# SNS COLLEGE OF ENGINEERING

Kurumbapalayam (Po), Coimbatore – 641 107

**An Autonomous Institution**

Accredited by NBA – AICTE and Accredited by NAAC – UGC with 'A' Grade
Approved by AICTE, New Delhi & Affiliated to Anna University, Chennai

## DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

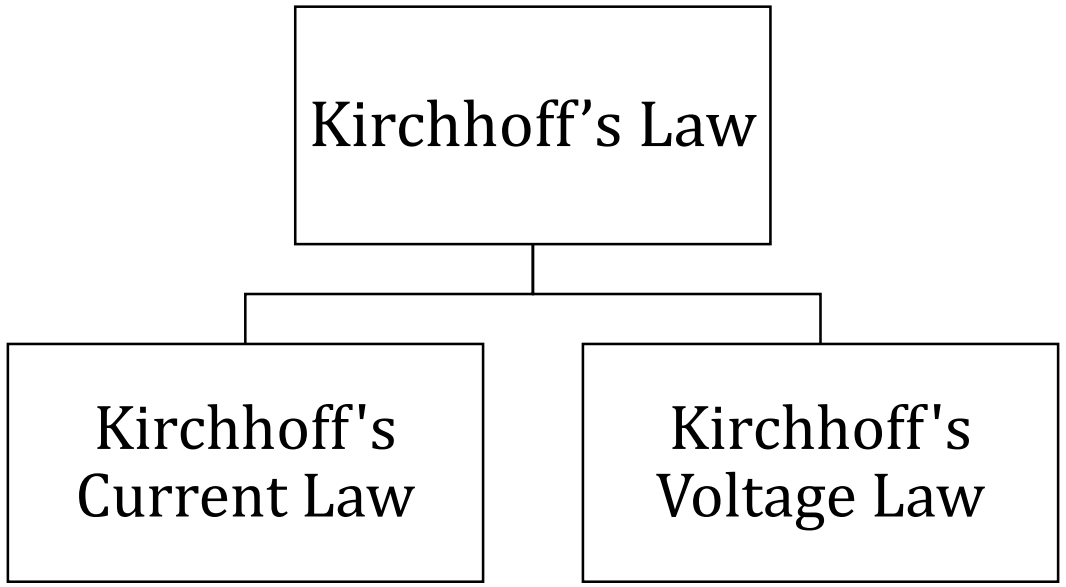
## COURSE NAME : 19EE01 BASIC ELECTRICAL AND ELECTRONICS ENGINEERING

I YEAR /I SEMESTER INFORMATION TECHNOLOGY

Unit 1 – Electrical Circuits and Measurements

Kirchoff's Law

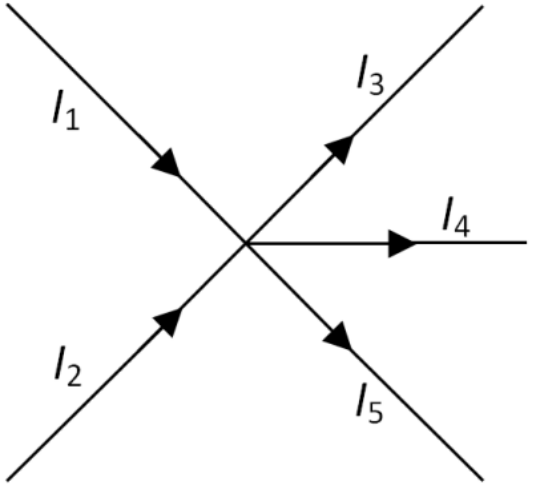
# KIRCHOFF'S LAW




Gustav Robert Kirchhoff
(1824-1887)

# KIRCHHOFF'S CURRENT LAW

In an electrical circuit, the current flows rationally as electrical quantity. As the flow of current is considered as flow of quantity, at any point in the circuit the total current enters, is exactly equal to the total current leaves the point. The point may be considered anywhere in the circuit.

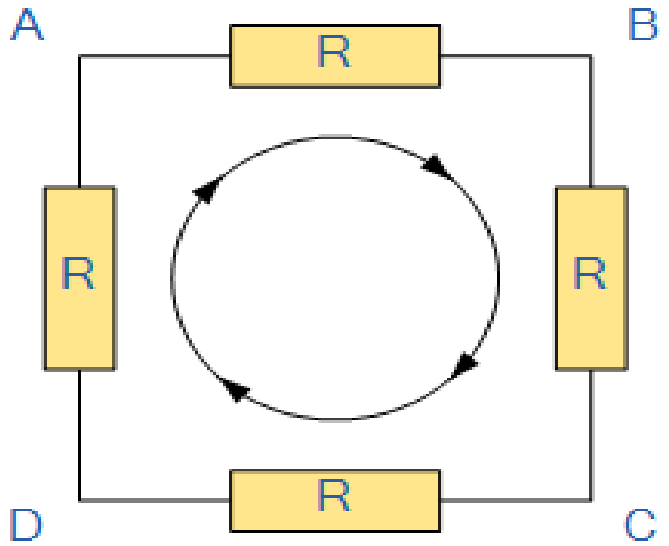



$$I_1 + I_2 = I_3 + I_4 + I_5$$

# KIRCHHOFF'S VOLTAGE LAW

- Kirchoffs Voltage Law or KVL, states that “in any closed loop network, the total voltage around the loop is equal to the sum of all the voltage drops within the same loop” which is also equal to zero. In other words the algebraic sum of all voltages within the loop must be equal to zero.

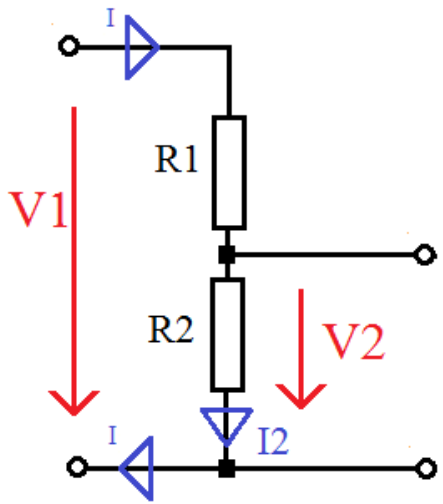
The sum of all the Voltage Drops around the loop is equal to Zero




$$V_{AB} + V_{BC} + V_{CD} + V_{DA} = 0$$

# VOLTAGE DIVISION RULE

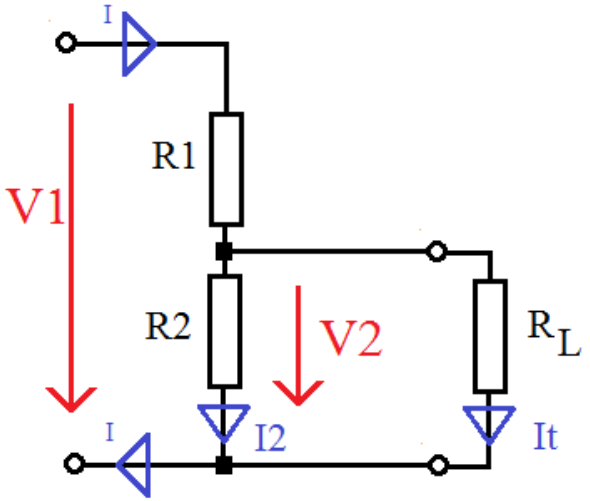
Without Load




$$I = \frac{V1}{R1 + R2} = \frac{V2}{R2}$$

$$\frac{V1}{V2} = \frac{R1 + R2}{R2}$$

With Load

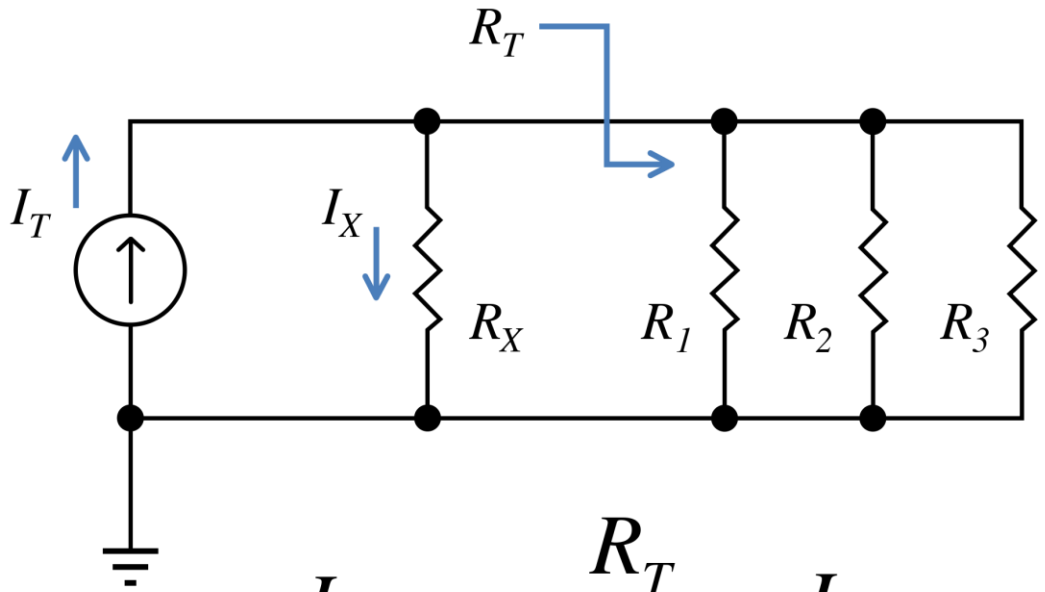



$$I = \frac{V1}{R1 + (\ R2 \times R_L\ )} = \frac{V2}{(\ R2 \times R_L\ )}$$

$$I = I_2 + It$$
$$I_2 = V2 / R2$$
$$It = V2 / R_L$$

$$\frac{V1}{V2} = \frac{R1 + (\ R2 \times R_L\ )}{(\ R2 \times R_L\ )}$$

# CURRENT DIVISION RULE




$$I_X = \frac{R_T}{R_X + R_T} I_T$$

# PROCEDURE FOR APPLYING RULES

1.Assume all voltage sources and resistances are given. (If not label them V1, V2 ..., R1, R2 etc)

2. Label each branch with a branch current. (I1, I2, I3 etc)

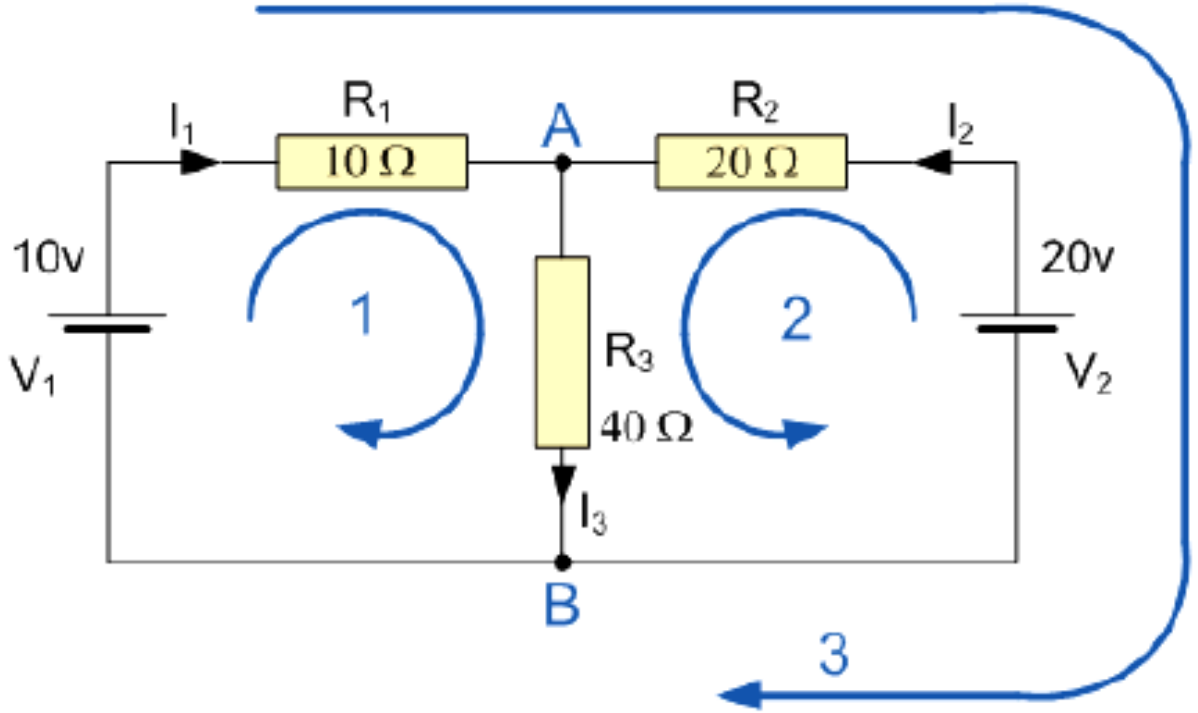
3. Apply junction rule at each node.

4. Applying the loop rule for each of the independent loops of the circuit.

5. Solve the equations by substitutions/linear manipulation.

# ASSESSMENT 1

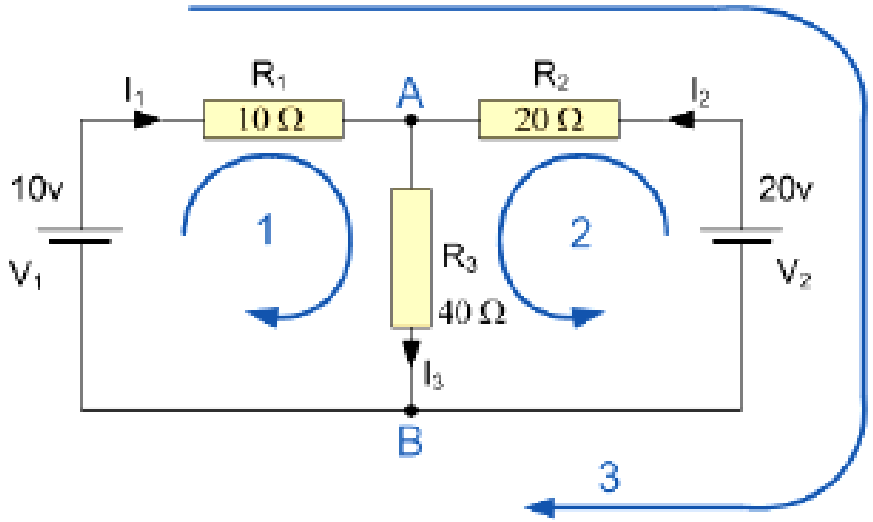
Determine the values of the current flowing through each of the resistors.



# SOLUTION

The circuit has two nodes (at A and B). We have the choice of choosing only two of the three loops shown (blue). This is because only two of the loops are independent.

- Node A
- Node B
- Loop 1
- Loop 2 $I1+I2=I3$ $I3=I1+I2$
- $10-I1R1-I3R3=0$
- $20-I2R2-I3R3=0$



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2. Muthu subramanian R, SalivahananS,“ Basic Electrical and Electronics Engineering”, Tata McGraw Hill Publishers, (2009)
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# THANK YOU