Lab Report 04

Submission Date: 29-01-2022

Experiment Name	Verification of KCL and Current Divider Rule	
Course Code	CSE 114	
Course Title	Electrical Engineering Sessional	
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Experiment No: 4

Objective: Verification of KCL and Current Divider Rule.

Apparatus: Proteus Professional Software.

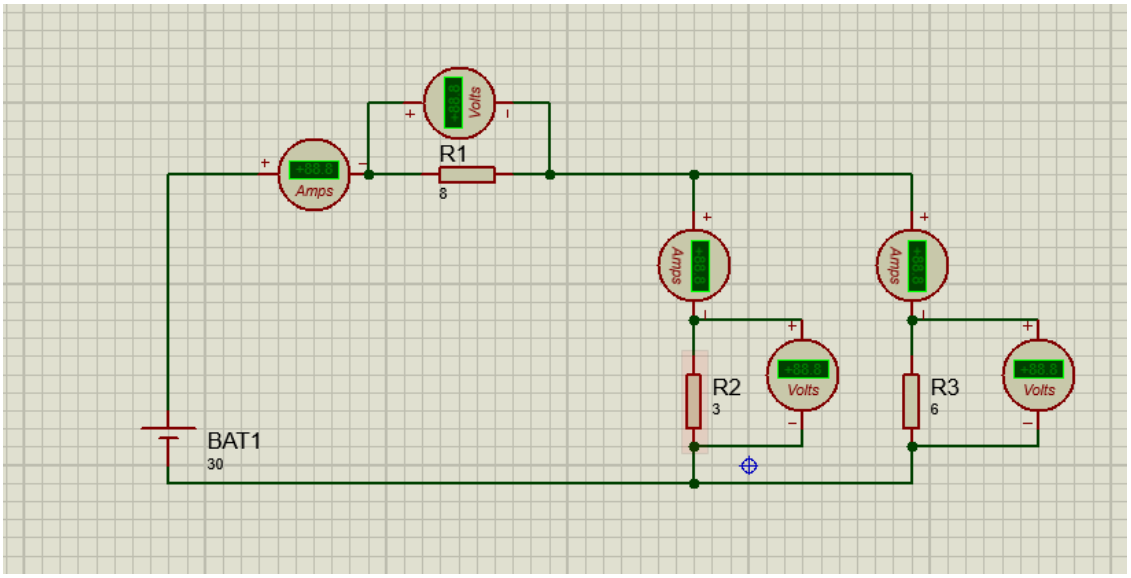
Theory:

KCL states that: “The sum of currents flowing into a point in a circuit is equal to the sum of the currents flowing out of that same point”.

A current divider is defined as a linear circuit that produces an output current that is a fraction of its input current. This is achieved through the connection of two or more circuit elements connected in parallel, the current in each branch will always divide in such a way that the total energy expended in a circuit is minimum.

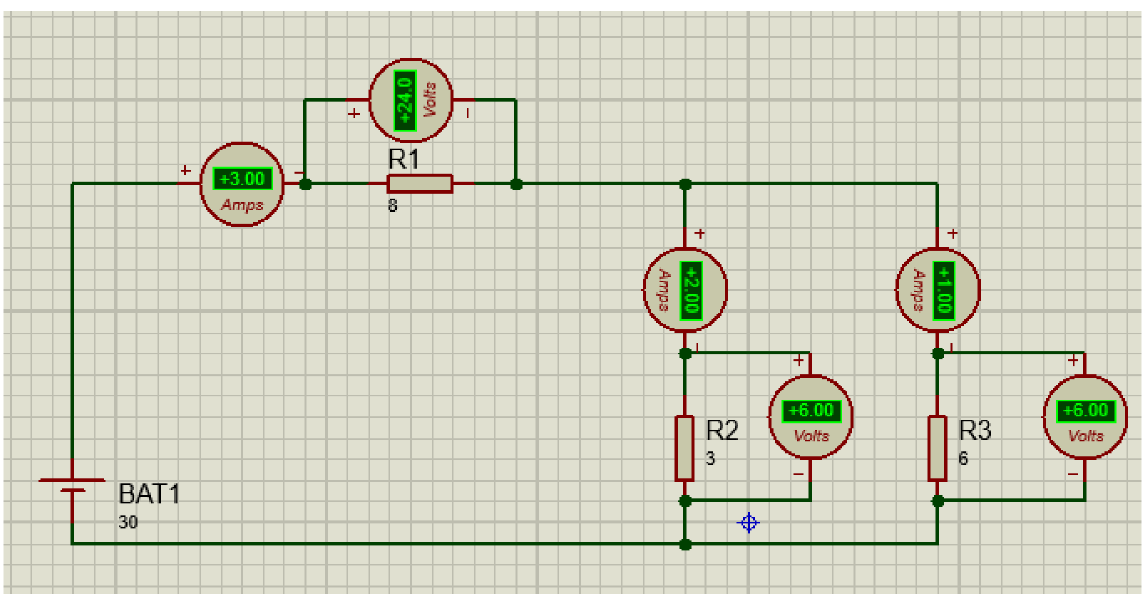
Circuit Diagram:

Before Simulation:



Result:

After Simulation:



Calculation:

We know that KCL gives as:

$i_1 - i_2 - i_3 = 0$ ---------(i)

Here We applying KVL in loop 1

$-30 + 8i_1 + 3i_2 = 0$

$i_1 = \frac{30 - 3i_2}{8}$

Applying KVL in loop 2

$6i_3 = 3i_2$

Or, $i_3 = \frac{3i_2}{6}$

Or, $i_3 = \frac{i_2}{2}$

Now put i_1 and i_3 value in equation (i).

$\frac{30 - 3i_2}{8} - i_2 - \frac{i_2}{2} = 0$

Or, $i_2 = 2$ A

Now put i_2 value in the i_1 and i_3 then we get,

$i_1 = 3$A and $i_3 = 1$A

So, $i_1 = 3$A, $i_2 = 2$A and $i_3 = 1$A

Now we see that $i_1 - i_2 - i_3 = 3$A -2A -1A = 0

We can say that the summation of current in and out are same.

Now we have to verify this current using CDR (Current Divider Rule)

According to CDR we know

$i_1 = \frac{R2*I}{Rp}$

Here, R_1 = 8 Ω, R_2 = 3 Ω, R_3 = 6 Ω (Here R_2 and R_3 connect in Parallel)

Now,

$R_2 \parallel R_3 = \frac{1}{3} + \frac{1}{6}$

or $R_2 \parallel R_3$ = 2 Ω

So, Total Resistance R_p is,

$R_1 + (R_2 \parallel R_3)$ = 10 Ω and total Current I = 3A

For i_1,

$i'_1 = \frac{(R2+R3)*I}{Rp}$

or $i'_1 = \frac{9*3}{10}$

or $i'_1 = 2.7A \approx 3A \approx i_1$

Similarly,

$i'_2 = \frac{R3*I}{Rp}$

or $i'_2 = \frac{6*3}{10}$

or $i'_2 = 1.8A \approx 2A \approx i_2$

also,

$i'_3 = \frac{R2*I}{Rp}$

or $i'_3 = \frac{3*3}{10}$

or $i'_3 = 0.9A \approx 1A \approx i_3$ (Verified) find Voltage across every resistor using Ohm's Law

We know that,

$V = IR$

So, $V_1 = i_1*R_1$

$\therefore V_1 = 3*8 = 24v$

Similarly

$V_2 = 2*3 = 6v$ and $V_3 = 1*6 = 6v$

$\therefore V_1 = 24v$, $V_2 = 6v$ and $V_3 = 6v$

Discussion:

In this experiment we have to verify the KCL and Current divider rule. To verify those law, we have been given three resistors and one battery in Proteus Professional software. By using DC Ammeter, we have to find the current of the circuit across the resistors and we have to verify it. We have to careful in our calculation and verify current by Current divider rule.