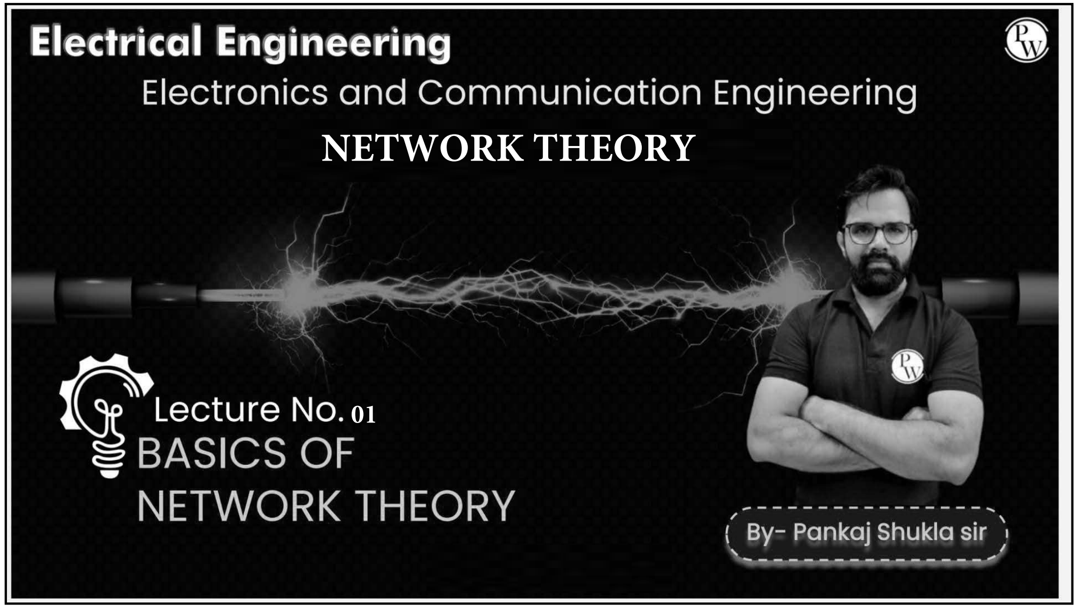




1. Basics
2. $q(t)$, $i(t)$, $v(t)$
3. $P(t)$, $w(t)$
4. Power absorbing
5. Power Delivers.
6.

## Basics of Network theory

- charge ($q(t)$)
- current ($i(t)$)
- Voltage ($v(t)$)
- Power ($P(t)$) ⟷ Energy ($w(t)$ or $E(t)$)

[Basic Building block of N/w theory]

charge ($q(t)$) → It is a bipolar → ⊕, ⊖

- It is the most fundamental Quantity.
- charge exposure can be felt.

↓

charge has two electrical effects.

- Separation of charge (Energy will be expended) to create the force).
  ↓
  Force → $v(t)$ → voltage
- flow or Motion of charge.
  It creates electric fluid.
  ↓
  current ($i(t)$).

$$v(t) = \frac{dW}{dq} \rightarrow \text{'volt'} \rightarrow J/C$$

$$i(t) = \frac{dq}{dt} \rightarrow (\text{Ampere}) \rightarrow C/\text{second}$$

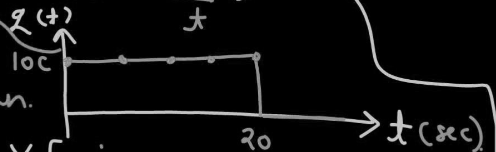
or

$$i(t) = \text{'}\frac{q}{t}\text{'}$$

$$i(t) = \frac{dq(t)}{dt}$$ General expression (Always applicable)

$$= \frac{d}{dt}(10)$$

$$= (0\ A) ✓$$




$$\times \left[ i(t) = \frac{10}{20} = \frac{1}{2} = 0.5\ A \right]$$

{ conditional expression & Valid if we have constant current }

---

$q \propto t$

- $q(t) = 10\,t \rightarrow$ Ramp signal

$\downarrow y \quad \downarrow m \quad \downarrow x$

$= \text{y-axis}$ $q(t) \; [\, y = mx \,]$

$$i(t) = \frac{dq(t)}{dt}$$

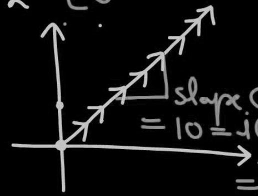
$$i(t) = (10 \times 1)$$

$$\int 1\, dq(t) = \int i(t)\cdot dt$$

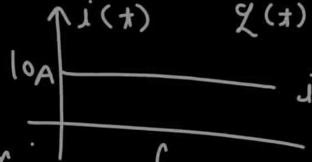
$$i(t) = \frac{d}{dt}(10t)$$

$$i(t) = \frac{d}{dt}(q(t))$$

$$\boxed{q(t) = \int i(t)\cdot dt}$$




slope (m) $= 10 = i(t)$ = rate of change = Differentiation = slope (m)




$$q(t) = i(t) \times t$$

$$i(t) = \frac{q(t)}{(t)}$$

$$q(t) = \int 10 \cdot dt = 10 \times t$$

---

Note:

① $\frac{d}{dt}(f(t)) \longrightarrow$ Slope of f Vs t curve.

② $\int f(t)\,dt \longrightarrow$ Area of f Vs t curve

---

- The relation b/w $v(t)$ & $i(t)$ can be co-related with Power & energy.

$$p(t) = \text{Power} = \frac{dW(t)}{dt} \cdot \frac{dq}{dq}$$

$$P(t) = \left(\frac{dq}{dt}\right) \times \left(\frac{dW}{dq}\right)$$

$\qquad\qquad\qquad\quad \downarrow i(t) \qquad \downarrow v(t)$

$$\boxed{P(t) = v(t)\cdot i(t)}$$

- $p(t) = \frac{dW(t)}{dt} \longrightarrow \int 1\, dW(t) = \int p(t)\, dt$

$$\boxed{W(t) = \int p(t)\cdot dt}$$

$p(t) = \frac{dw(t)}{dt}$ → Rate of change of energy w.r.t time
→ slope of $w(t)$ Vs 't' graph.

$w(t) = \int p(t) \cdot dt$ → Area under the curve [ $p(t)$ Vs 't' ]

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## Topic-02. Concept of Absorbing & Delivering Power.

**Network.**

- It is a just connection of electrical elements.
- Minimum requirement of element to form a N/w is 2.

**Circuit.**

- It is also the connection of electrical elements but with certain fixed requirements.

(1) It must have atleast one Independent Source

(2) It must have atleast one closed path.

Note: "All circuits are always Network but all networks are not neccessarily to be a circuit"

---

## Condition for the flow of current.

There are three-must condition:

Cod$^n$01: There must be atleast one Independent Source in the N/w or circuit.

Condition02: There must be atleast one closed Path.

Condition03: There must be a return path also.

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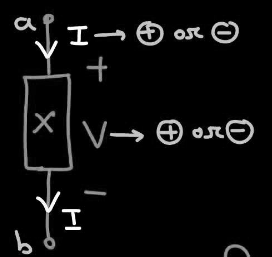
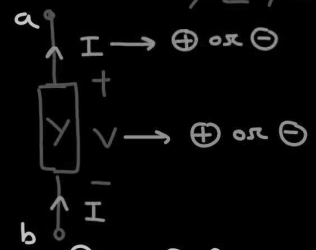
X & Y → can be any element.




$P_x$ → Absorbing Power

$P_x = (V \cdot I)$ → ⊕ or ⊖

It is Independent of the sign of V & I.

$P_y$ → Delivering Power

$P_y = V \cdot I$ → ⊕ or ⊖

It is independent of sign of V & I.

- In a $\boxed{\text{whole}}$ electrical circuit :

(1) $\left[\sum P_T \text{ or } \sum W_T = 0\right]$

→ Energy or Power conservation Principle.

or

→ Energy can not be created or can not be destroyed.

(2) In a whole circuit,

$$\left[\sum P_{T}(\text{Actual Deliver}) = \sum P_{T}(\text{Actual absorb})\right]$$

@ pankajshukla sir pw

(telegram)