DATE:18.01.2021

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Objective : To Verify KCL And KVL Equations

Software used : NI Multisim

Theory :

1)Theory for KCL:

Junction is a point where three or more components of a circuit meet **.**

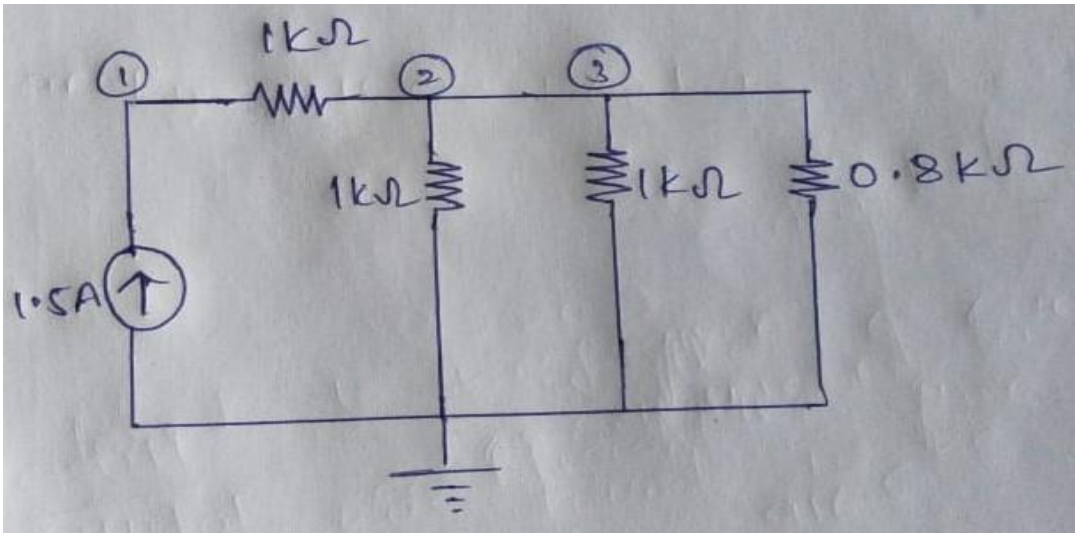
Kirchhoff's Current Law states that **"** The sum of the currents flowing towards the junction is equal to the sum of the currents flowing away from the junction " .

In another way we can say that **"**The algebraic sum of currents at a junction is zero**" . i.e.** $\Sigma I = 0$.

Let us prove Kirchhoff's current law by taking one circuit .

In the given circuit we have 1kohm,1kohm,0.8kohm resistors connected in

parallel and these three resistors connected to 1kohm resistor in series .



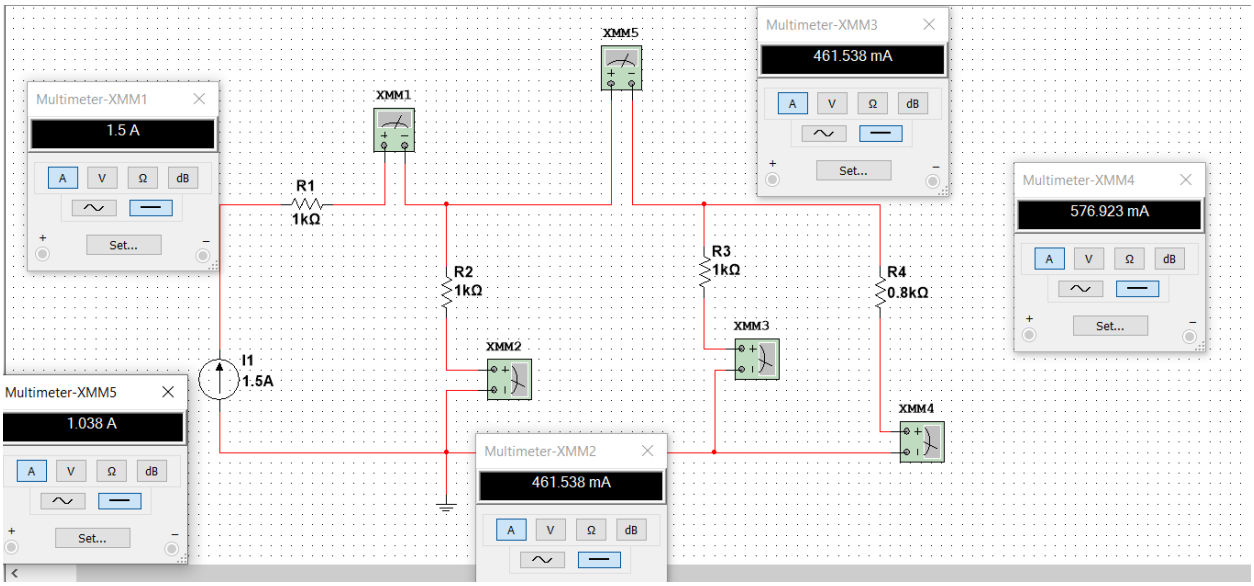
Let us assume that the current at node 2 is divided into two currents as i2,i3 and current at node 3 is divided into two currents as i4,i5.

According to kirchhoff's law 1.5A=i2+i3,

i2=i4+i5

Now let's design the circuit in Multisim and see the results .

CIRCUIT DIAGRAM :



RESULTS AND OBSERVATIONS :

After designing the circuit in Multisim . To find the current by using multimeter across each resistor.

i2=1.038A

Current across R2, i.e. i3 is 461.538mA

Current across R3, i.e. i4 is 461.538mA

Current across R4, i.e. i5 is 576.923mA

Now according to Kirchhoff's current law :

1.5A=i2+i3

=1.038+0.461

=1.5A

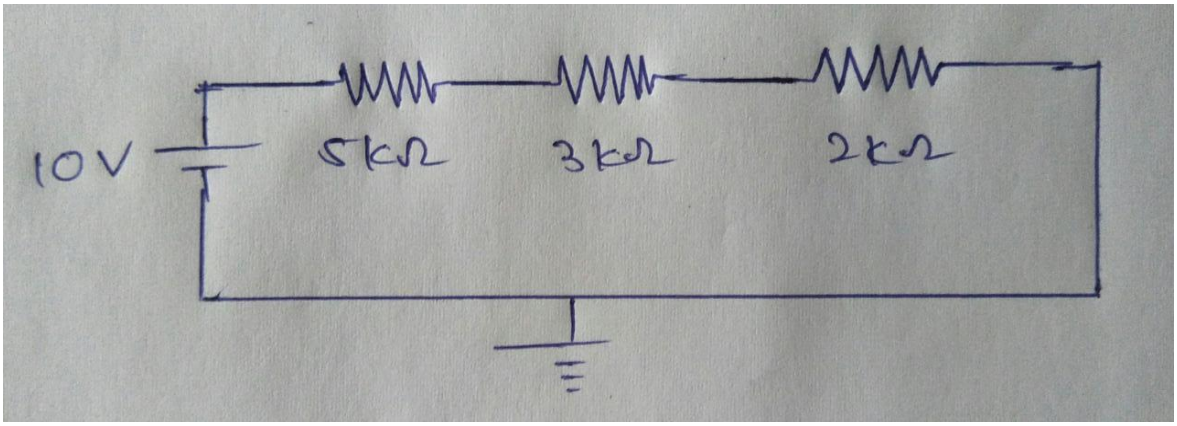
Hence by using Multisim Kirchhoff's current law is proved .

2) Theory for KVL :

Kirchhoff's Voltage Law states that **"**The algebraic sum of all voltages around any closed loop in a circuit is equal to zero**". i.e.** $\Sigma V = 0$.

In another way we can say that "The sum of all the potential differences around the loop must be equal to zero .

Let's take an example to prove kirchhoff's voltage law



Here 5kohm,3kohm,2kohm resistor connected in parallel .

Let us assume that the current flowing through the circuit is I and voltage across 5kohm,3kohm,2kohm is V1,V2,V3 .

According to KVL,

10V-V1-V2-V3=0

10V=V1+V2+V3.

As all the resistors connected in series is I = 10v/(5+3+2)ohm = 1 milliampere.

As all the resistors are connected in series , the current will remain same .

So , V1=5*1=5 Volts

V2=3*1=3 Volts

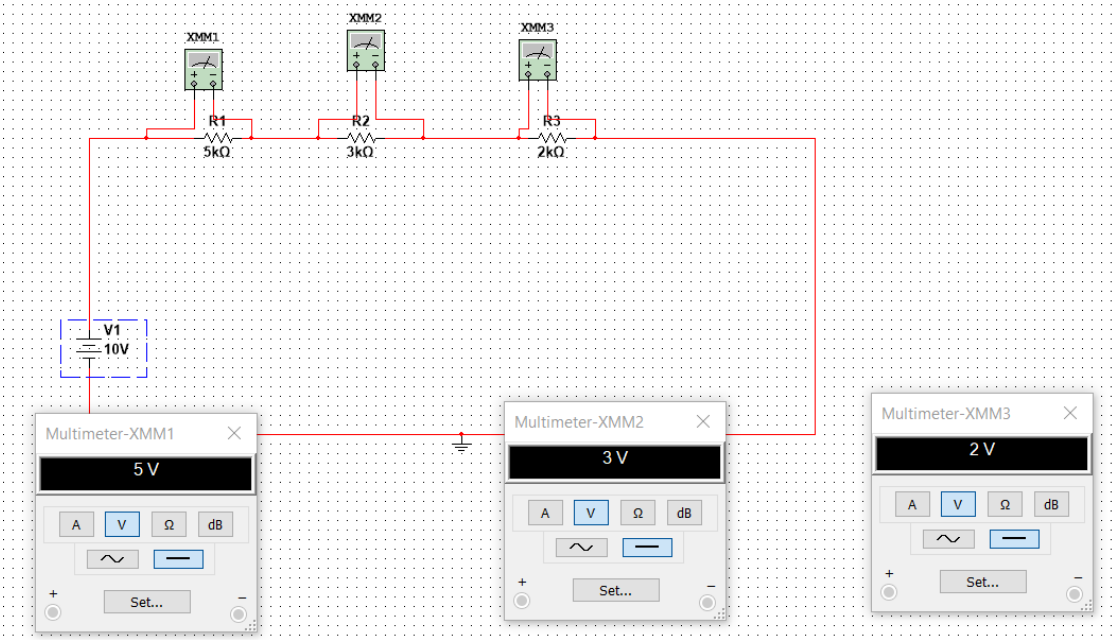
V3=2*1=2 Volts

Now according to Kirchhoff's law ,

10V=V1+V2+V3

=5+3+2 =10V (Kirchhoff's voltage law is theoretically proved)

CIRCUIT DIAGRAM :



RESULTS AND OBSERVATIONS :

When the circuit was constructed on Multisim the results obtained were same as the results we got while theoretically equating Kirchhoff's voltage equation . As you can see by using multimeter in Multisim the voltage across V1 i.e.5k ohm is 5V , across V2 i.e.3k ohm and across V3 i.e. 2K ohm is 2V . By adding all together we get 10V same as the voltage proved across the circuit 10V .

Hence Kirchhoff's Voltage law is proved .