ELEMENTS OF ELECTRICAL ENGINEERING
UE24EE141B

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Lecture 1 - Network Terminology & Basic Concepts

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Network Terminology

Electrical Network:

An interconnection of electrical elements.

Electrical Circuit:

An electrical network with at least one source and a sink and having a closed path for current flow.

Network Terminology

Active Element:

An element which supplies or delivers energy in an electrical network.
Eg: Voltage Sources & Current Sources

Passive Element:

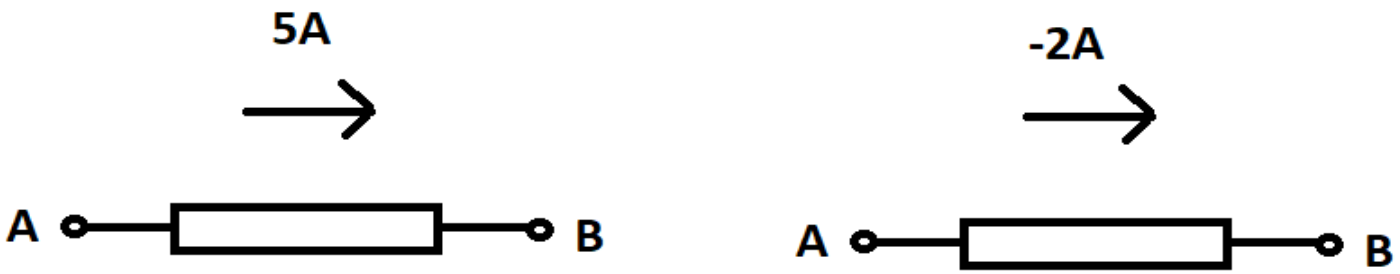
An element which absorbs or stores energy in an electrical network.
Eg: Resistors, Inductors & Capacitors

Electric Current

An electric current is defined as the rate of flow of charges across the cross section of a conductor.

It is given by, $I = \frac{Q}{t}$ (or) $i = \frac{dq}{dt}$

It is measured in Amperes (A) & 1 Ampere = 1 Coulomb/sec

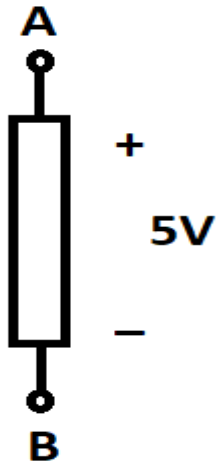


Potential Difference

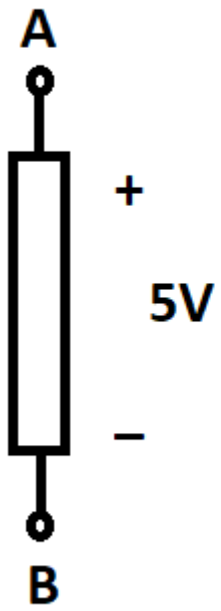
The energy required to move unit positive charge from one terminal to another is defined as the potential difference between the terminals.

It is given by, $V = \frac{W}{Q}$

It is measured in Volts (V) & 1 Volt = 1 Joule/Coulomb

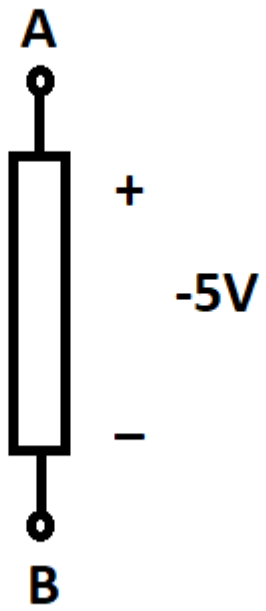


Double Subscript Notation for Voltage



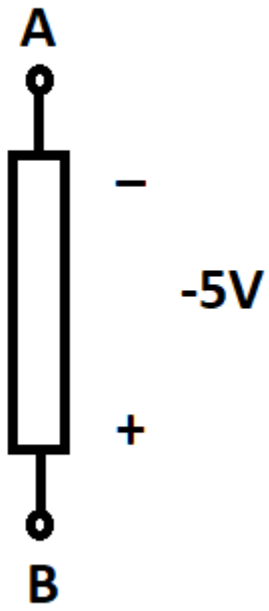
(a)

V_{AB} = 5V



(b)

V_{AB} = -5V



(c)

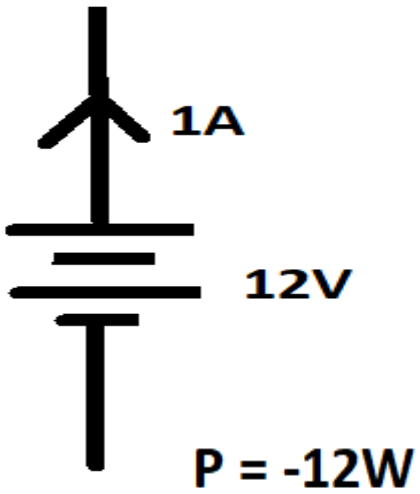
V_{AB} = 5V

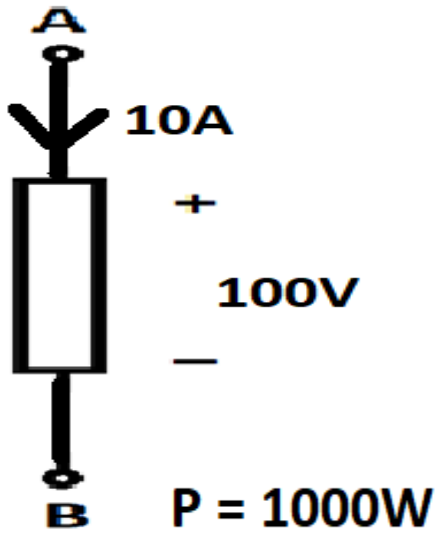
Electric Power

The rate of absorption or delivery of Electrical energy is called Electrical Power.

It is given by, P = V*I

It is measured in Watts (W) & 1 Watt = (1 Volt)*(1 Ampere)





Ohm's Law

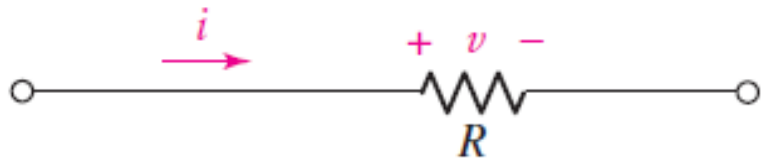
At a constant temperature, the potential difference across the terminals of a conductor is directly proportional to the current flowing through it.

i.e., $V \propto I$

$V = R*I$

Here, R is the electrical resistance of the conductor.

It is measured in Ohms (Ω) and 1 Ohm = 1 Volt/Ampere



Ohm's Law

Resistance of a conductor is the opposition offered to the flow of current through it.

It depends on the resistivity of the material & its dimensions.

i.e., $R = \frac{\rho l}{A}$

Where, ρ is the resistivity measured in Ohm-m

Conductance, $G = \frac{1}{R}$

It is measured in Siemens (S)

Active and Passive Sign Conventions

Active sign convention:

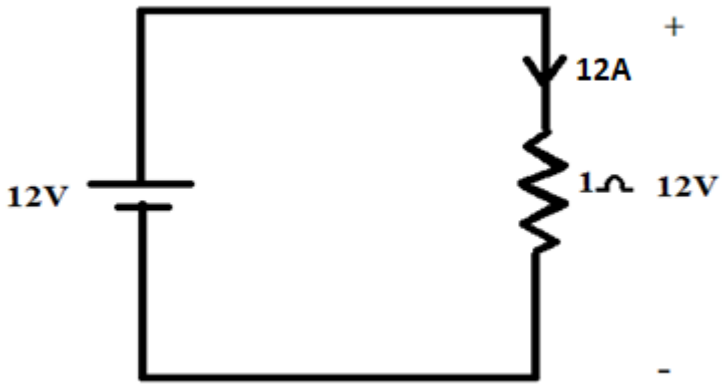
Applicable to active elements

It says “current leaves positive terminal in an active element”.

Passive Sign Convention:

Applicable to passive elements

It says “current enters positive terminal in a passive element”.



Text Book & References

Text Book:

"Electrical and Electronic Technology" E. Hughes (Revised by J. Hiley, K. Brown & I.M Smith), 11th Edition, Pearson Education, 2012.

Reference Books:

1. "Basic Electrical Engineering", K Uma Rao, Pearson Education, 2011.
2. "Basic Electrical Engineering - Revised Edition", D. C. Kulshreshta, Tata- McGraw-Hill, 2012.
3. "Engineering Circuit Analysis", William Hayt Jr., Jack E. Kemmerly & Steven M. Durbin, 8th Edition, McGraw-Hill, 2012.

THANK YOU

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