1 - Introduction

An electric circuit is an interconnection of electrical elements

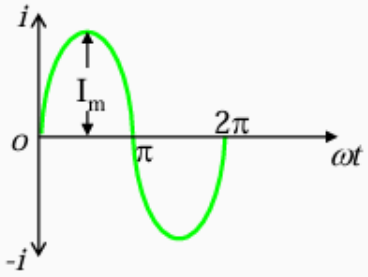
Electric current is the time rate of change of charge, measure in amperes (A)

Mathematically, the relationship between current i, charge q, and time t is

$$i = \frac{dq}{dt}$$

A direct current (dc) is a current that remains constant with time.

An alternating current (ac) is a current that varies with time



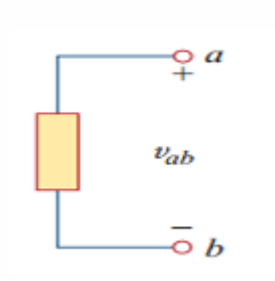
$$i = \mathrm{I_m} \sin \omega t$$

Frequency of the power supply of our country is 50 Hz.

Voltage: Voltage (or potential difference) is the energy required to move a unit charge through an element

Unit of voltage is volt(V)

Point a is at a potential of v_{ab} volts higher than point b



$$v_{ab} = -v_{ba}$$

Circuit Elements

Circuit elements are two types

- Passive element
- Active element

An active element is capable of generating energy

- Generator

An passive element can not generate energy

- Resistor
- Inductor
- Capacitor

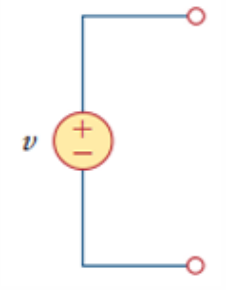
Source

Sources are two types

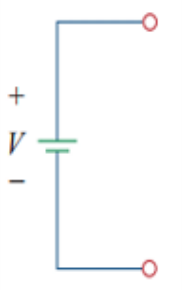
1. Independent source
2. Dependent source

Independent Source

An ideal independent source is an active element that provides a specified voltage or current that is completely independent of other circuit elements



Voltage source

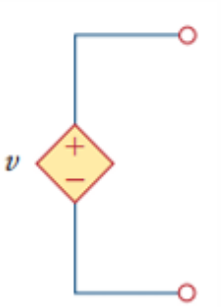


Voltage source (DC)

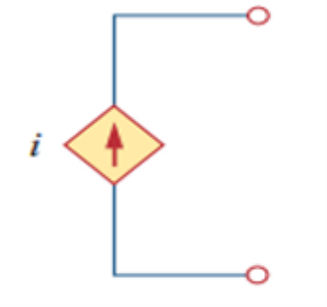
Current source

Dependent Source

An ideal dependent (or controlled) source is an active element in which the source quantity is controlled by another voltage or current



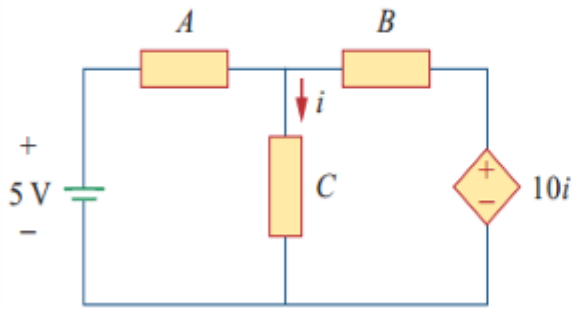
Dependent voltage source



Dependent current source

Dependent sources are four types

1. Voltage-controlled voltage source (VCVS)
2. Current-controlled voltage source (CCVS)
3. Voltage-controlled current source (VCCS)
4. Current-controlled current source (CCCS)



Current-controlled voltage source