Current-Electricity

NEET - 2-3

JEE Mains (1-2)

⇒ Experiment - board

⇒ Conductor :- $\sim 10^{28}$ electrons/m^3

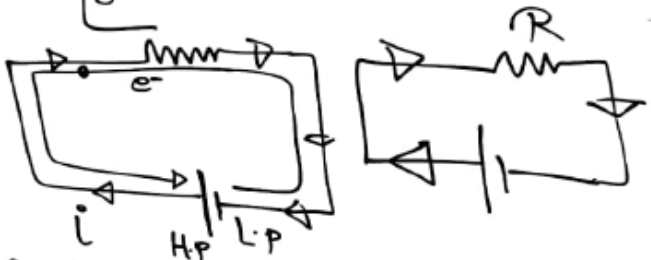
** :- Conducting wire.

or "Current due to movement of free electron"

⇒ Defⁿ of Current ≠ Rate of flow of Charge.

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

$dq \rightarrow$ dt



⇒ Dirⁿ of Current :- opposite to flow of electron.

⇒ Dirⁿ of current :- flow of positive charge.

⇒ Current is a fundamental quantity

⇒ SI Unit - Ampere ⇒ C/Sec

Dimension = [A]

Current is a tensor quantity

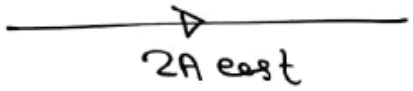
OR

Is a Scalar quantity

Current-Electricity

Vector quantity : Magnitude + direction + follow vector law
2 m/s, east

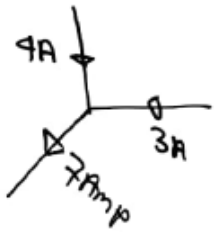
Scalar quantity → Magnitude + may be direction + Not follow vector law



Ex)

$= R = \sqrt{3^2 + 4^2 + 2 \times 3 \times 4 \cos 90^\circ} = \sqrt{25}$
$= 5$

Ex)



Current-Electricity

$\Rightarrow$ Electric Current

Average Current $i_{av} = \frac{\Delta q}{\Delta t}$

$\Delta q \to$

Δt

$i_{av} = \frac{\Delta q}{\Delta t}$

$dq \to$

dt

$dt = 0.00\ldots$

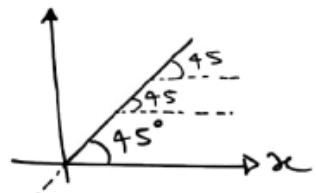
$i_{in} = \frac{dq}{dt}$

$i_{in} = \frac{d(q)}{dt}$

Current-Electricity

(#) **Slope :-** Value of θ with +x axis on line in A.C.W. Hence, Slope is equal to tan(Ang

(a)



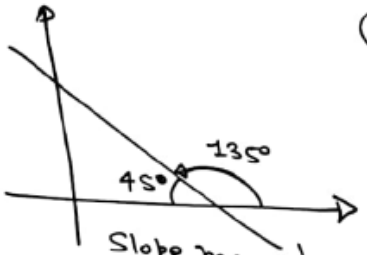
line Slope = $\tan 45°$

$m = 1$

Slope = Constant

Straight line

(b)

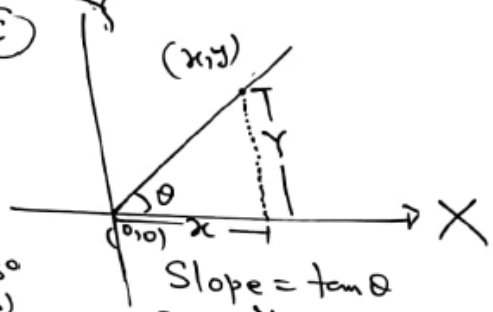


Slope $m = \tan 135°$

$= \tan(90+45)$

$= -\cot 45 = -1$

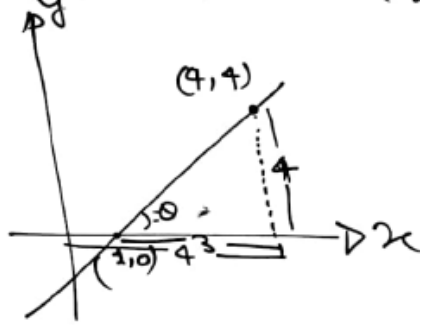
(c)



Slope = $\tan\theta$

$m = \frac{y}{x}$

$\left(\tan\theta = \frac{Y}{x}\right)$

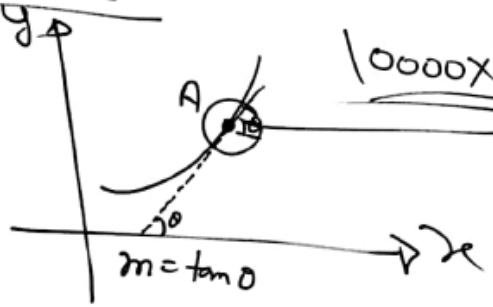


Slope = $\tan\theta = \frac{4}{3}$

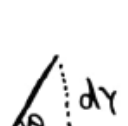
$\tan\theta = \tan 53°$

$\theta = 53°$

(d) (e)



10000x Room

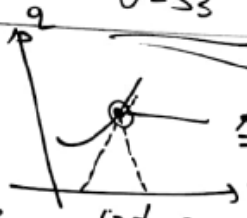


Slope = $\tan\theta = \frac{dy}{dx}$

Slope = $\frac{dy}{dx}$

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

Slope of q-t graph give instantaneous current



$i = \tan\theta$

$\tan\theta = \frac{dq}{dt}$

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

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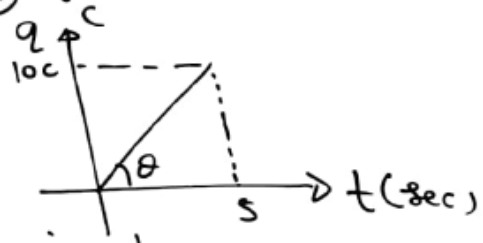
$i_{inst} = \frac{dq}{dt}$

Slope of q-t graph gives current.

(Q1) find i in interval 0 to 5 second.



$i = \tan\theta$

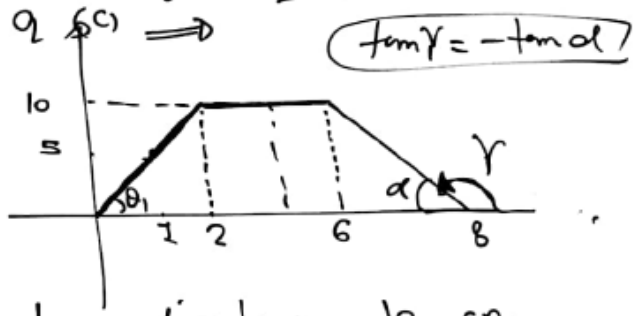
$i = \frac{10}{5} = 2\,Amp$

$t_i = 0 \quad q_i = 0$

$t_f = 5 \quad q_f = 10C$

$i = \frac{\Delta q}{\Delta t} = \frac{10-0}{5-0} = 2\,Amp$

(Q2) find current in $t = 1$, $t = 4$, & $t = 7$ sec.



$\tan\gamma = -\tan\alpha$

$t = 1, \quad i = \tan\theta_1 = \frac{10}{2} = 5\,Amp$

$t = 4 \quad i = 0 \quad Slope = 0$

$t = 7, \quad i = -\tan\alpha = -\frac{10}{2} = -5\,Amp$

Current-Electricity

Current

(a) 10^{20} electron passing through a Conductor Per second. find current in conductor.

↳ $i = \frac{q}{t} = \frac{ne}{t} = \frac{10^{20} \times 1.6 \times 10^{-19} C}{1}$

$i = 16$ Amp

↳ 10^{20} electron per second

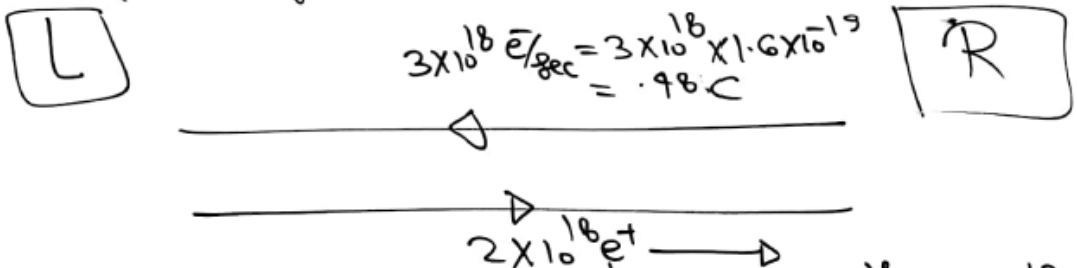
⇓

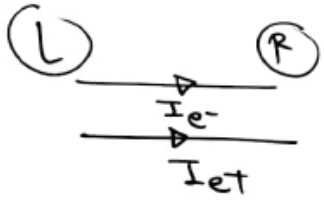
$q = ne$ per sec

=

Current-Electricity

In a discharge tube 3×10^{18} e/second moving from right to left & 2×10^{18} (positive ions) e^+ move from left to right. Find current in discharge tube.





$$I_{net} = I_{e^-} + I_{e^+} = \frac{n_{e^-}e + n_{e^+}e}{1\,sec} = \frac{q_- + q_+}{1} = \frac{.48 + .32}{1} = .80\ Amp$$

.8 Amp