Viva - voice

1. What is ohm's law. What are the limitations of ohm's law?

Ans. Ohm's Law - The current flowing through a resistor is directly proportional to the voltage applied across its terminals under constant temperature

$$V \propto I \Rightarrow V = IR$$

V = voltage , I = current , R = resistance

Limitations :

1. Ohm's law fails to explain the behaviour of semi-conductors and uni-lateral devices like diodes, Transistors etc

2. If Temperature and pressure are not kept constant then ohms law may not give expected result

3. It is not applicable to non- linear quantites and phenomenon such as electric arc.

4. It is not applicable to super conductors too.

2. What is the difference between the ohmic and non-ohmic materials?

Ans: The materials which follow ohm's law for all voltages across it is called as an ohmic material.

Example: a wire, heating element or a resistor.

The device that does not follow ohm's law is known as a non-ohmic device

Example: Thermistors, crystal rectifiers, vacuum tube, etc.

3. What are the linear and non-linear elements?

Ans. Linear Element is an electrical element having linear relationship between current and voltage. Example :- Resistor, Capacitor & inductor
Non-linear Elements dont always follow the linear relationship between current and voltage. Example :- Transistor, Diode

4. How will you differenciate between unilateral and bilateral elements?

Ans. Unilateral Element: Conduction of current in one direction is termed as unilateral. Example :- Diode, Transistor
Bilateral Element: Conduction of current in both direction is termed as bilateral. Example : Resistance, Capacitor & Inductor.

5. What is source tranformation?

Ans. It is the process of simplifying a circuit solution, especially with mixed sources, by transforming voltage sources into current sources, and vice versa, using Thevenin's theorem and Norton's theorem respectively

6. Define temperature coefficient of resistance?

Ans. Temperature coefficient of resistance is the measure of change in electrical resistance of any material per degree celsius of temperature change

$$R = R_{ref}[1+\alpha(T-T_{ref})]$$

7. Resistance of a conductor is 1.72 Ω at a temperature of 20°C. Find the resistance at 100°C. Given the coefficient of resistivity $\alpha = 0.00393$ per °C.

Ans: $R_{ref} = 1.72\ \Omega$, $T_{ref} = 20°C$, $\alpha = 0.00393$

we know that

$$R = R_{eq}\left[1 + \alpha(T - T_{ref})\right]$$

$$R = 1.72\left[1 + (0.00393)(100-20)\right]$$

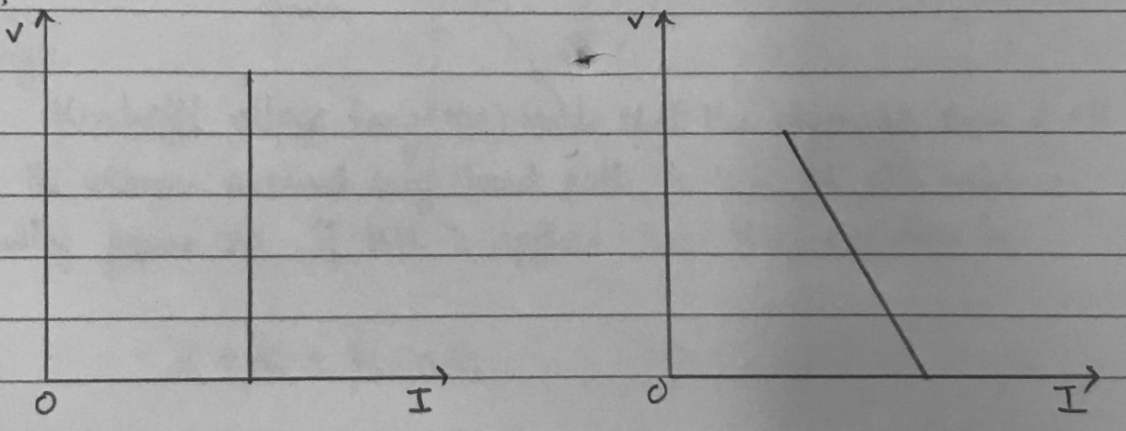
$$R = 1.72\left[1 + (0.00393)(80)\right]$$

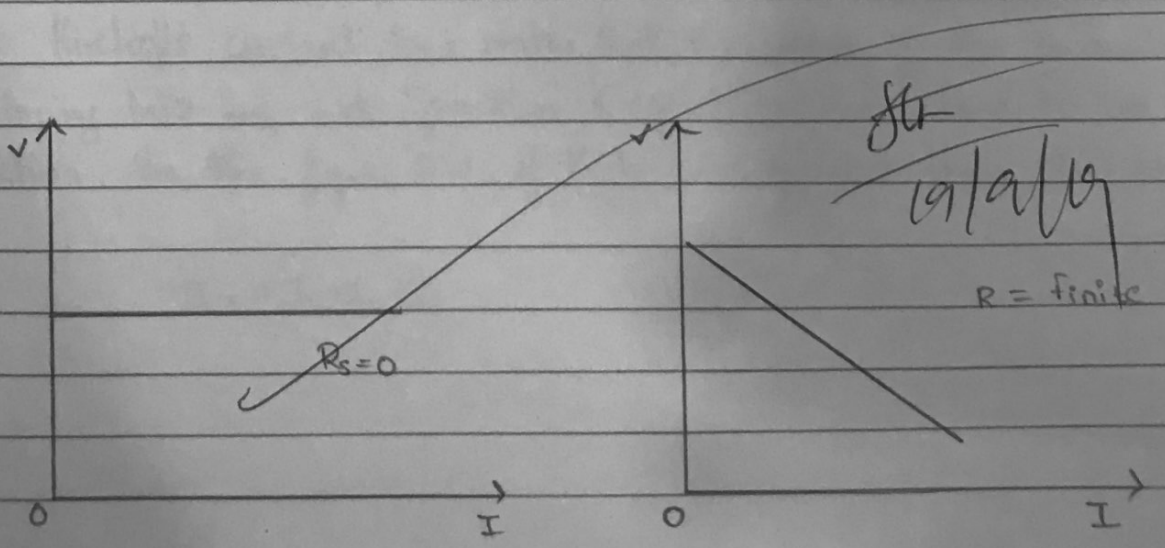
$$R = 1.72\left[1 + 0.3144\right) = 1.72(1.3144)$$

$$\boxed{R = 2.26\ \Omega}$$

8. Draw the V-I characteristics of energy sources.

Ans.





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R = finite

Result

As theoretical values are approximately equal to practical value both KVL and KCL relations are verified.

Viva- Voice

1) What is jumper wire/patch cable?

A. A jump wire is an electrical wire or group of them in a cable with a connector or pin at each end which is normally used to interconnect the components of a breadboard or other prototype or test circuit, internally or with other equipment or components, without soldering.

2) Define terms: i) Branch, (ii) loop, (iii) Node (iv) Mesh

A: i) Branch - A single element with its terminals is usually called a branch

(iii) Node: When two or more branches are connected at a point that point is called a node

(ii) loop: A loop is a closed path formed by starting at a node, passing through a set of nodes and returning to the starting node without passing through any node more than once

(iv) Mesh: A mesh is a closed path in a circuit with no other paths inside it.

3) What is nodal analysis and mesh analysis?

A. Nodal analysis is a method of determining the voltage between nodes in an electrical circuit in terms of branch circuit

Mesh analysis is a method that is used to solve planar circuits for the currents at any place in the electrical circuit. Planar circuits are circuits that can be drawn on a plane surface with no wires crossing each other

4) If a network contains 'b' branches and 'n' nodes. What are the formulae for no. of mesh current equations & no. of nodal voltage equations?

A) Number of Mesh equations: $B-(N-1)$

Number of nodal voltage equations: $n-1$

5) What is VDR & CDR?

A. A VDR is a voltage dependent resistor or also known as varistor. It is non-linear, non-ohmic current voltage characteristics similar to a diode.

A CDR is a current dependent resistor. It is non-linear, non-ohmic similar to a diode.

6) Kirchoff's laws are based on which fundamental laws?

A: Kirchoff's voltage law is based on Faraday's law of induction and Kirchoff's Current law is based on conservation of Energy.

5) What is VDR and CDR?

Ans. VDR is voltage division rule which states that the voltage is divided between two series resistors in direct proportion to their resistances.

CDR is the current division rule which states that the current in any of the parallel branches is equal to the ratio of opposite branch resistance to the total resistance, multiplied by the total current.

Result

Hence proved.

Viva-Voice

1) Define Resonance phenomenon.

A) The frequency at which the response amplitude is a relative maximum is called as 'Resonance phenomenon'.

2) What is meant by Quality factor?

A) Quality factor is a factor, which determines the efficiency of an RLC circuit. It is the measure of sharpness of resonance

3) What are the half power frequencies?

A.) The frequencies for which the current in RLC series circuit is equal to $\frac{1}{\sqrt{2}}$ of Maximum current are called half power frequencies.

4) What is the power factor of RLC circuit under resonance?

A) It is equal to one because under resonance $R = Z$ $\therefore$ Resonant frequency becomes maximum and power factor $\frac{R}{Z} = 1$

5) Write the application of series resonance?

A) a) Tuning i.e as an oscillator circuit

b) It is also used as 'voltage Amplifier'.

6) Why is the series circuit called as acceptor circuit?

A) At resonance, the impedence of the circuit is at its minimum; so that it can easily accepts the current whose frequency is equal to its Resonating

7) What is the power at resonant condition?

A) $P = I^2R$ $(\because R = Z)$

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

$$P = \frac{V^2}{Z^2} \cdot Z$$

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

Result

Impedence and current relations verified

Viva - Voice

1) What is meant by power factor of a circuit?

A) The power factor of a circuit is the ratio of real power to apparent power.

2) What do you understand by active and reactive components of current?

A) Active component of current is the part of current which is in-phase with applied voltage.
Reactive component of current is the part of current which is 90° out of phase with applied voltage.

3) What is the effect of frequency on inductive and capacitive reactance?

A) Inductive reactance $= X_L = L\omega = 2\pi f \times L$

$\therefore X_L \propto f$

$\therefore$ The effects of frequency are directly proportional to Inductive capacitance.

Capacitive reactance $= X_C = \frac{1}{2\pi f C}$

$\therefore X_C \propto \frac{1}{f}$

$\therefore$ The effects of frequency are inversely proportional to Inductive capacitance.

4) Explain (i) resistance (ii) Impedence.

(i) Resistance is the measure of the opposition to the flow of current on active elements.

(ii) Impedence is the measure of the opposition to the flow of current when an AC supply is connected to passive elements.

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5) What is the phase relationship between the supply voltage and current flowing in the following circuits (i) Purely resistance circuit, (ii) Purely inductive circuit, (iii) purely capacitive circuit.

(i) In purely resistive circuit current and voltage are in ph

(ii) In current lags voltage by 90°.

In (iii) current leads voltage by 90°

Result

Hence, we measured the voltage, current and real power in a single phase transformer

Viva - Voce

1) What is step up & step down transformer?

A) A transformer that increases the voltage from primary to secondary (more secondary winding turns that primary winding turns) is called a step-up transformer. Conversely, a transformer designed to do just the opposite is called a step-down transformer.

2) What is turns ratio? write all possible formulae.

A.) The turns ratio is defined as the ratio of wire in the primary winding to the number of turns of wire in the secondary winding.

$$K = \frac{N_p}{N_s} = \frac{V_p}{V_s} = \sqrt{\frac{Z_p}{Z_s}}$$

3) What is the difference between an ideal and practical transformer?

A) In an ideal transformer, the power to the primary coil is transferred to the secondary coil without any loss which does not occur in practice. In a practical transformer there is a power loss when the power is transfered.

4) What are no-load components of transformers?

A) Whenever a transformer is on no-load, i.e, the secondary winding has no burden connected to it --- the transfer must actually withdraw zero current from primary side but this not the case even on no load, a small amount of current drawn from primary side to set up the magnetic flux this is known as no load current of a transformer in this way the other components also work in no load components of transformer.

5) What is the use of laminated core of transformer?

A) The core is laminated to reduce these to a minimum as they interfere with the Efficient transfer of Energy from the Primary Coil to the Secondary one. The Eddy current Cause Energy to be Lost from transformer as they heat up the Core.

Viva-Voce

1) What is the purpose of load test?

A. Load test is performed to determine a system's behaviour under both normal and anticipated peak load conditions. It helps to identify the maximum operating capacity and determine which element is causing degradation.

2) Why transforma rating is in KVA?

A. The power loss occurs due to the flow of the current in the transformer winding and the core loss occurs due to the voltage. These losses do not depends on the power factor so that it is rated in KVA.

3.) What are the losses in transformer?

A. There are various types of losses in the transformer such as iron losses, copper losses, hysteresis losses, eddy current losses, stray losses, dielectric losses.

4) Why efficiency of transformers is more compared to motors/generators?

A. In case of generators or motors there is a rotational part so their losses is greater than transformer losses. As there are no mechanical losses in transformer.

5) What happens if transformer is fed with DC supply?

A. When DC supply is applied it will setup a constant flux so no EMF is induced.

6) What is the condition for maximum efficiency in transformers.

A. When copper losses = iron losses, transformer will give maximum efficiency.

(9)

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Performance characteristics of a three ph
motor is verified

Viva-Voce

1) What is slip in Induction motor operation?

The slip is defined as the ratio of difference of sync speed and actual rotor speed to the synchronous speed of the machine.

2) In which type of induction motor, considerably high starting torque can be acheived?

In three phase motor and VFD, in type of induction motor high starting torque can be acheived

3) How high starting torques are obtained in slip ring induction motors?

The slip ring motor has high starting torque as the resistance of the rotor winding is increased by adding the external resistance to it. The starting torque is increased as the power factor of the rotor circuit gets improved during starting

4) How to reverse the direction of rotation in 3ph induction?

The direction of rotation of a 3-ϕ induction motor can be reversed by interchanging any two of the 3 motor supply lines

5) Why the rotor of an induction motor cannot run at synchronous speed, if it rotates at N_s, what will be torques value?

If the speed of rotor reaches the synchronous speed the flux linkage will be zero so the rotor will deaccelerate as there is no torque and once it deaccelerates again there will be a difference in speed. The EMF induced in the rotor of induction motor is due to linkage of rotating magnetic flux in stator.

6) If the fuse in one of the phases burn while running condition, what happens to the motor?

When one of the fuse of the three phase supply cut off in induction motor is called single phasing when the single phasing happens during running of motor, due to unbalanced load. The motor, ~~does~~ takes high current and causes insulation failure in winding which leads to burning.

VIVA - VOICE

1) Define regulation?

A) Voltage regulation of transformer is defined as change in secondary terminal voltage (V_2) from no-load to full-load at constant primary voltage & Temperature

$$\% \text{ regulation} = \frac{E_2 - V_2}{E_2} \times 100.$$

2) Difference between EMF & MMF methods?

A) EMF stands for Electromotive force, its driving force required for movement of electrons in an electrical circuit. and MMF stands for Magnetic motive Force.

3) For lagging power factor regulation of an alternator is?

A) For lagging power factor of alternator there is always drop in terminal voltage hence regulation values are positive.

4) For leading power factor regulation of an alternator is?

A) Voltage regulation for alternator for leading power factor is negative due to magnetizing nature of armature reaction.

5) What is the name given to MMF & EMF method?

A) EMF method is also called pessimistic method value of regulation obtained is much more than the actual value. The MMF value is also called optimistic method as value of regulation obtained is much less than actual value.

6) Which method gives high values of synchronous impedence with that of actual values?

A) Synchronous impedence method gives reacne which is higher than original value. That's why it's called pessimistic method.

7) How does armature reaction is considered in MMF method?

A) Armature Reaction in a synchronous machine. The effect of armature flux on flux produced by motor field poles is called armature reaction. When current flows through armature winding of an alternator. a flux is produced by resulting MMF.

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to be constant speed motor.

Viva - Questions

Why shunt motor is called constant speed motor?

In DC shunt motor flux produced by field windings is proportional to field current. Here the input voltage is constant so field current and flux is also constant. Therefore DC shunt motor is called constant speed motor

2) What are the applications of DC shunt motor?

A) These motors are used where ever the constant speed is need and starting conditions are not severe.

3) What is the purpose of starters?

A) Starters are used to protect DC motors from damage

4) How the direction of rotation of a DC shunt motor is reversed?

A) To reverse the direction of rotation we switch the wires connected to the brushes, if we switch only one direction is reversed if both are changed the direction is brought to the default.

5) One DC motor drives another DC motor when excited and driven the second DC motor runs as

Ans) Generator

6) Why armature rheostat position of motor should be kept at max position initially?

Ans) To control and reduce the high starting current

7) Why field rheostat position of motor should be kept at minimum initially?

Ans) To ensure that the speed does not go beyond rated voltage and to increase torque

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Viva - Voice:

1) How capacitors and inductors store energy? Give the formula for stored energy.

A) A capacitor stores energy in the form of an electric field while an inductor stores energy in a magnetic field.

energy stored in capacitor = $\frac{1}{2}Q^2 = \frac{QV}{2} = \frac{1}{2}CV^2$

Energy stored in inductor = $E = \frac{1}{2}Li^2$

2) Define time constant in series RL and RC circuit?

A) The time constant τ in a RL circuit is measured by $\tau = L/R$ in seconds where 'R' is the value of resistor in ohms. 'L' is the value of inductor in Henrys. The time constant of an RC circuit is the product of the resistance and capacitance $\tau = RC$.

3) How does a capacitor and inductor respond to DC voltage?

A) In a DC source capacitor acts like an open circuit as voltage is constant. And an inductor acts as a short circuit for a DC source.

4) What is the behaviour of capacitor and inductor in steady state?

A) In a steady state a capacitor becomes open circuit and inductors become short circuit.

(9)

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