Chapter 1

The basic electrical quantities are:

- Electric Charge.
- Electric Current.
- Electric Potential Difference or Voltage.
- Energy and Power.

Electric Charge (Q or q)

- Charge is the most fundamental quantity of electric circuits.
- There are two types of the electric charges:

1) Negative charge (Electron), which is -1.602×10^{-19} C
2) Positive charge (Proton), which is 1.602×10^{-19} C

Measuring units: Coulomb (C)

Electric Current (I or i)

- Electrical current is the time rate of flow of electrical charge through a conductor or circuit element.

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

- i = current flow (ampere)
- q = charge (coulomb)
- t = time (second)

- The unit is Ampere (A), which is equivalent to coulombs per second (C/Sec).

Electric Potential Difference or Voltage (*v*)

- The voltage across an element is the work (energy) required to move a unit charge from one point to the other.

$$v = \frac{dw}{dq}$$

- v = voltage (volt)
- q = charge (coulomb)
- w = Energy (joule)

- The unit of voltage is volt (V), which are equivalent to joules per coulomb (J/C).

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Energy (w) and Power (p).

- Energy is the capacity to do work, measured in joules (J).
- Power is defined as the time rate of change of doing work, measured in watt (W).

$$p = \frac{dw}{dt}$$

- p = power (watt)
- w = Energy (joule)

$$p = \frac{dw}{dt} = \frac{dw}{dq} * \frac{dq}{dt} = v * i$$

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Power Balancing.

- Foe any electric circuit, the power may be supplied (delivered or developed) or dissipated absorbed or consumed).

- The amount that is supplied must be equal to the amount that is absorbed.

$$\sum p_{supplied} = \sum p_{dissipated}$$