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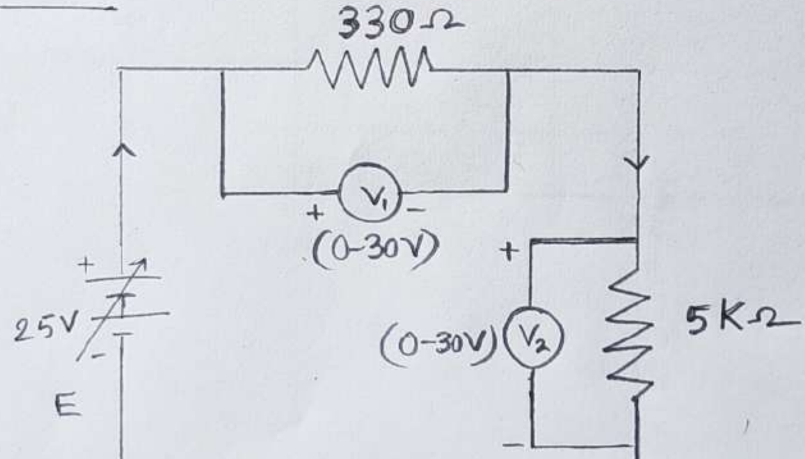
EEE MOCK TEST - 3

AIM : To verify Kirchoff's Voltage Law (KVL) of given circuit

APPARATUS:

SL.NO	Apparatus	Range	Quantity
1.	RPS (Regulated Power Supply)	(0-30)V	01
2.	Resistance	330Ω, 5 kΩ	02
3.	Ammeter	–	0
4.	Voltmeter	(0-30)V	02
5.	Breadboard and Wires	–	Required

Circuit for KVL:



given KVL circuit

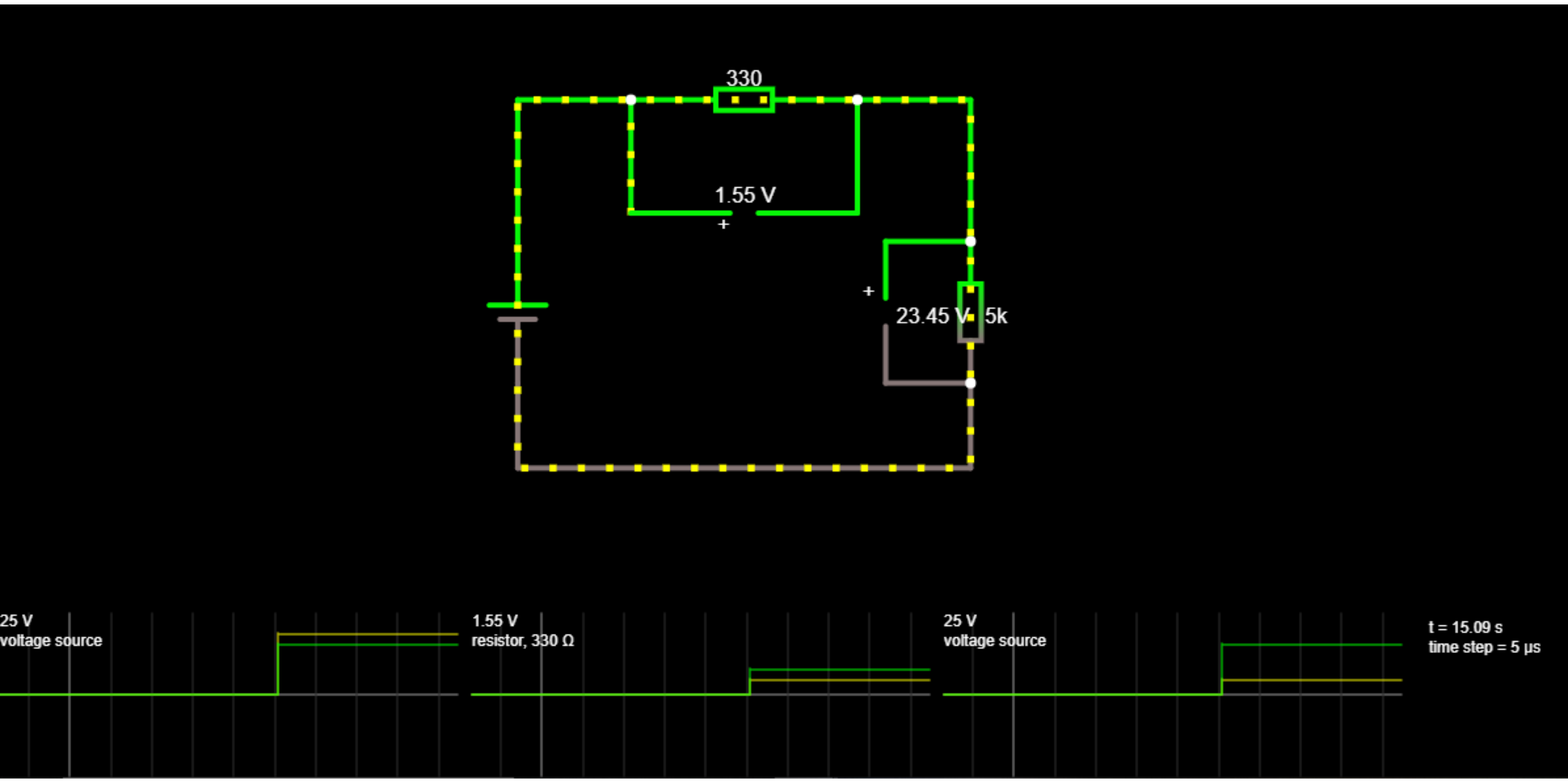
KVL: (Calculations)

Tabular Column :- (Practical)

SL.NO	RPS (in volt) (E)	Voltage (in Volt)		KVL (in volt)
		V_1	V_2	$E = V_1 + V_L$
1	5	0.3095	4.69	5
2	10	0.6191	9.38	10
3	15	0.9287	14.07	15
4	20	1.24	18.76	20
5	25	1.55	23.45	25

Tabular Column :- (Theoretical)

SL.NO	RPS	Voltage (in Volt)		KVL
		V_1	V_2	$E = V_1 + V_L$
1	5	0.3094	4.69	5
2	10	0.6191	9.38	10
3	15	0.9286	14.07	15
4	20	1.239	18.76	20
5	25	1.547	23.45	25


330
1.55 V
+
+
23.45 V
5k
25 V
voltage source
1.55 V
resistor, 330 Ω
25 V
voltage source
t = 15.09 s
time step = 5 µs

Calculation :-

(a)

① In the loop, applying Kirchoff's voltage law:-
(Let current in the loop be denoted I)

$330I + 5000I - 25 = 0$ [∵ total voltage is equal to sum of all voltage drops within the loop].

$\Rightarrow 330I + 5000I = 25$

$\Rightarrow 5330I = 25$

$\Rightarrow I = 25/5330 = 4.69 \times 10^{-3}$ A

$= 4.69$ mA.

Now the voltage drop across 330 Ω resistance :-

$V_1 = IR_1$ (ohm's law)

$= 4.69 \times 10^{-3} \times 330$

$= 1.547$ volt

Also the voltage drop across 5kΩ resistance :-

$V_2 = IR_2$ (ohm's law)

$= 4.69 \times 10^{-3} \times 5000$

$= 23.45$ volt

So total voltage (KVL) (E) = $V_1 + V_2 = 1.547 + 23.45 = 24.997 \approx 25$ V.
(proved)

(2) In the loop, applying Kirchoff's voltage law;

(Let the current in the loop be denoted I)

$$330\,I + 5000\,I - 20 = 0.$$

$$\Rightarrow 5330\,I - 20 = 0$$

$$\Rightarrow 5330\,I = 20$$

$$\therefore I = 20/5330 = 3.75 \times 10^{-3}\ A$$

$$= 3.75\ mA$$

The voltage drop accross 330 Ω resistance :-

$$V_1 = IR_1 \quad \text{(Ohm's Law)}$$

$$= 3.75 \times 330 \times 10^{-3}$$

$$= 1.239\ \text{volt.}$$

Also the voltage drop across 5 kΩ resistance :-

$$V_2 = IR_2 \quad \text{(Ohm's law)}$$

$$= 3.75 \times 10^{-3} \times 5000$$

$$= 18.758\ \text{volt}$$

So total voltage (KVL) (E) $= V_1 + V_2 = 1.239 + 18.758$

$$= 19.989$$

$$\approx 20\ \text{volt. (proved)}$$

Viva voice:

① **Potential drop:** : The potential drop in a circuit is a measure of how much voltage supplied by the voltage source is reduced by passive elements like resistors, capacitors, inductors.

Potental rise: The battery that is powering a circuit is a potental rise. It can also be described as an icrease i electrical pressure due to battery i.e. energy is supplied in the circuit.

② **Kirchoff's Voltage Law (KVL).** : KVL states that in any closed loop network, the total voltage around the loop is equal to the sum of all voltage drops within the same loop. which is equal to zero.

Result :- The observation of voltage drop in KVL circuit that we get through the stimulator circuits are verified by theoretical calculation. Thus Kirchoff's voltage law for the given circuit is verified and the aim of ~~laborato~~ laboratory experiment is satisfied.

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