North South University
Department of Electrical & Computer Engineering

LAB REPORT

Course Code: EEE -141L

Course Title: Electrical circuits Lab

Faculty: RQN

Experiment Number: 2

Experiment Name:

KCL, Current divider rule with parallel and ladder circuit

Experiment Date: 14-02-25

Date of Submission: 26-02-25

Section: 19

Group Number: 02

Submitted To: KASHFIA MAHMOOD

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1. Experiment name: KCL, Current Divider Rule with parallel and ladder circuit.

2. Objectives:

* Learn how to connect parallel circuit on breadboard.
* Validate the current dividers rules and verify KCL and KVL in ladder circuit.

3. Apparatus:

* Trainer board
* Resistors (1K, 3.3KΩ, 4.7KΩ, 5.6KΩ, 10KΩ)
* Digital Multimeter (DMM)
* Connecting wire.

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4. Theory:

The current divider rule is key concept in electrical circuits. It used to calculate how current is shared between the parallel branches of a circuit. It is based on Ohm's Law. the voltage across each branch remains constant, but the current in each branch can differ.

The current divider rule states that the electrical current entering the node in a parallel circuit is divided into the branches. Current divider rule is used to calculate the magnitude of divided current in circuits.

A parallel circuit and a voltage source is shown below.

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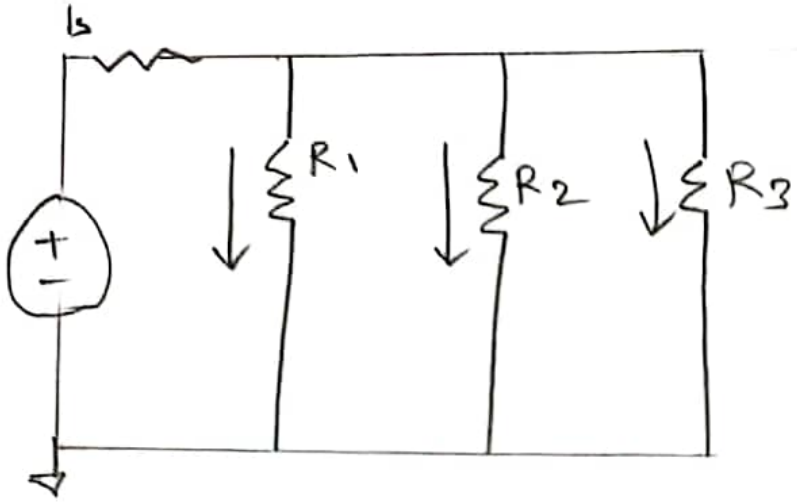
A parallel circuit:



current divider formula: $I_x = \frac{I_t}{R_n} R_t$

Kirchhoff's Current Law (KCL) states that the algebraic sum of currents entering and leaving junction (or node) in an electrical circuit is 0.

In equation form, the above statement can be written as follows:

$$\sum I_i = \sum I_o$$

I_i representing current entering and I_o representing current leaving.

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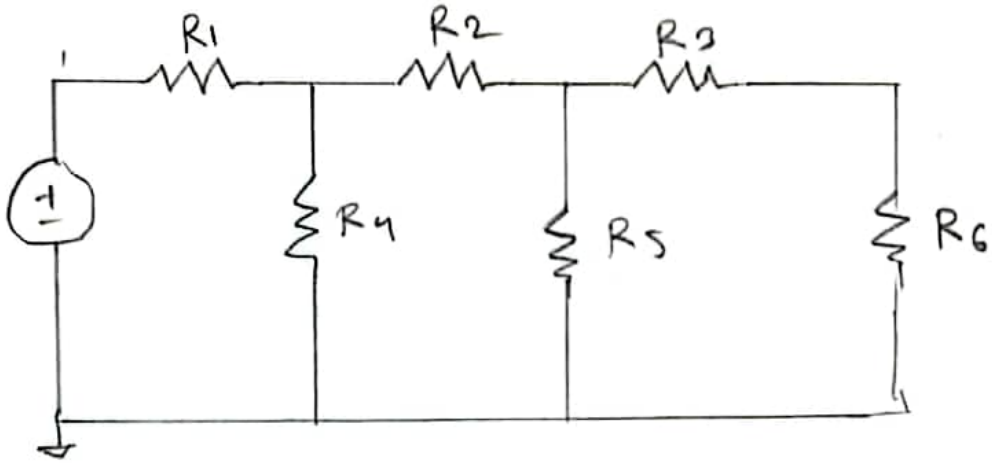
The combination of series and parcalled circuit is called ladder circuit.

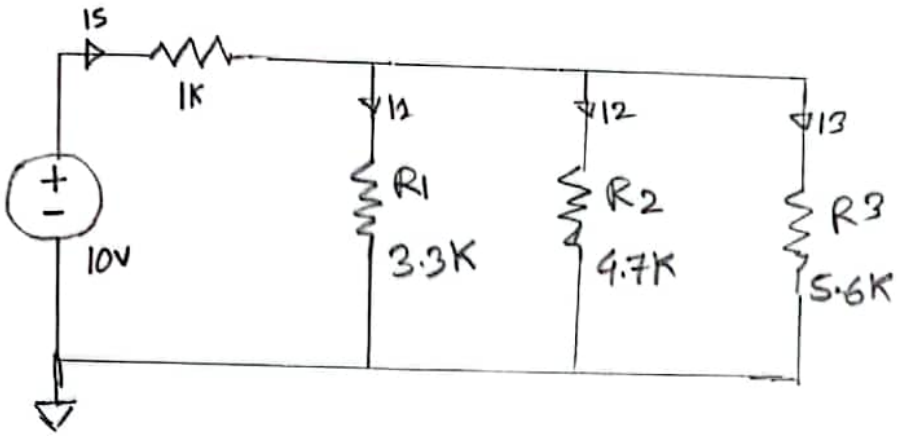
Example of a ladder circuit:



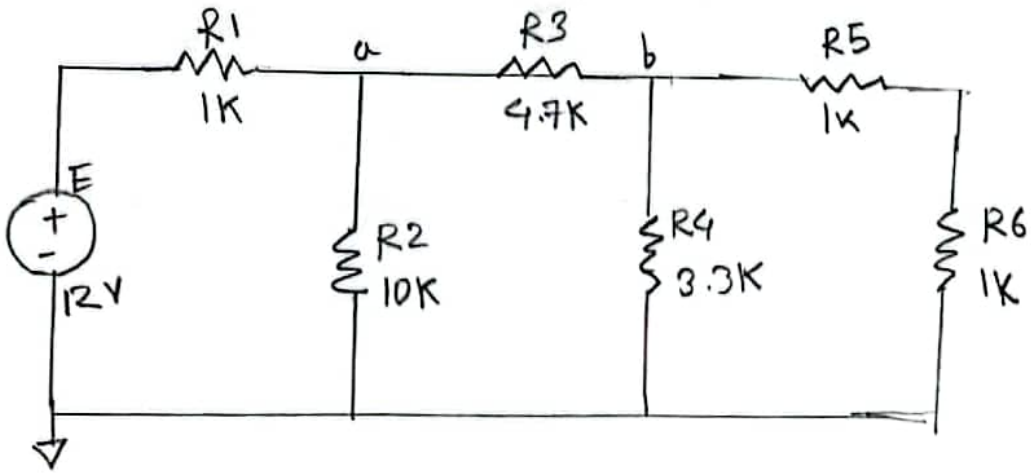
A ladder circuit.

A color code is used to indentify the values of resistors to be used in a circuit.

5. Circuit Diagrams:



Circuit 1



Circuit 2

Table 1: Data Table:

Resistance using colour coding					Resistance DMM	% Error
Band 1	Band 2	Band 3	Band 4	Resistance		
Brown	Black	Red	Gold	(950-1050)	0.98	2
Orange	Orange	Red	Gold	(3135-3465)	3.21	2.72
Yellow	purple	Red	Gold	(4465-4935)	4.62	1.70
Green	Blue	violet	Gold	5.32×10^8 5.88×10^8	5.61	0.17

Table 2:

Experimental readings				Theoretical Values			
I_S	I_{R1}	I_{R2}	I_{R3}	I_S	I_{R1}	I_{R2}	I_{R3}
4.18	1.84	1.28	1.05	4.08	1.78	1.25	1.03
% Error							
I_S		I_{R1}		I_{R2}		I_{R3}	
2.20%		3.3%		2.4%		1.94%	

Table 3:

I_S	4.08	sum?
$(I_{R1}+I_{R2}+I_{R3})$	4.17	

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Table 4:

Experimental Req	Theoretical Req	% Error
2.40	2.44	1.63%

Table 5:

Component	Voltage	Current
E	12.09	2.59
R1	2.46	2.61
R2	9.61	0.67
R3	5.82	1.64
R4	3.28	0.62
R5	0.98	1.02
R6	0.97	1.01

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Discussion:

In this experiment, we used four resistors. First, we calculated their resistance using colore coadingand -tave the valves. Then, we placed them on trainere board and measured their actual resistance with a digital multimeter the circuit was build with four resistors: 1KΩ, 3.3KΩ, 4.7KΩ, 5.6KΩ.

Then we build the circuit. we set out DMM to mA mode and connect the red wire to the Ampere. we measure the current of each resistors. Then we disconnect the circuit from the source and measure the Req.

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we added the current flow through each resistors in parallel and compared it to that of the resistors in series. The values were not exactly same. the difference was negligible. we also calculate the percentage of error.

$$\% \text{ Error} = \frac{|\text{practical value} - \text{theoretical}|}{\text{Theoritical}} * 100$$

Next we built circuit 2. we measured the voltage across each resistors by connecting the DMM in parallel. Then, we measured the current through each resistor by connecting the DMM in series. We keep the values in table 5.

we completed our lab experiment witout any major issues. Minor issues were solved by our lab instructor. This lab experiment was very helpful and we got to know about how to measure voltage, current and resistors by DMM and verify KVL, KCL and Calculate percentage of errors.

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NORTH SOUTH UNIVERSITY

DEPARTMENT OF ELECTRICAL & COMPUTER ENGINEERING

EEE41L/ETE141L

Sum of individual Current ($I_{R1} + I_{R2} + I_{R3}$)	4.17	

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Report

1. State the current division rule.
2. State the Kirchhoff's current law (KCL).
3. With the experimental data, verify Kirchhoff's voltage law in Circuit 1 within each independent closed loop of the circuit.
4. With the experimental data, verify Kirchhoff's current law at nodes *a* and *b* of circuit 2.
5. Showing all steps, calculate the theoretical values in Table 2. Compare theoretical values to your experimental values and explain whether your circuit follows KCL or not.
6. Showing all the steps, theoretically calculate Req of circuit 1. Compare with the experimental value.
7. Calculate all the theoretical values for Table 5. Show all steps.

Useful Formula:

Current Divider Rule : $I_X = I_S R_T / R_X$

% Error = (Theoretical value – Experimental Value) / Theoretical Value

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8. Now, disconnect the voltage source from the circuit and measure the total load resistance, Req of the circuit using DMM. Note down values in Table 4.
9. Construct Circuit 2.
10. Using a DMM, measure the potential differences across all the resistors in circuit 2. Record all the readings in Table 5
11. Using a DMM, measure the current through all the resistors and record in Table 5.

Data Collection

Lab 2
Group No. _____
Instructor's Signature _____

Table 1:

Resistance using colour coding					Resistance using DMM	% Error
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% Error							
I_S		I_{R1}		I_{R2}		I_{R3}	
2.20 %		3.31 %		2.4 %		1.94 %	

Table 3:

I_S	4.08	Is Total Current equal to sum individual current?

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