Contents

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1 Lecture 1

1.1 Volt calssification

- up to 1000V » Low voltage
- between 1kV and 50kV » Mideum voltage
- between 50kV and 500kV » High voltage

1.2 Electric circuits

For the circuits to be a circuit it needs:

- A supply
- A load
  - Light
  - Heat
  - Mechanical energy aka a motor
- A wire
- A switch

1.3 Basic circuit quantities

Most common types of wire are copper (Cu) and aluminum (Al).

1. The charge (q > coulumb)
2. The current (I > ampere = C/S)

   The rate of change of the quantity of charges.

   $I = \frac{dq}{dt}$ > differentiation of the charge

   $q = \int i(t).dt$ > integration of the current

   Example:

   $q = 12e - 12t \rightarrow I = 12(-12)e - 12tmA$
3. The potential difference (V > volt = J/C)

   The energy affecting the charge to move it a certain distance.

   $V = \frac{dW}{dq}$
4. The electrical energy (W > joule)
5. The electrical power (P > watt = J/S)

   $p = \frac{dW}{dt} = I \times V = V \times I = I^2 \times R = \frac{V^2}{R}$

1.4 Basic circuit analysis

1. DC circuits

   Constant voltage and current.
2. AC circuits

   Alternating voltage and current.

1.5 Basic circuit elements

1. Passive elements

   Elements that absorb the electrical energy.

   - The most common passive elements:
     - The resistor (R > ohm) (DC & AC)
     - The electrical coil (L > henery) (AC only)
     - The capacitor (C > farad) (AC only)

2. Active elements

   Elements that generate the electrical energy.

   (a) Current source
   Identified from the direction.

   - Independant
     Constant current intensity.
   - Dependant (Voltage controlled -Vx- || Current controlled -Iy-)
     Variable current intensity.

   (b) Voltage source
   Identified from the polarity.

   - Independant
     Constant voltage
   - Dependant (Voltage controlled -Vy- || Current controlled -Io-)
     Variable voltage

1.6 Basic circuit laws

1. Ohm's law

   $V = I \times R$

   - Power types (Conventional sign rule)
     Only applied when both the current and voltage are positive.

     (a) Power absorbed
     Current enters the element from the positive side.

     (b) Power supplied/delivered
     Current leaves the element from the positive side.

   For any balanced circuit (with an ideal wire) the sum of the power consumed equals the sum of the supplied power

2. Kirchoff's law

   [NEXT LECTURE]