

# Electrical - 2020

Q1 → Explain Active and passive elements.

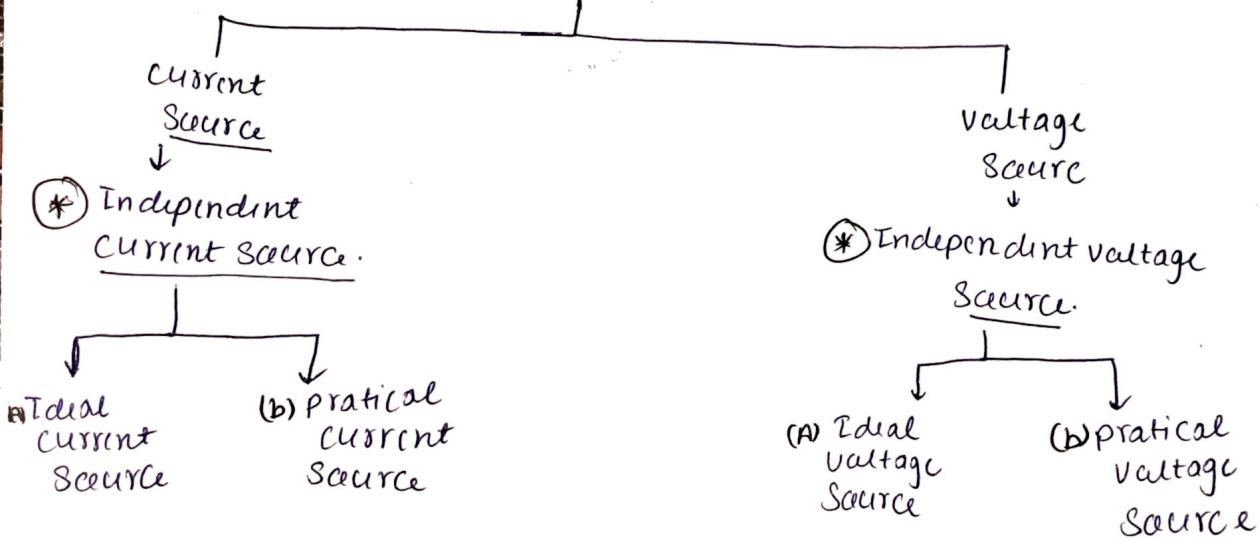
Ans 1 → Active element → in a electrical circuit require an external power source to operate. is called active element.

Passive element in a electrical circuit which do not require an external power source. is called passive element.

Q-2 Discuss different types of voltage and current sources.

Ans 2,

different type of current and voltage and



(a) Ideal current source (Ics)

It is the two terminal device, the voltage across b/w these two terminal, in respective of all circuit condition

(a) Ideal voltage source (IVS)

Ideal voltage source, which has zero internal resistance, is considered as ideal source.

### (ii) Practical Voltage Source (PVS)

Source having same amount of internal resistance is known as the practical voltage source due to this resistance, voltage drop takes place & it caused the terminal voltage to reduce. The characteristic equation of PVS written  $V_L = V_S - RSI$

### Q3) Independent current source

It is also a two terminal device and gives the constant current irrespective the external circuit condition.

Ideal current source : It has infinite resistance.

Practical current source : It has the internal resistance. The current delivered in mega ohm's by a practical source.

### Q3) State and explain Kirchhoff's law.

The total current entering a junction on a node is equal to the charge is lost.

This because it has no other place to go as no charge is lost.

\* In other words the algebraic sum of all the current entering & leaving a junction must be equal to zero as :  $\Sigma I_{in} = \Sigma I_{out}$

\* This idea by Kirchhoff is commonly known as the conservation of charge, as the current is conserved around the junction with no loss of current.

$$I_1 + I_3 - I_2 - I_4 - I_S = 0$$

## ② Kirchhoff's second law or Kirchhoff's voltage law (KVL)

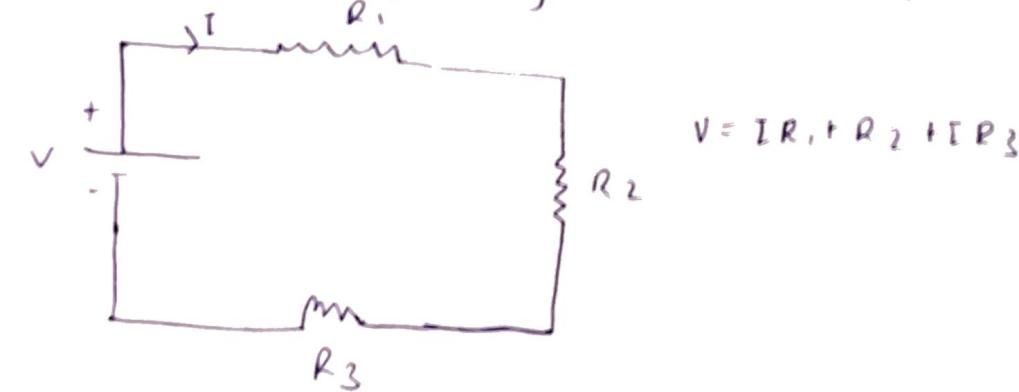
The voltage around a loop equals the sum of all voltage drops in the same loop for any closed network is equal zero. This is because a circuit loop is a closed conducting path so no energy is lost.

In other words the algebraic sum of (drop/rise) the potential differences around the loop must be equal to zero as:  $\Sigma V = 0$

Note that the term "algebraic sum" means to take in account the polarities using the source & collapse drops around the loop.

This idea by Kirchhoff is commonly known as the conservation of energy, as moving around a closed

loop on circuit, you will end up back to where you started. In the circuit therefore back to some initial potential with no loss of voltage around loop.



Q4 → Define term: MMF, flux and reluctance.

Ans → Magneto-motive force (MMF)

The magnetic pressure that sets up air tend to setup magnetic flux in a magnetic circuit is called magneto-motive force.

As per ~~Watt's~~ law it may be define as the work done in moving a unit magnetic pole ( $q_{wb}$ ) one round the magnetic circuit is called mmf. In general  $\boxed{mmf = \text{flux} \times \text{reluctance}} = \boxed{\Phi \times S}$ ,

$$\boxed{mmf = NI}$$

Q5 → Describe the analogies between electrical and magnetic circuit.

#### Magnetic circuit

- ① Flux does not actually flow in magnetic circuit
- ② Permeability does not largely vary from material to material
- ③ Flux can pass through air
- ④ Residual flux persists after removal of mmf.
- ⑤ Magnetic field intensity

$$\boxed{[H]}$$

$$\boxed{\text{Unit: A/m}}$$

#### Electrical circuit

- ① Current does not flow in an electrical circuit
- ② Conductivity varies largely from partial of material to much so that some material are insulator of good conductor
- ③ Current would not flow through air unit the arc is in short.
- ④ The current is induced till zero after removal of source of emf
- ⑤ Electrical field intensity

$$\boxed{[E]} \quad \boxed{\text{Unit: N/C}}$$

Q11 what is the function of transformer?

Ans A transformer is an electrical device that transfer electrical power from one circuit to another while either increasing or decreasing the voltage.

Voltage changes  $\rightarrow$  Transformer can increase or decrease the voltage level of alternating current.

Frequencies  $\rightarrow$  Transformer transfer power without changing the frequencies

Galvanic isolation  $\rightarrow$  Transformer can provide galvanic isolation between circuit.

Signal processing  $\rightarrow$  Transformer can couple stages of signal processing circuit's

Q12  $\rightarrow$  What do you understand by step up and step down transformer.

Ans-Step up transformer  $\rightarrow$  When the transformer raises the voltage  
 $\therefore$  e when the output voltage is higher than its input voltage, it is called ~~step down~~ step up transformer.

Step down transformer  $\rightarrow$  When the transformer lowers the voltage

$\therefore$  e when the output voltage is less than its input voltage, it is called transformer

Note  $\rightarrow$  It basic construction requires moving part so it is often called static transformer! Efficiency between 96% to 99%.

leakage:- In which flow a path not designated path.

leakage coefficient:- it is the ratio of total flux path to useful flux.

$$\lambda = \frac{\text{total flux}}{\text{useful flux}}$$

$$\boxed{\lambda = \frac{\phi_T}{\phi}}$$

$$\boxed{\lambda = \frac{\phi_L + \phi}{\phi}}$$

Q8. Define the following:

(i)  $\alpha$  factor

(ii) power factor

(iii) Active and Reactive power.

Ans  $\alpha$ -factor - A dimensionless number that measure how well as system store energy.

power factor - is a quantitative measure that indicate how efficiently a circuit use in coming power.

Active power - The useful power that dissipated in a circuit and used to move device work, it's also known as real or true power. Active power is measured in watt's.

Q7 State and explain Faraday's law of Electromagnetic induction.

Ans) First Law → It states that whenever there is a change in magnetic flux associated with a coil, EMF is induced in that coil.

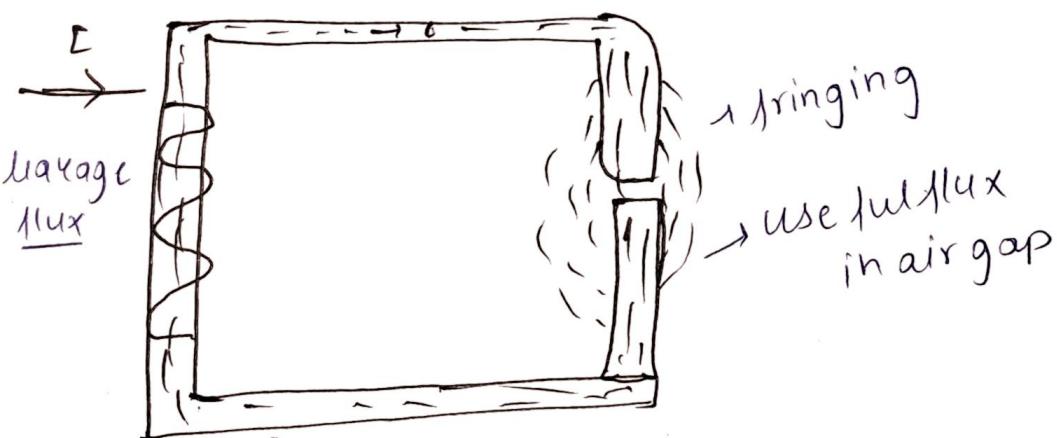
Second Law → It states that the magnitude of EMF induced in the coil is directly proportional to the rate of change of magnetic flux associated with that coil.

$$\mathcal{E} = \frac{d\phi}{dt}, \text{ where } \mathcal{E} \text{ is the induced.}$$

$$\text{EMF} = \frac{d\phi}{dt} \text{ is the rate of changes.}$$

Q7 - What do you mean by leakage and fringing?

Ans) Léakage & Fringing → The useful flux passing out across the air gap reduces the effective area of air gap and increases the flux density in the air gap ridges as compare to the in core - these.



Q13 + Explain super position theorem.

Superposition state that in any linear active, bilateral network having more than once source. the response across any element is the sum of the response obtained from each source are unaffected by their internal resistances. The super position theorem is used to solve the network where two or more source are present and connected.

