23/10/17

Basic Electrical

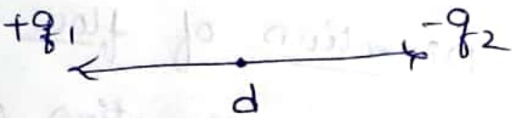
→ $e^- = -1.6 \times 10^{-19} C$

→ mass of an Electron $= 9.1 \times 10^{-31}$ kg / 9.1×10^{-28} gm

→ $Q = ne$

→ **Charge** :- charge is that basic property of a body by virtue of which is either produces or experiences any electric or magnetic force.

→ **Coloumbs law**:-



Force $\propto q_1 q_2$, Force $\propto \frac{1}{d^2}$ $\quad F = \frac{1}{4\pi\epsilon_0} \cdot \frac{q_1 q_2}{d^2}$ Newtons

* in free space the relative permitivity $\epsilon_r = 1$

→ charge is Quantised in nature $Q = ne$

Method of charging a body:-

1. Method of conduction
2. Method of Induction

Current:-

$$I = \frac{dq}{dt} \text{ c/sec (or) Amperes S.I units.}$$

Q) if a charge expression is given by $Q = 0.625(1 - e^{-0.5t})$ Find the value of current at $t = 0$?

$$I = \frac{dq}{dt} \Rightarrow \frac{d}{dt}\left(0.625(1 - e^{-0.5t})\right)$$

$$\Rightarrow \frac{d}{dt}(0.625) - \frac{d}{dt}(0.625\, e^{-0.5t})$$

$$\Rightarrow (-0.625) \times (0.5)\, e^{-0.5t}$$

$$= 0.3125$$

Q) $Q = 3t^2 + 5t + 5$, $t = 5$ sec , I

$$I = \frac{dQ}{dt}$$

$$= \frac{d(3t^2 + 5t + 5)}{dt}$$

$$= \frac{d}{dt}(3t^2) + \frac{d}{dt}(5t) + \frac{d}{dt}(5)$$

$$= 6t + 5 + 0$$

$$= 6(5) + 5$$

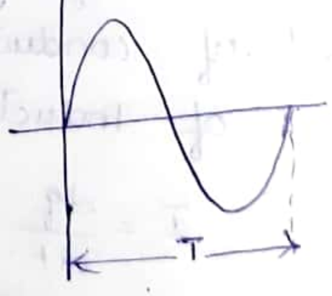
$$= 35 \text{ amp (or) C/sec}$$

→ **Conventional Direction of flow of current:-**

the conventional direction of flow of current through external ckt from battery +ve terminal to -ve terminal. the magnitude of flow of current at any section of the conductor is the flow of electron i.e. charge flowing per second.

→ Frequency :- cycle / sec

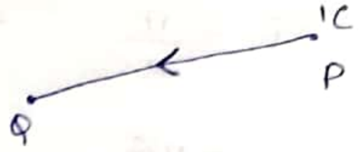
$$T = \frac{1}{f}$$



* if frequency is increased then eddy current losses increase $\therefore P_e \propto f^2$

→ **Electric field:-** the locus of unit +ve charge is called electric field.

→ **potential** :- $V = \frac{W}{Q}$ — W: joules, Q: coloumbs



Scientist → Alessandro volta

→ **EMF** :- electro motive force → volts

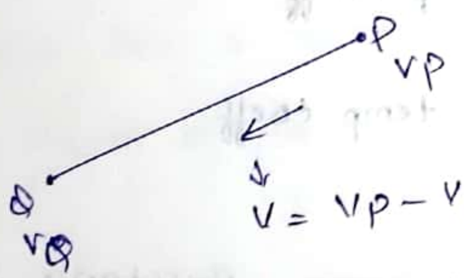
Q) 1 volt defination $1V = \frac{1\ \text{joule}}{1\ \text{coloumb}}$

Q) How much work is done a charge of 2 coloumb across two point having p.d of 12V.

$V = \frac{W}{Q} \Rightarrow W = QV \Rightarrow W = 2 \times 12 = 24$ joules

~~$W = \frac{Q}{V} = \frac{2}{12} = \frac{1}{6}$ joules~~

→ **potential difference** :-



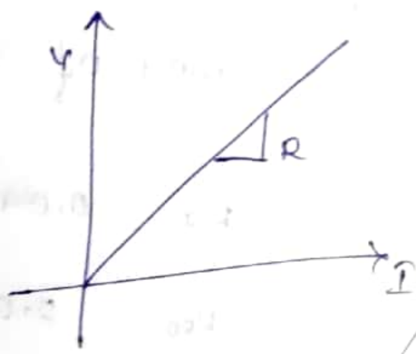
$V = V_P - V_Q$

→ **ohm's law** :- (George Simmon ohm)

$V \propto I \Rightarrow V = IR$ → Resistance (constant)

$y = mx$

↓ V, R, I



$\Rightarrow I = \frac{V}{R}$ $\rightarrow \frac{1}{R} = G$ (conductance) $\xrightarrow{\text{unit}}$ ℧

$I = VG$

→ **temperature const:- (α) coeffient**

Cu = 0.00395 /°C , magnin = 0.00015 /°C

$$R_t = R_0 [1 + \alpha \Delta t]$$

→ α : temperature Coeffient
→ Δt : temperature Differenu

$$H = I^2 R t$$

→ **temperature coefficient of Resistance:-**

- Conductor → +ve temp coeff
- Insulator →
- Semiconductor →

} -ve temp coeff

→ Heat α Temperature increase Resistance ↓

→ temp ↑ Resistance ↑

Q) Calculate the Resistance of copper at 50°C if at 15°C the resistance of copper is 0.04 Ω ($\alpha_{cu} = 0.0004/°C$)

$$R_t = 0.04 [1 + 0.0004 (35)]$$

$$R_{50} = 0.04 + 0.04 \times 0.0004 \times 35$$

= 0.04056 Ω

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