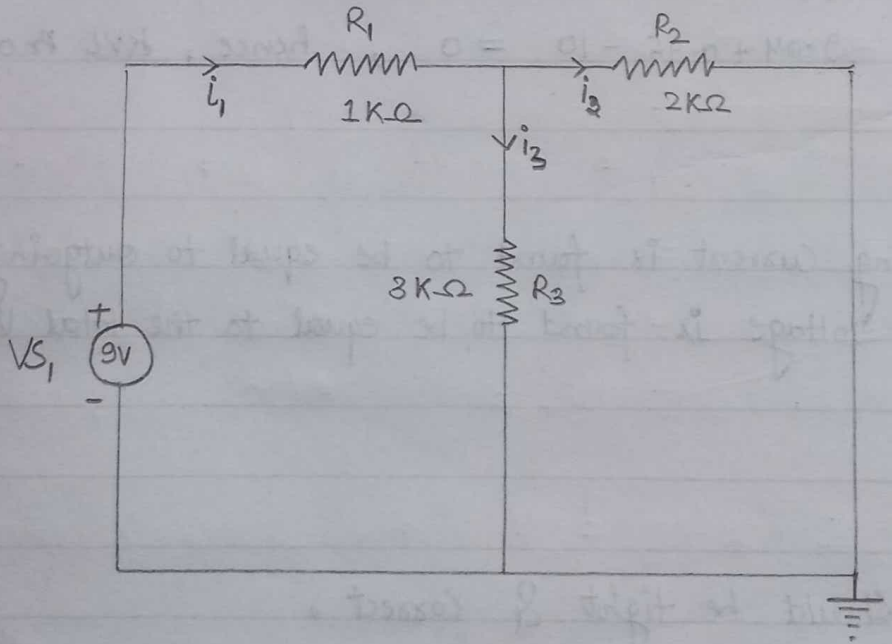

R1
1KΩ
i1
R2
2KΩ
i2
i3
3KΩ
R3
12V
VS2
VS1
9V


R1
1KΩ
i1
R2
2KΩ
i2
i3
3KΩ
R3
VS1
9V

Date .....

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EXPERIMENT - 03

Aim :-

Verification of Superposition theorem

Requirements :- Multism live

(ii) Apparatus required : 2 Power Supply (9V DC & 12V DC)

(iii) Components Required : 3 Resistor (1KΩ, 2KΩ, 3KΩ)

Theory :-

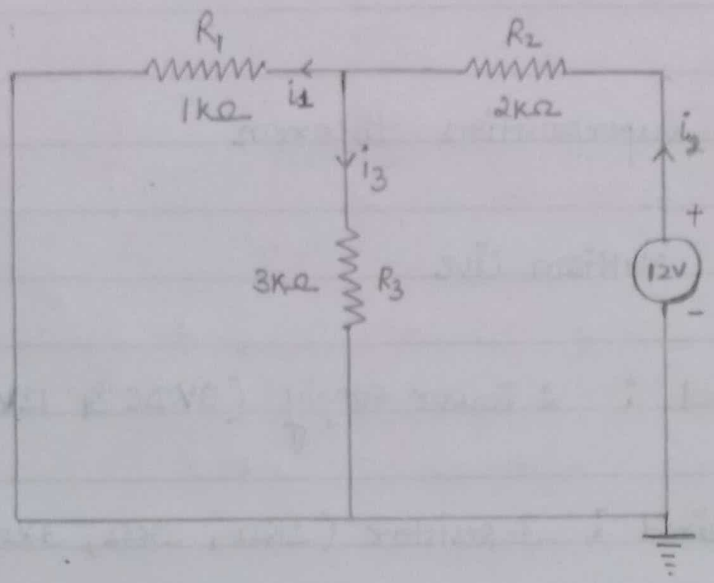
The Superposition theorem states that for a linear system, the response in any branch having more than one independent source equals the algebric sum of the responses caused by each independent source.

Observation Table :-

(i) Measured Currents and Potential :

Active Vs	V_{R_1}	V_{R_2}	V_{R_3}	I_1	I_2	I_3
Vs1 only	4.0909 V	4.9091 V	4.9091 V	4.0909 mA	2.4545 mA	1.6364 mA
Vs2 only	3.2727 V	8.7272 V	3.2727 V	3.2727 mA	4.3636 mA	1.0909 mA
Both	0.818 V	3.818 V	8.16 V	818.18 µA	1.9091 mA	2.7273 mA

Teacher's Signature: _____


R1
1kΩ
i1
R2
2kΩ
i2
i3
+
12V
−
3KΩ
R3

Date .....

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(ii) Calculated current and potential :

Active Vs	V_{R_1}	V_{R_2}	V_{R_3}	I_1	I_2	I_3
					~~2.45mA~~	~~1.63mA~~
V_{S_1}	4.09V	4.91V	4.91V	4.09mA	2.45mA	1.63mA
V_{S_2}	3.27V	8.72V	3.27V	3.27mA	4.36mA	1.09mA
Both	0.818V	3.818V	8.16V	0.81mA	1.90mA	2.72mA

Calculation :-

(i) V_{S_1} only :

$-i_1 - 3i_3 + 9 = 0$ — (1)

$-2i_2 + 3i_3 = 0$ — (2)

$i_1 = i_2 + i_3$ — (3)

$\rightarrow$ $i_1 + 3i_3 = 9 \times 2$

$-2i_1 + 2i_2 + 3i_3 = 0$

+

$11i_3 = 18$

$i_3 = 18/11 = 1.63mA$

$i_2 = 2.45mA$, $i_1 = 4.09mA$

$V_{R_1} = 4.09V$

$V_{R_2} = 4.91V$

$V_{R_3} = 4.91V$

(ii) V_{S_2} only :

$-2i_2 - 3i_3 + 12 = 0$ — (1)

$-i_1 + 3i_3 = 0$ — (2)

$i_2 = i_1 + i_3$ — (3)

$\rightarrow$ $2i_2 + 3i_3 = 12$

$4i_3 - i_2 = 0 \times 2$

+

$11i_3 = 12$

$i_3 = 12/11 = 1.09mA$

$i_2 = 4.36mA$

$i_1 = 3.27mA$

$V_{R_1} = 3.27V$

$V_{R_2} = 8.72V$

$V_{R_3} = 3.27V$

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(iii) Both V_{s_1} & V_{s_2} :

$9 + (-i_1) - 3i_3 = 0$ — ①

$12 - 2i_2 - 3i_3 = 0$ — ②

$i_3 = i_1 + i_2$ — ③

→ $9 = 4i_3 - i_2$ — ① × 2

$+ \quad 12 = 3i_3 + 2i_2$ — ②

$30 = 11 i_3$

$i_3 = \frac{30}{11} = 2.72 \text{ mA}$.

$i_1 = 9/11 = 0.818 \text{ mA}$

$i_2 = 21/11 = 1.909 \text{ mA}$

$V_{R_1} = 0.818 \text{ V}$

$V_{R_2} = 3.818 \text{ V}$

$V_{R_3} = 8.16 \text{ V}$

Result :-

These Readings of the active Vs Calculated seperately is equal to the reading of active Vs Calculated together. Thus, justifying Superposition theorem.

Precaution :-

(i) All connection should be tight.

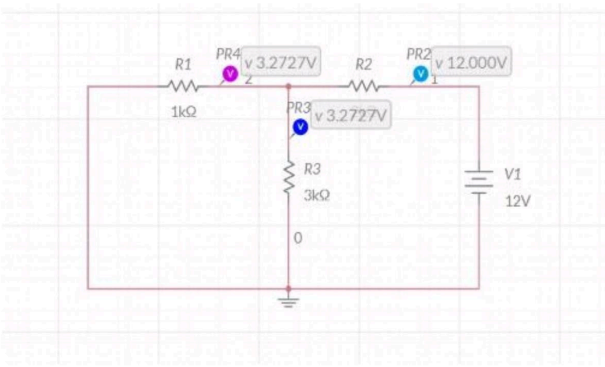
(ii) Make proper & correct Calculation.

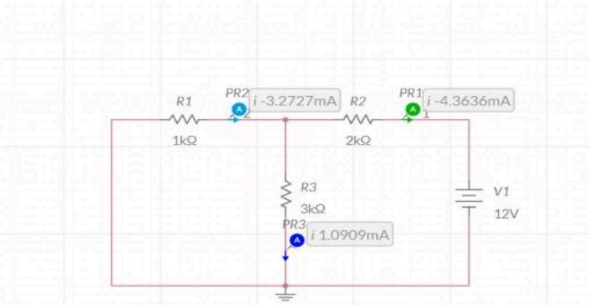
(iii) Switch off the apparatus when not in use.

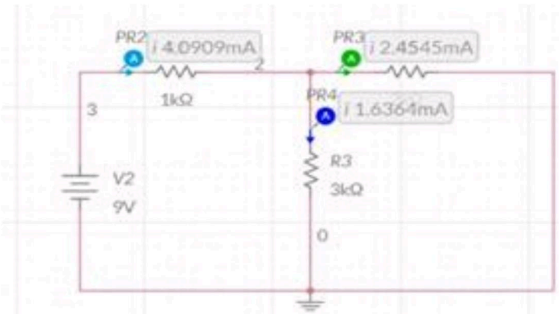
learning Outcomes :-

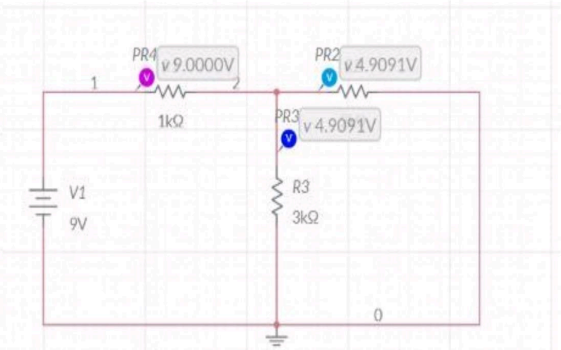
we learn to use the superposition theorem in a solving the Circuits.

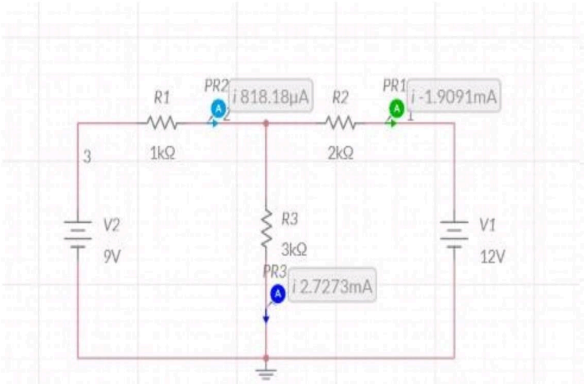
Teacher's Signature: _____

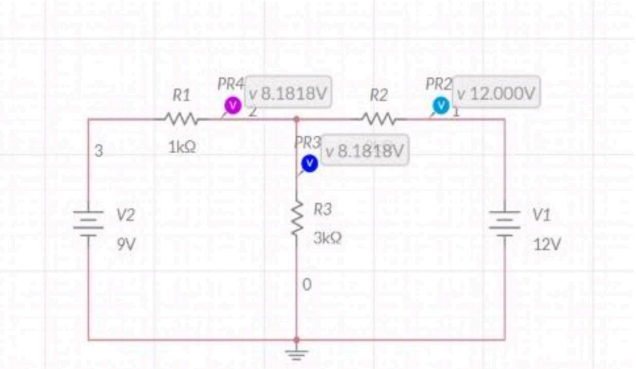

R1
PR4
v 3.2727V
R2
PR2
v 12.000V
1kΩ
PR3
v 3.2727V
R3
3kΩ
V1
12V
0


R1
PR2
i -3.2727mA
R2
PR1
i -4.3636mA
1kΩ
2kΩ
R3
3kΩ
V1
12V
PR3
i 1.0909mA


PR2
i 4.0909mA
PR3
i 2.4545mA
1kΩ
PR4
i 1.6364mA
3
V2
9V
R3
3kΩ
0


PR4
v 9.0000V
PR2
v 4.9091V
1
1kΩ
PR3
v 4.9091V
V1
9V
R3
3kΩ
0


R1
PR2
i 818.18µA
R2
PR1
i -1.9091mA
3
1kΩ
2kΩ
V2
9V
R3
3kΩ
V1
12V
PR3
i 2.7273mA


R1
PR4
v 8.1818V
R2
PR2
v 12.000V
3
1kΩ
PR3
v 8.1818V
V2
9V
R3
3kΩ
V1
12V
0