JOB ROLE – **LINEMAN DISTRIBUTION**

Sector: Power
(Qualification Pack Code : PSS/Q0102)

PSS Central Institute of Vocational Education
Shyamla Hills, Bhopal – 462013, Madhya Pradesh, India

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Unit 1: Basic Electricity -1

Session 2: Basic Units and Definition of Electricity

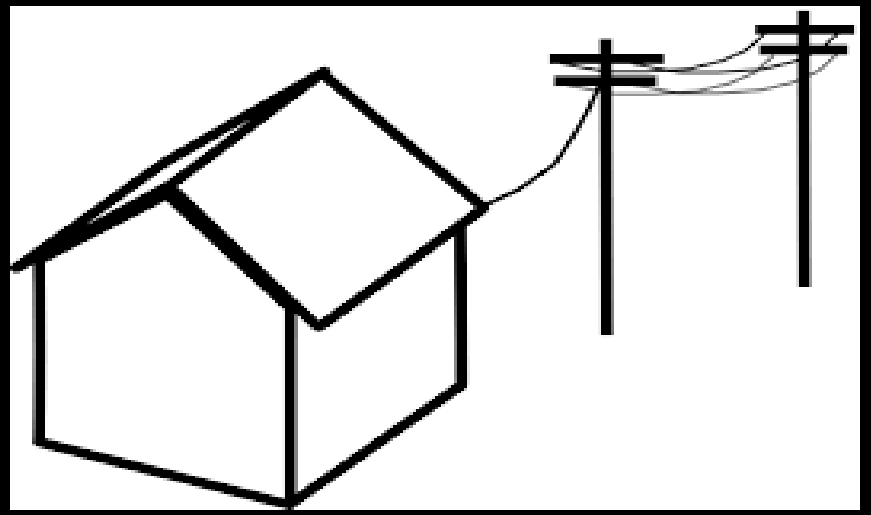
Content

Session Objectives

1. The student will be able to develop his skills for productive efficiency.
2. Understand the basic electrical quantities.
3. develop his skills for productive efficiency.

Electricity

Electricity: - It is something real which cannot be seen but its effects are felt. It may be define as a form of energy.



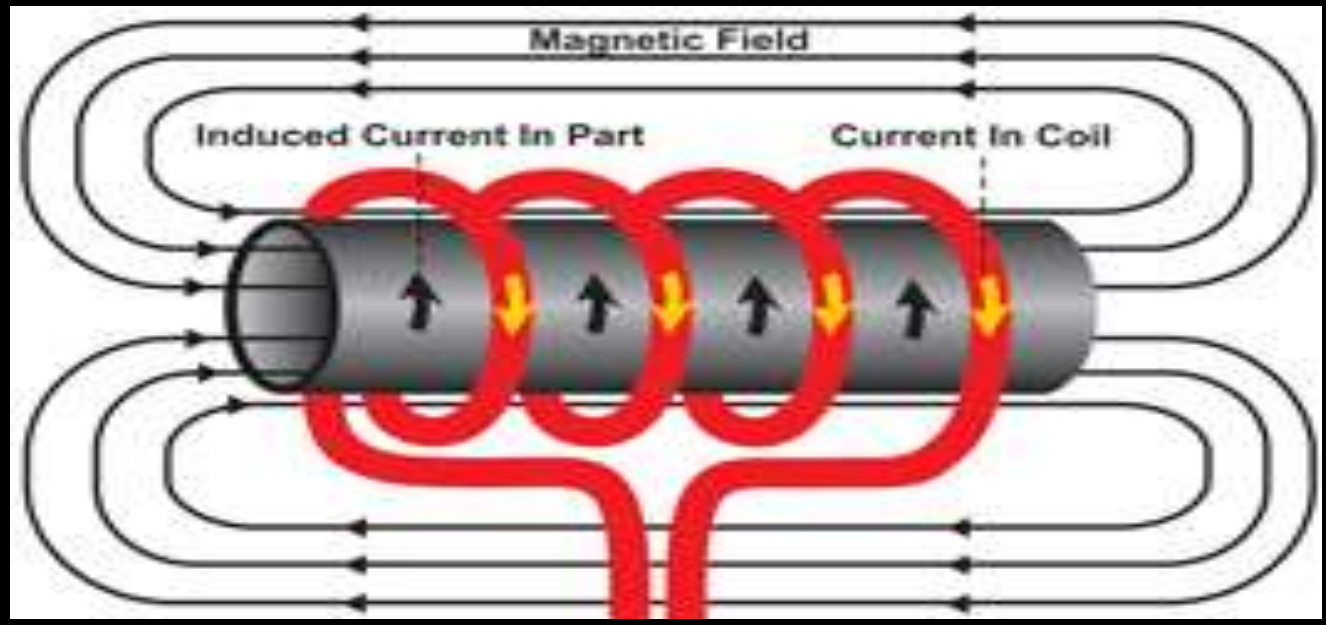
Effects of Electric Current are

Heating Effect: Heat is produced in the conductor like ni-crome due to flow of current through it is called heating effect of electric current or joules effect of electrical current.

Light Effect:- When electricity flowing through a conductor like tungsten, light emitted from the surface of conductor. It is called light effect of electric current.

Chemical Effect: - When current passed through an electrolyte, it breaks up in its ions. This breaking effect is known as Chemical effect of electric current

Magnetic Effect:- It was describe by Faraday. A magnetic field is produced around the conductor through which current is flowing. This effect is called is called Magnetic effect of electric current.



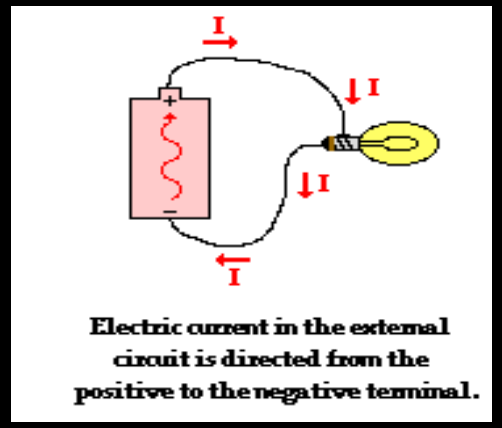
Physical Effect: - When electricity flowing through the human body, contraction of nerves take place, which may be dangerous for his life. This is called physical effect of electric current.

- **Definition of Voltage, Current, Resistance, Capacitance and Inductance.**
- If two objects placed with charged to different potential side by side, charges will not move from one to the other, Now if the two are connected using a wire or a conductor like copper wire the flow of charges takes place. Charge will flow as long as there is a difference of potential between the two objects. The flow stops as soon as their potential becomes equal. This flow of electric charge is called electric current.
- The potential difference (P.D.) of one volt between two points is the measure of work done in moving one coulomb of charge across them.
- It is easily understand air current (air flow) and water current (water flow). We know that flowing water constitute water current in rivers. Similarly, if the electric charge flows through a conductor like a copper wire it says that there is an electric current in the conductor. In a torch, the cells provide flow of charges or an electric current through the torch bulb to glow.

- It has also seen that the torch gives light only when its switch is on. A continuous and closed path of an electric current is called an electric circuit. Now, if the circuit is broken anywhere the current stops flowing and the bulb does not glow. Electric current is expressed by the amount of charge flowing through a particular area in unit time. In other words, it is the rate of flow of electric charges.
- Let us understand the analogy water flow. Water will not flow in a perfectly horizontal tube. If one end of the tube is connected to a tank of water kept at a higher level, such that there is a pressure difference between the two ends of the tube, water flows out of the other end of the tube. For flow of charges in a conducting wire, the voltage play a great roal the electrons move only if there is a difference of electric pressure called the potential difference or voltage. This difference of potential may be produced by a battery, consisting more than one electric cells. The chemical action within a cell generates the potential difference across the terminals of the cell, when no current is drawn from it. When the cell is connected to a conducting circuit element, the charge flows from one end to other.

Current: - Flow of electrons in any conductor is called current.

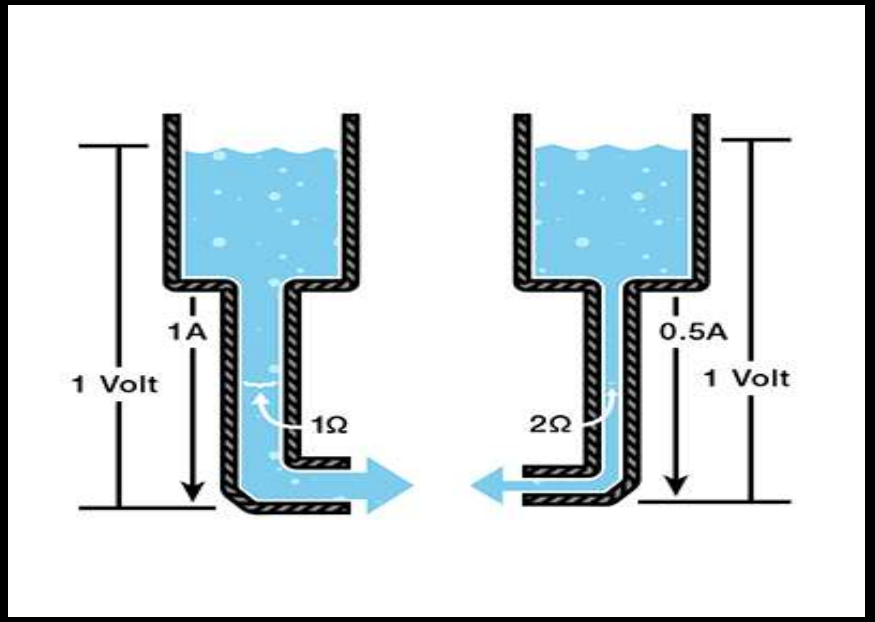
If electron (charge) flows through some region, say a wire of copper, we say that there is an electric current in that region. Like flow of current through the copper wire. Like a river current is the flow of water molecules, electricity current is the flow of charged particles.
Unit: Ampere

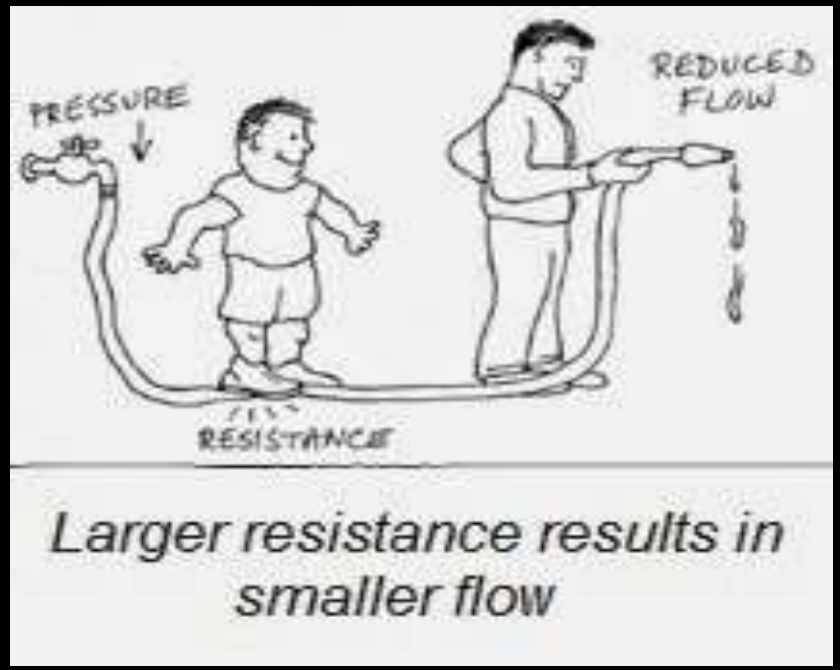


Electric current in the external circuit is directed from the positive to the negative terminal.

Resistance : It is a property of a substance which opposes the flow of electrons is called resistance.

The ratio of the voltage and current is called the electric resistance of the conductor. So we say that Electric resistance is the ratio of one volt and one ampere. Or We can say that Ohm Ω



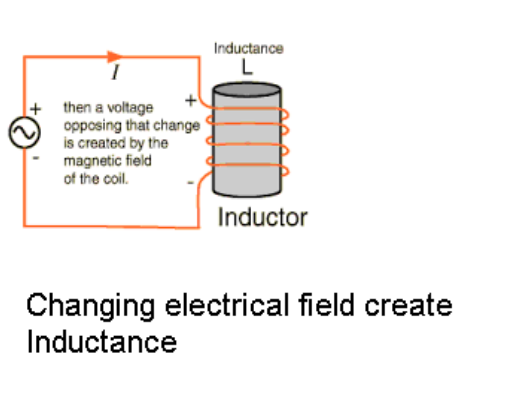


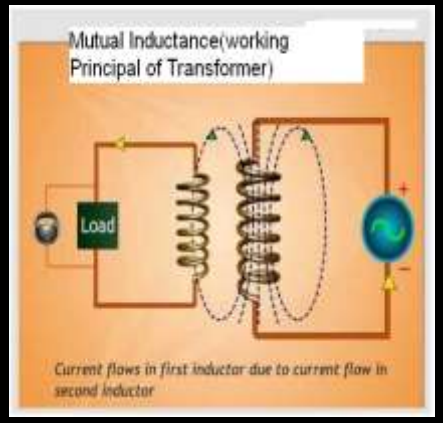
Capacitance

- Capacitance is the capability of a device for storing electric charge. Capacitance is expressed as the ratio of stored charge in coulombs to the impressed potential difference in volts.
- Unit- Farad
- In an electric circuit the device who store charge is called Capacitor. The ratio of the charge Q on one of the plates of a capacitor and potential difference V between the plates; that is, capacitance (formerly called capacity) is
- $C = Q/V$.

Inductance:

- If a changing magnetic field called flux is linked with a coil of a conductor there should be an electromotive force induced in it. The property of the coil of inducing electromotive force due to the changing flux linked with it is known as **inductance of the coil.** Due to this property all electrical coil can be referred as **inductor.** In other way, an inductor can be defined as an energy storage device which stores energy in form of magnetic field.
- Unit – Henry

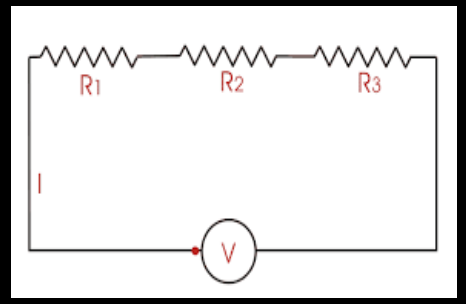


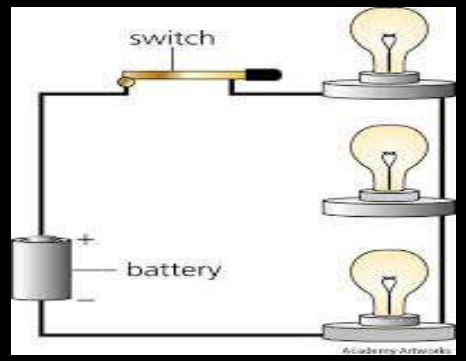


Understanding Series and Parallel Circuit

- **Series Circuit:**

If two or more lamp (Load) are connected in such a way that they form the shape of chain, one after the other, so that each carries the same current when the combination is connected the supply source. They are said to connected in series. This circuit is called series circuit.

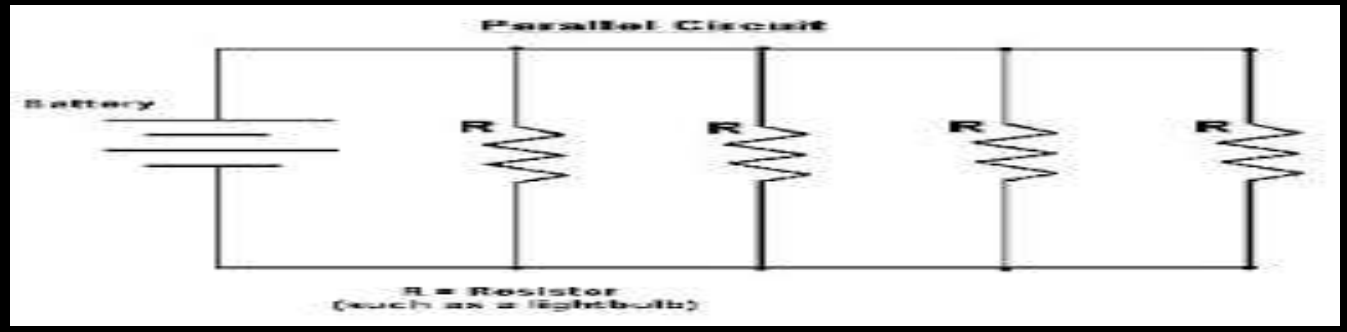


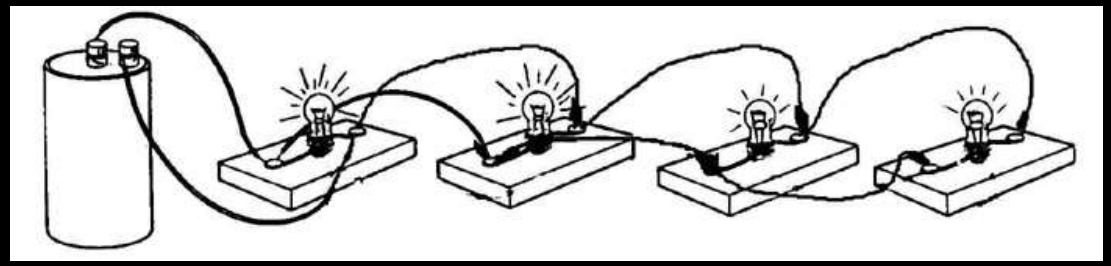


- **In series Circuit:**
- **Resultance Resistance R=R1+R2+R3**

- **Parallel Circuit:**

When two or more bulb (load) are connected in such a way that each form a separate path for a part of total current, they are said be arrange in parallel and circuit is called parallel circuit.

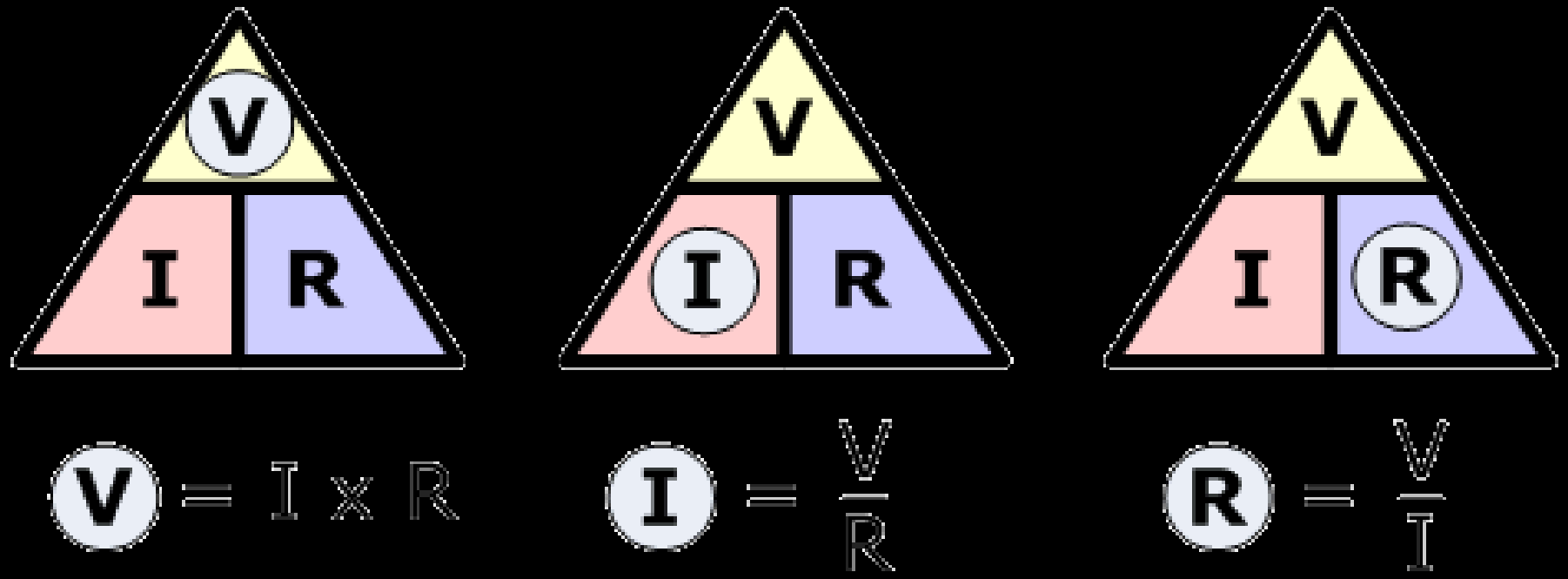




- **In Parallel Circuit:**
- **Resultance Resistance 1/R=1/R1+1/R2+1/R3**

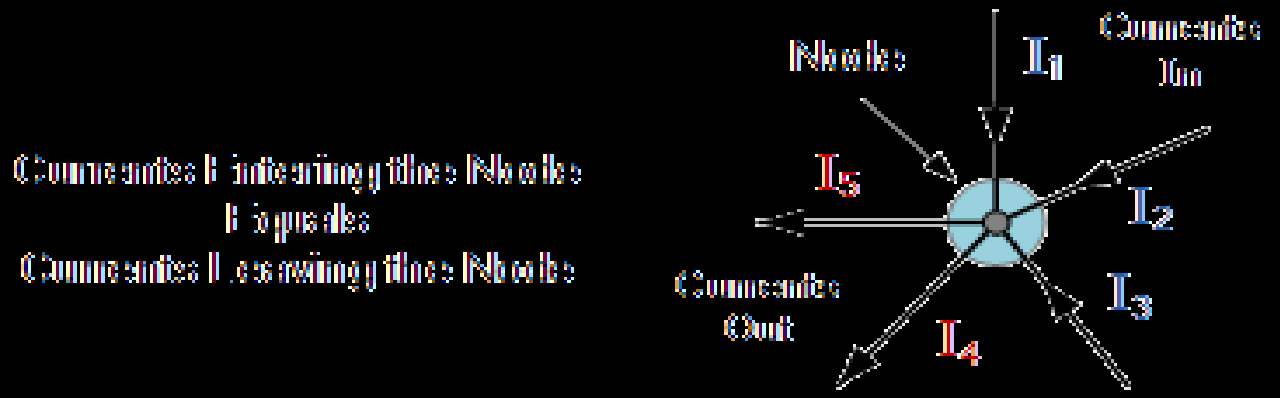
Ohm’s Law and Kirchhoffs Law

- **Ohm’s Law:** In any electrical circuit when physical condition (Temp, Dia, and Length) is constant Voltage is directly propos anal to the current.
- Mathematically: V α I



Kirchhoffs Current Law or KCL

- It states that the *total current or charge entering a junction or node is exactly equal to the charge leaving the node, as no charge is lost within the node*. In other words the algebraic sum of ALL the currents entering and leaving a node must be equal to zero, I(current entering in the node) + I(current leaving the node) = 0.
- This idea by Kirchhoff is commonly known as the **Conservation of Charge** or Kirchhoffs Current Law



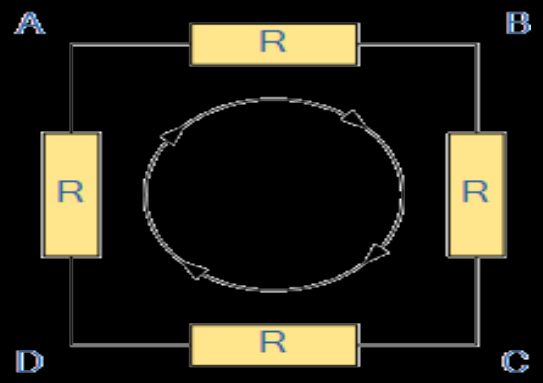
$$I_1 + I_2 + I_3 = (-I_4 + -I_5) = 0$$

- Here, the 3 currents entering in the node, I_1, I_2, I_3 are all positive in value and the 2 currents leaving the node, I_4 and I_5 are negative in value.
- Then this means we can also rewrite the equation as:
- $I_1 + I_2 + I_3 – I_4 – I_5 = 0$

Kirchhoffs Second Law – The Voltage Law, (KVL):

Kirchhoffs 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. This is called Kirchhoff second Law or law of the Conservation of Energy.

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



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

Starting at any point in the loop continue in the same direction noting the direction of all the voltage drops, either positive or negative, and coming back to the same starting point. It is important to maintain the same direction either clockwise or anti-clockwise or the final voltage sum will not be equal to zero. We can use Kirchhoff's voltage law when analyzing series circuits.

When analyzing either DC circuits or AC circuits using **Kirchhoffs Circuit Laws** a following definitions and terminologies are used to describe the parts of the circuit being analyses such as:

1. Node 2. Paths 3. Loops 4. Meshes

These terms are used in circuit analysis so it is important to understand them.

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