$$\boxed{v_d = \frac{eE}{m_e}\tau}$$

Relaxation Time

Random Motion + Organized Motion.

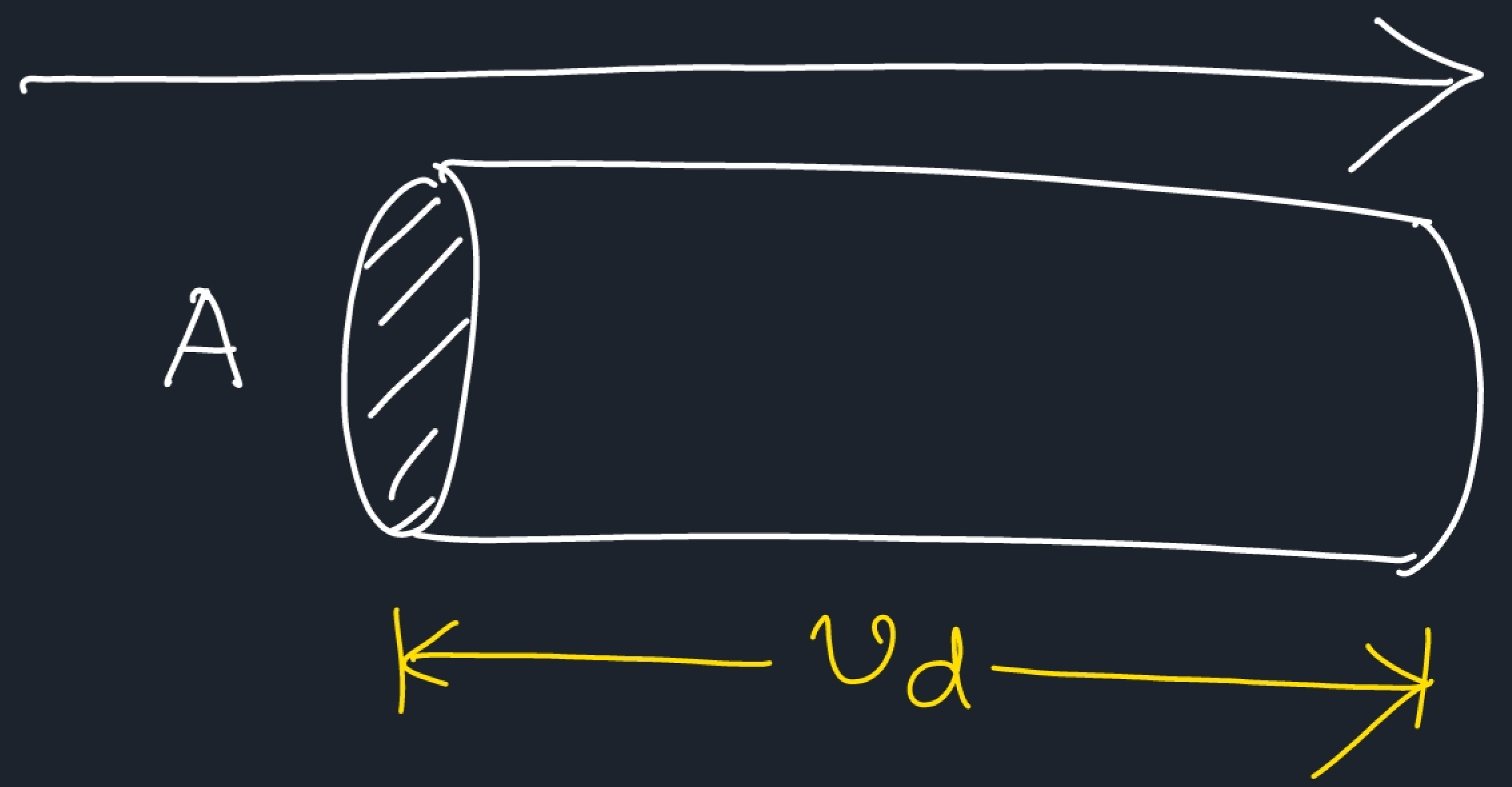
N_e

$$\boxed{\vec{J} = \sigma \vec{E}} \Rightarrow \text{OHM's Law.}$$

$$E = -\frac{dV}{dx}$$

$$|E| = \left|\frac{V}{l}\right|$$

$$\frac{I}{A} = \sigma \frac{V}{l} \qquad I = \frac{A}{l}\frac{1}{\rho} V$$



$$e N_e A v_d = Q = I$$

$$I = e N_e A \frac{eE}{m_e}\tau$$

$$V = \frac{\rho l}{A} I$$

$$\frac{I}{A} = \underbrace{\left\{\frac{e^2 N_e}{m_e}\tau\right\}}_{\sigma} E = J$$

$$\boxed{V = RI}$$

⑫ Problem:-

Cu wire

$A = 4\,mm^2$

$l = 4\,m$

$I = 10\,A$

$N_e = 8 \times 10^{28}\ m^{-3}$

$v_d = ?$

$I = N_e e A v_d$

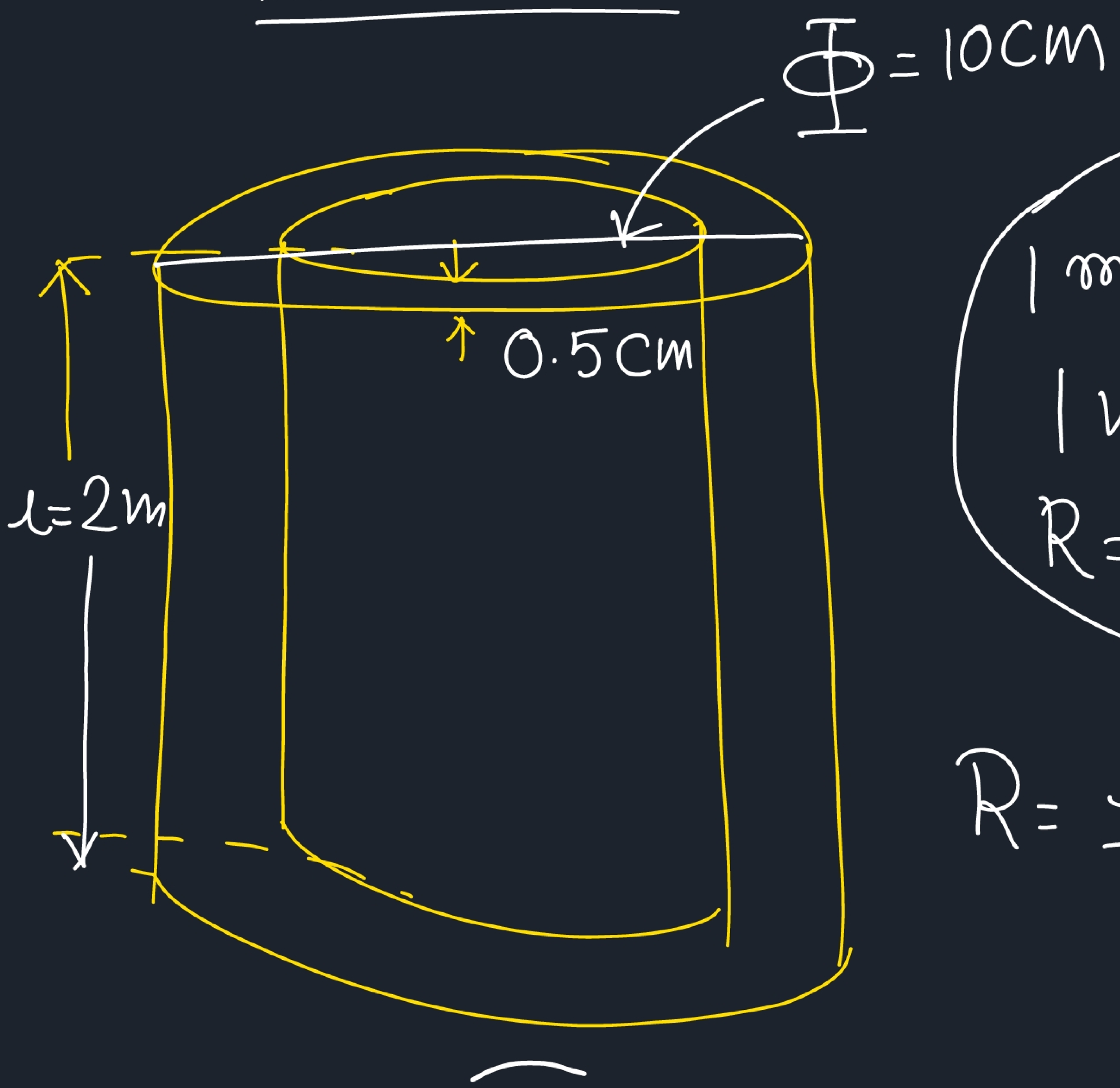
$$v_d = \frac{I}{N_e e A}$$

$$= \frac{10}{8\times10^{28} \times 1.602\times10^{-19} \times 4\times10^{-6}}\ m/sec.$$

$$= 1.95 \times 10^{-4}\ m/sec.$$

0.000195

Problem:-



1 m length of
1 mm^2 of cu tube
$R = 0.015\ \Omega$

$\rho_{cu} = ?$

$R = \frac{\rho l}{A}$

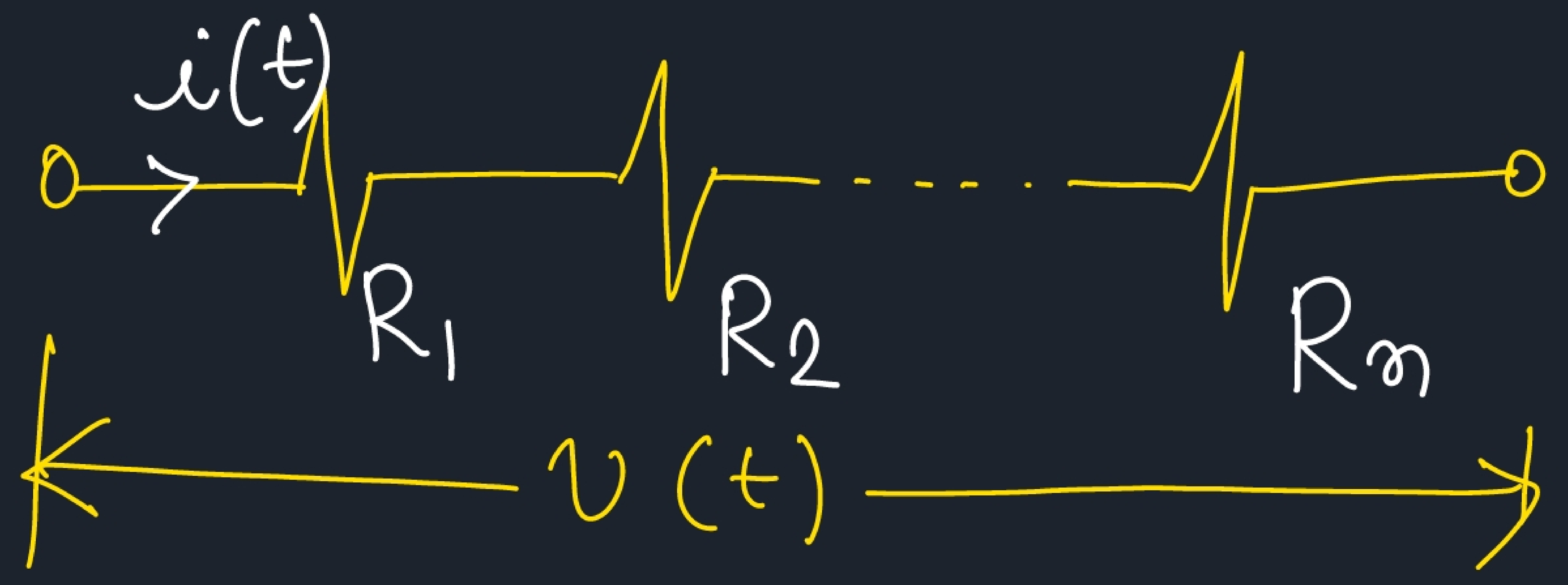
$\rho = \frac{RA}{l}$

$= \frac{0.015 \times 1 \times 10^{-6}}{1}$

$R = \frac{\rho l}{A}$

$A = \pi \{ r_{ext}^2 - r_{int}^2 \} = ?$

$20.1038 \times 10^{-6}\ \Omega$



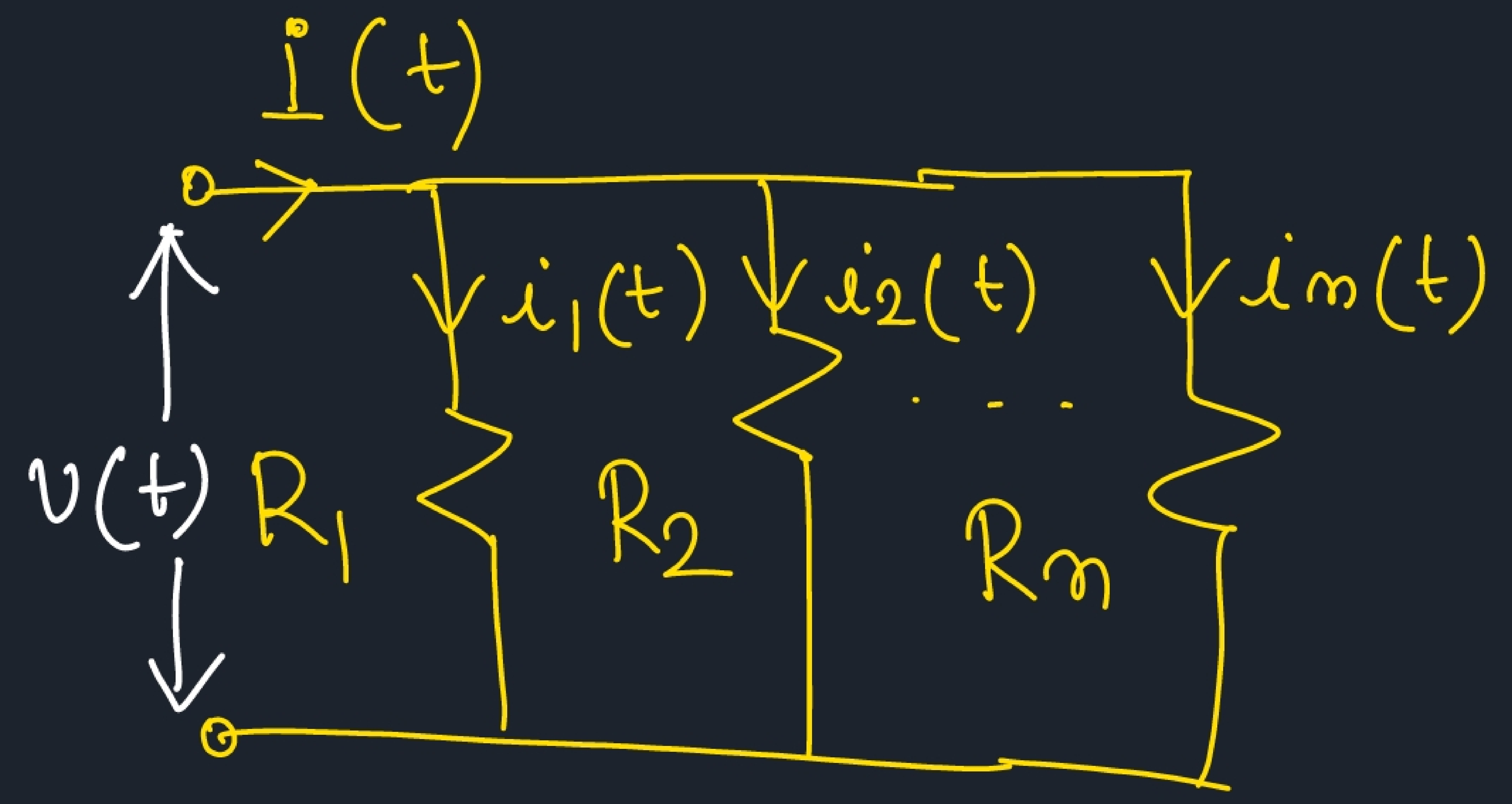
$$v(t) = v_1(t) + v_2(t) + \dots + v_n(t)$$
$$= i(t)R_1 + i(t)R_2 + \dots + i(t)R_n$$
$$= \underbrace{\left(\sum_{j=1}^{n} R_j\right)}_{R_{eq}^{S}} i(t)$$

$$v_1(t) : v_2(t) : \dots : v_n(t) = R_1 : R_2 : \dots : R_n$$

$$v_m(t) = \frac{R_m}{\sum_{j=1}^{n} R_j} v(t) \quad ✓$$

$$p_1(t) : p_2(t) \dots p_n(t) = R_1 : R_2 : \dots : R_n$$

$$p_m(t) = \frac{R_m}{\sum_{j=1}^{n} R_j} p(t)$$



$$i(t) = i_1(t) + i_2(t) + \dots + i_n(t)$$

$$= \frac{v(t)}{R_1} + \frac{v(t)}{R_2} + \dots + \frac{v(t)}{R_n}$$

$$= v(t) \cdot \underbrace{\sum_{j=1}^{n} \frac{1}{R_j}}_{R_{eq}^{P}}$$

$$i_1(t) : i_2(t) \dots i_n(t)$$

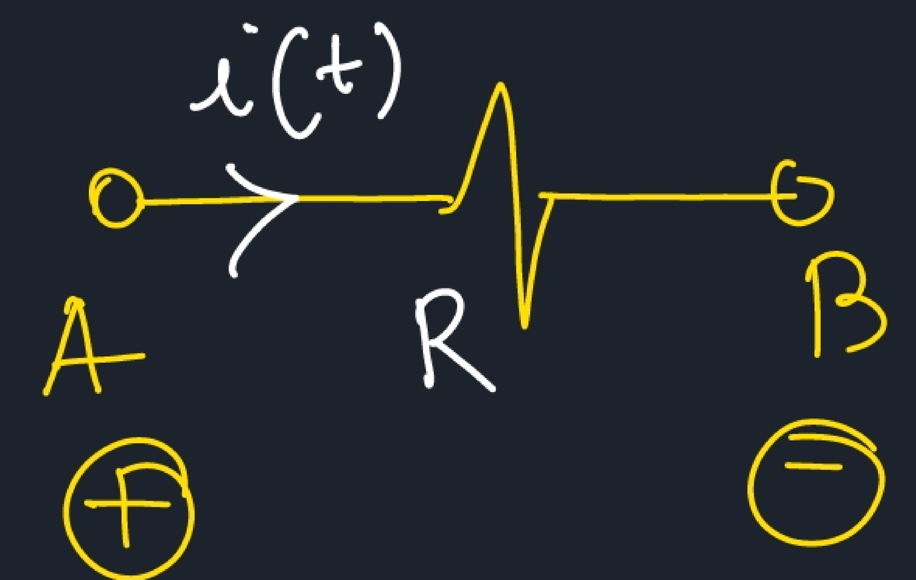
$$= G_1 : G_2 \dots : G_n$$

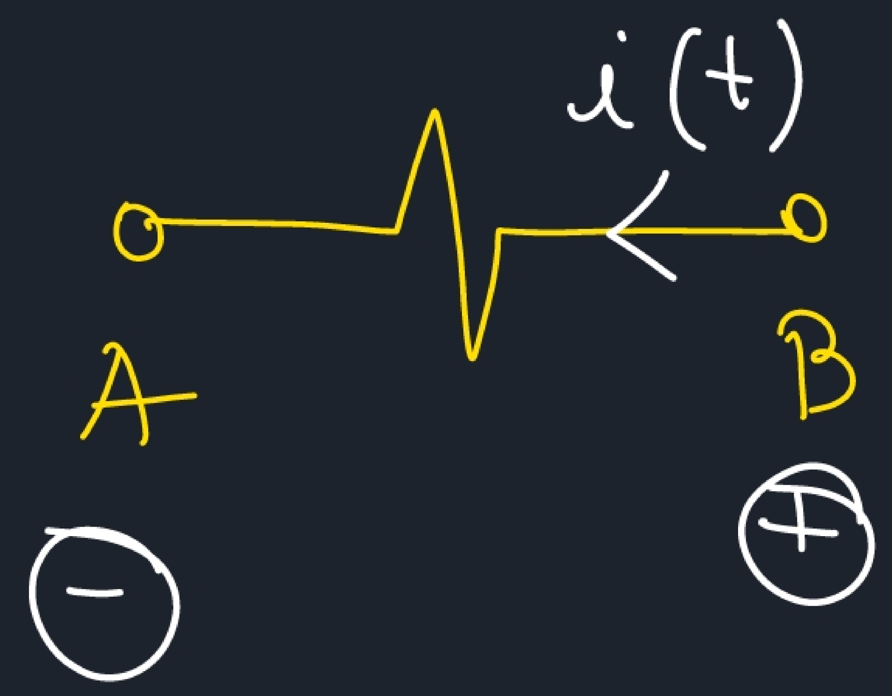
$$\boxed{i_m(t) = \frac{G_m}{\sum_{j=1}^{n} G_j} i(t)}$$

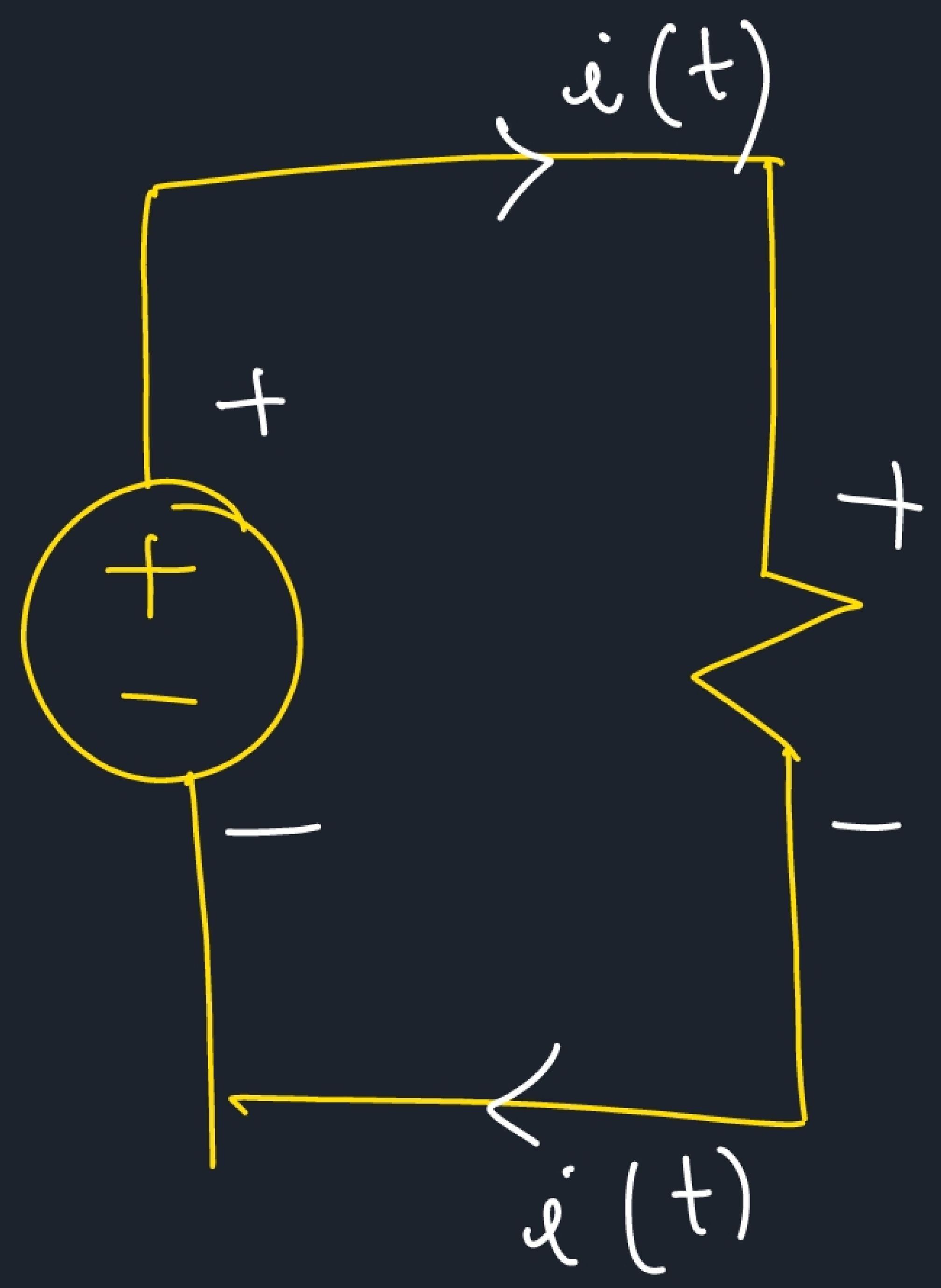
$$p_1(t) : p_2(t) \dots p_n(t)$$

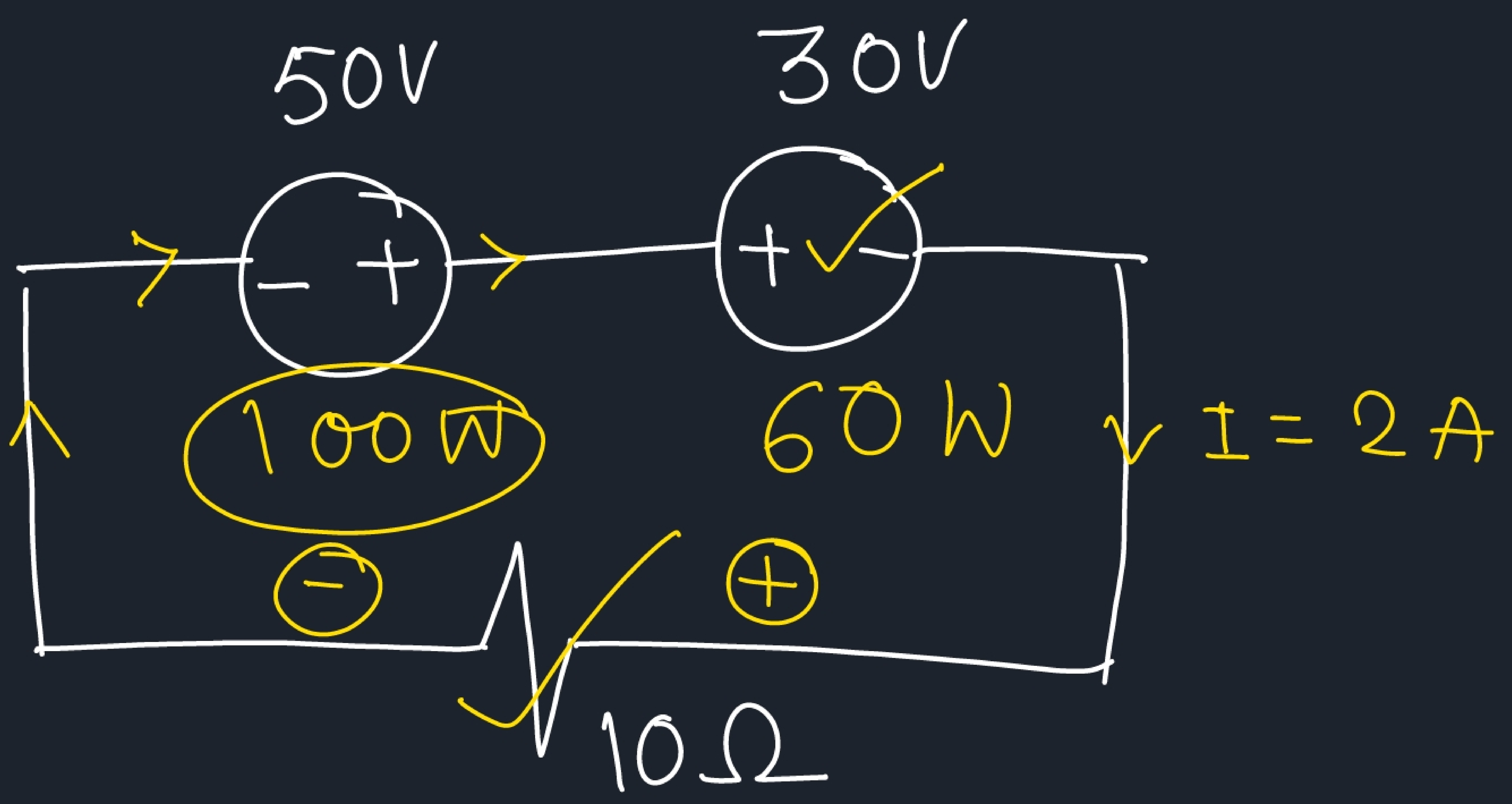
$$= G_1 : G_2 \dots : G_n$$

$$p_m(t) = \frac{G_m}{\sum_{j=1}^{n} G_j} p(t)$$

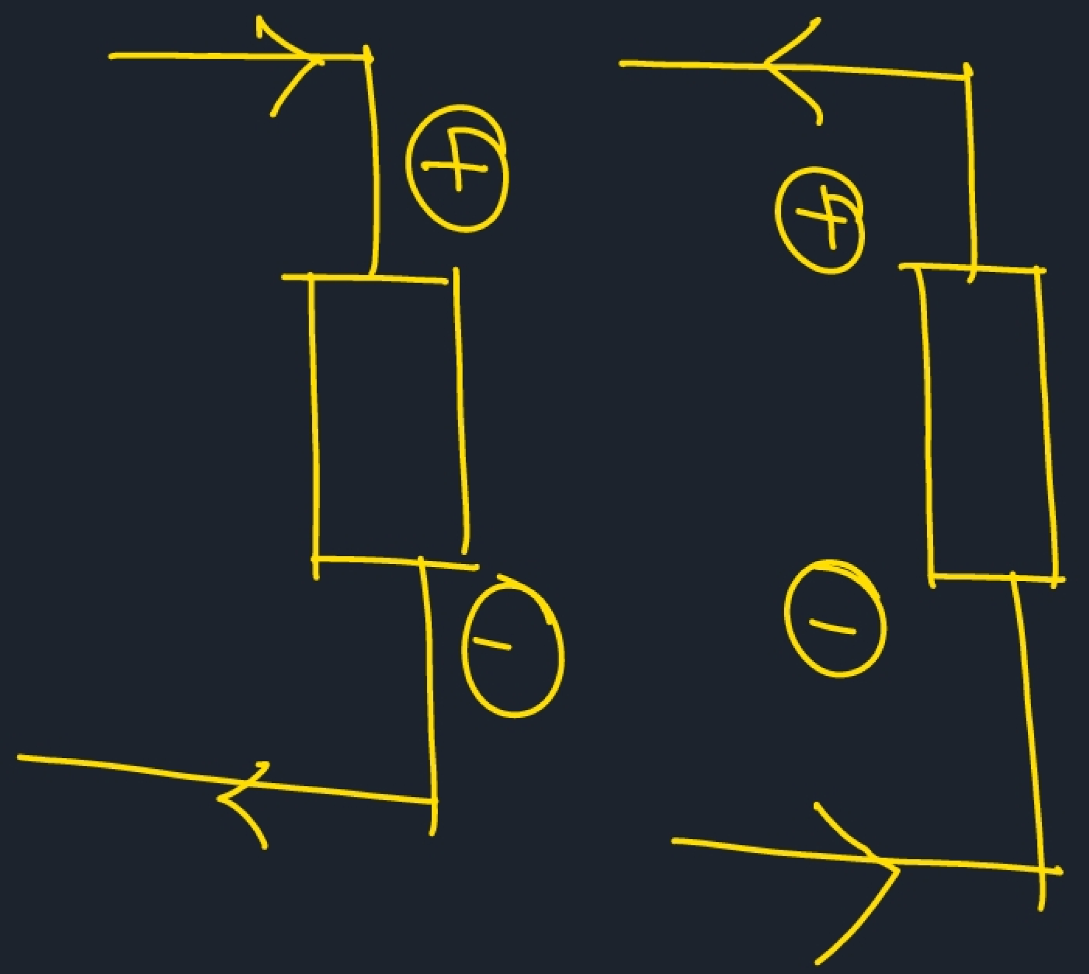


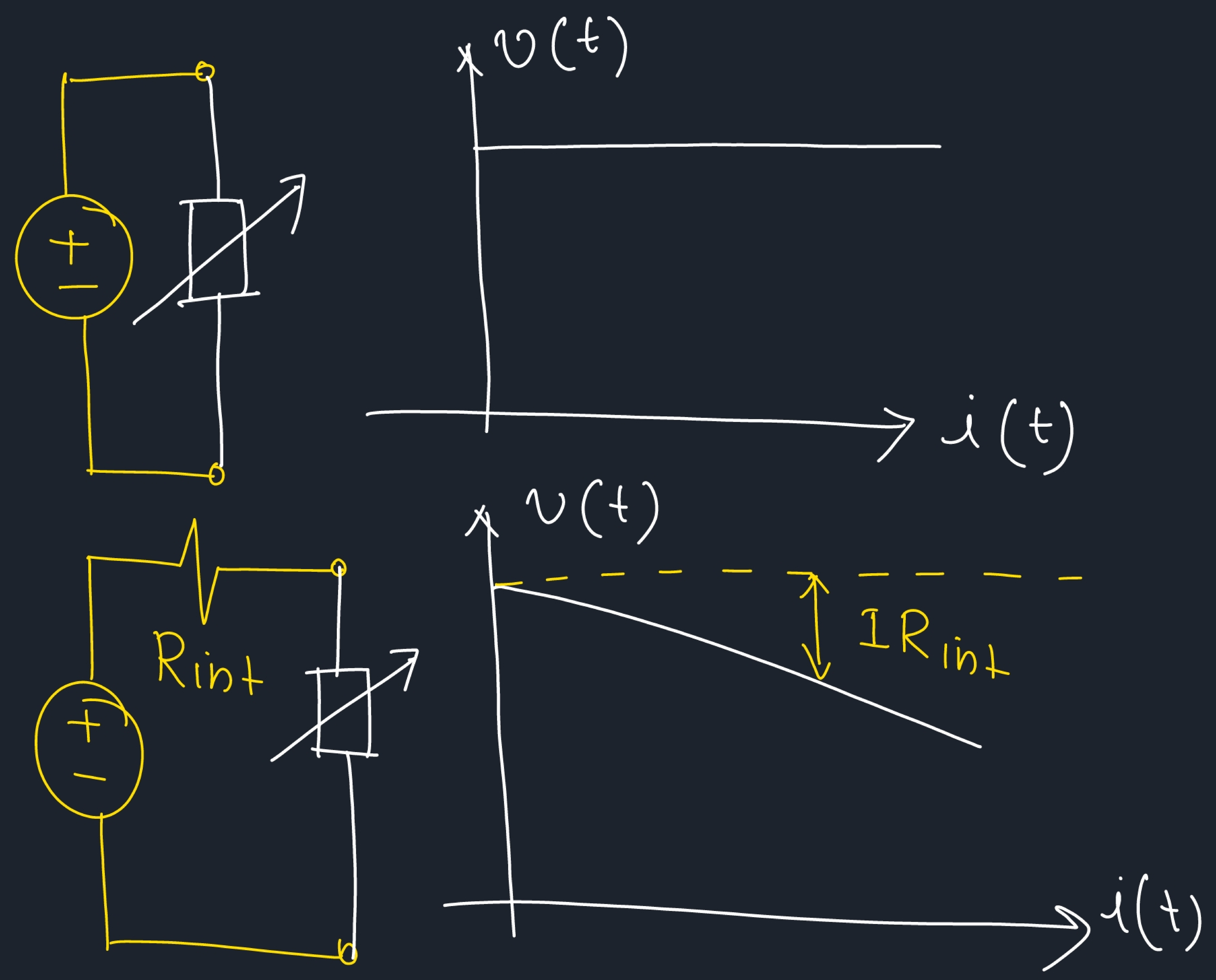






40 W.





v(t)
i(t)
v(t)
IRint
Rint
i(t)