Ch21 Concept

Tuesday, 27 October 2020 20:48

Circuit

V = Voltage [$V_{(volt)}$] : Voltmeter ($\infty\Omega$ & // Resistor)

I = Current [$A_{(Ampere)}$] : Ammeter (0Ω & in series)

R = Resistance [$\Omega_{(ohm)}$] : $V = IR$

P = Power [$W_{(Watt)}$] : $P = VI$ // $= \frac{E}{t}$

E = Energy [$J_{(Joule)}$] : $E = Pt$

Q = Charges (Total) [$C_{(Columb)}$]

Hardware

potenciometer [Functional Same!]

Reostat (Rotary)

Thermistor [Semi conductor]

Diode [One way for particle]

Voltage & Current

Definition

$I = \frac{Q}{t} = \frac{Nq}{t}$ (N = Total n Particle, q = Charges of each part.)

$[A] = [Cs^{-1}]$

$V = \frac{E}{Q}$

$[V] = [J \cdot C^{-1}]$

Voltage

ε = e.m.f →

$V_{p.d}$ = potencial difference →

Ideal case

ε = p.d. in EACH closed circuit

In Series ( )

$\varepsilon = V_1 + V_2$

In parallel ( )

$\varepsilon = V_1 + V_2$

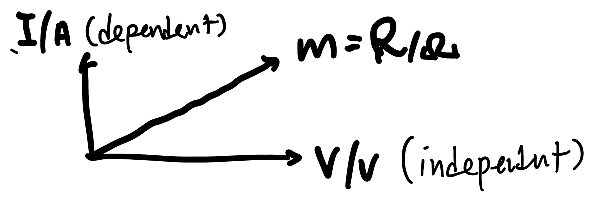
$\varepsilon = V_3$

$V = IR$ (ohm's law)

$[V] = [A\Omega]$

// $[\Omega] = [VA^{-1}]$

I-V graph



I-V graph

m = st. line ⇒ const. R

⇒ Ohmic

$m \propto \frac{1}{R}$

$$V = I \cdot R$$

Restitivity : ρ [Ωm]

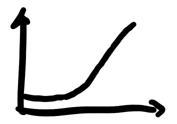
$\rho = \frac{R \cdot A_{(cross\ section\ area)}}{\ell_{(length)}}$

$[\Omega m] = [\Omega \frac{m^2}{m}]$

Non-Ohmic

- semi-conductor

$I \propto \frac{1}{R}$



Restistors

In Series

$\Sigma V = V_1 + V_2 + \dots V_n$

$\therefore I\Sigma R = I(R_1 + R_2 + \dots R_n)$

* const. I in same branch

$\therefore \Sigma R = R_1 + R_2 + \dots + R_n$

Parallel

$\frac{1}{\Sigma R} = \frac{1}{R_1} + \frac{1}{R_2} + \dots \frac{1}{R_n}$

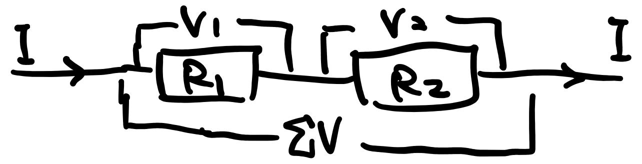
or $\Sigma R^{-1} = R_1^{-1} + R_2^{-1} + \dots R_n^{-1}$

* Parallel w/ same p.d.

$\Sigma R = \frac{R}{n}$

Share of Voltage

* Ch22



$\because V_1 + V_2 = \Sigma V$

$R_1 + R_2 = \Sigma R$

$I = \frac{\Sigma V}{\Sigma R}$

For each p.d V

$V_1 = IR_1$

$V_1 = \frac{\Sigma V}{\Sigma R} \cdot R_1$

$V_1 = \frac{R_1}{R_1 + R_2} \cdot \Sigma V$

$\rightarrow V_n = \frac{R_n}{\Sigma R} \cdot \Sigma V$

Power

$P = VI = I^2R = \frac{V^2}{R}$

$P = \varepsilon I$

sub & Ideal case

Light Brightness (which is Pwr)

Series (I const.)

$P = I^2R$

$P \propto R$

Parallel (V const)

$P = \frac{V^2}{R}$

$P \propto \frac{1}{R}$

$1kWh = \frac{1000W}{3600s} \Rightarrow 3.6MJ$

$3.6e6J$

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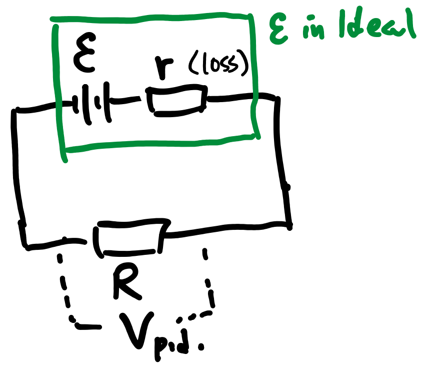
Nothing is Ideal

IRL

$\varepsilon \neq V_{p.d}$

$\varepsilon_{w/loss} = V_{p.d}$



$\varepsilon = I(R + r) = V + Ir$

$V = \varepsilon - Ir$

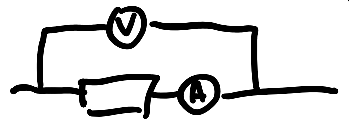
p.d = emf - emf loss

(A)/(V) in non-Ideal circuit

R_{small}

(V) not affected by (A)$_R$

R_{large}



(A) is not affected by (V)$_R$

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