

EEE IV Year/ VII Sem

EE8701 High Voltage Engineering Question Bank

Unit-I

Part -A

1. What are the causes of over voltages in power system?

The causes of over voltages in power system may be internal cause or external cause.

Internal

- a) Switching transients
- b) Arcing ground
- c) Insulation failure
- d) Resonance

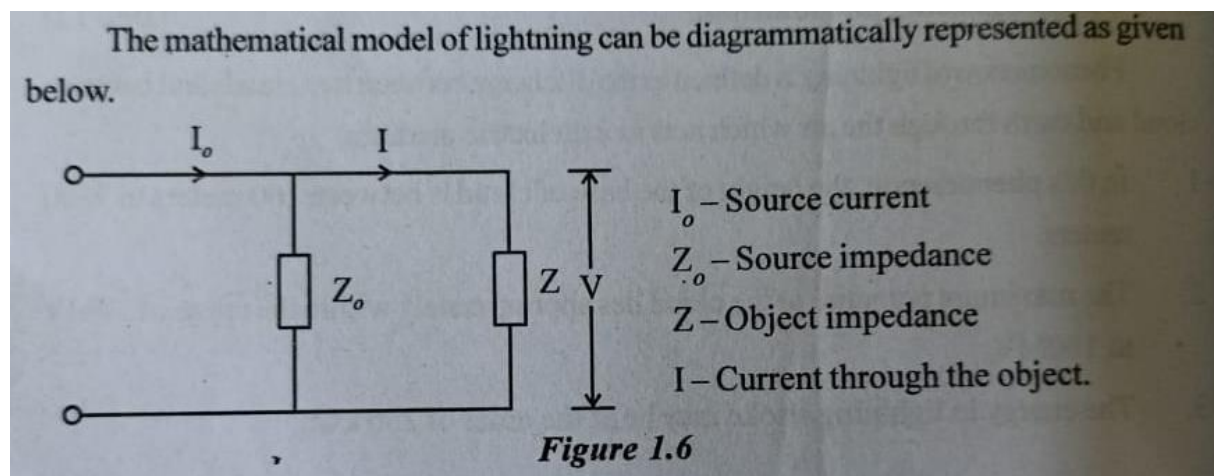
External

- a) Lightning

2. List the sources of switching over voltage in power system

- a) Opening and closing of circuit breakers
- b) Switching surges with high rate of rise voltage may cause repeated restriking of the arc between the contacts of the CB
- c) High natural frequencies of the system
- d) Restriking and recovery voltage with successive reflected waves from terminations

3. Draw the mathematical model for lightning discharge





4. What is meant by corona?

When an alternating voltage applied across two conductors at a certain voltage, called critical disruptive voltage, the conductors are surrounded by a faint glow called corona. The phenomenon of corona is accompanied by a hissing sound, and production of ozone gas.

5. Define Isokeraunic level or thunderstorm days

It is defined as the number of days in a year when the thunder is heard or recorded in a particular location. Often it does not distinguish between the ground strokes and the cloud-to-cloud strokes.

6. Name the source of switching surges

Sudden switching off of loads, short circuits and fault clearances, disconnection of unloaded transformers, reactors.

7. List the different methods employed for lightning protection of overhead lines

- i) Shielding the overhead line using ground wires
- ii) Using ground rods and counterpoise wires
- iii) Using protective devices like expulsion gap, protector tubes, surge diverters

Part-B

- 1. What are the mechanisms by which lightning strokes develop and induce overvoltage on overhead power lines?**
- 2. Explain the different methods employed for lightning protection of overhead lines**
- 3. Explain the techniques to be used for controlling the switching over voltages in a power system**
- 4. Explain the causes of power frequency overvoltage in transmission line and also methods to mitigate it.**
- 5. Describe the various steps to draw the Bewley-Lattice diagram of successive reflections**



Unit-II

Part-A

1. Define Paschen's law

Paschen's law states that breakdown voltage of uniform field gap filled with a gas is a unique function of product gas pressure 'P' and gap length 'd' for particular gas and particular electrode configuration

$$V_b = F(pd)$$

2. Define uniform and non-uniform fields

In uniform field the applied field remains constant across the gap. E.g.: two plane electrodes

In non uniform field the applied field varies across the gap. E.g.: Point-plane and sphere plane gaps

3. What are the factors which affect the breakdown voltage of a gaseous dielectrics?

- a) Pressure
- b) Temperature
- c) Electrode configuration
- d) Nature of electrode surface
- e) Availability of initial conducting particles

4. What are the insulating materials used in power transformer?

- a) Transformer oil
- b) Electrical grade paper
- c) Pressboard

5. Define Gas law

A statement that the product of the pressure and volume of one mole of a gas equals the product of the gas constant by the absolute temperature (as expressed by the equation $pV=RT$) it is also called as ideal-gas law.

6. What is ionization by collision

In the process of ionization by collision, a free electron collides with a neutral gas molecule and gives rise to a new electron and positive ion



Part – B

- 1. Explain clearly breakdown in vacuum dielectrics**
- 2. Explain the breakdown mechanism of liquid dielectrics**
- 3. Explain the breakdown mechanism involving in solid dielectrics breakdown**
- 4. State and explain Paschen's law. How do your account for the minimum voltage for break down under a given (pd) condition**
- 5. What do you understand by intrinsic strength of solid dielectrics? Explain different mechanisms by which breakdown occurs in solid dielectrics in practice**

Unit-III

Part – A

- 1. What are called DELTATRON circuits**

A combination of Cockcroft Walton type voltage multiplier with cascaded transformer dc rectifier is developed for very high voltages but limited output currents having high stability, small ripple factor and fast regulation. This type of circuit is called deltatron circuit

- 2. Mention the specifications of impulse current as per Indian standards**

By defining the rise of front time and tail time $1.2/50\mu\text{s}$, 1000 KV (standard value), fall time of 50% peak value of $50\mu\text{s}$ and a peak value of 1000 kV.

- 3. What are the advantages of high frequency transformers for generating high AC voltage?**

Due to absence of iron core, cost and size decreases

Pure sine wave output is obtained

Voltage is distributed uniformly across the winding coils

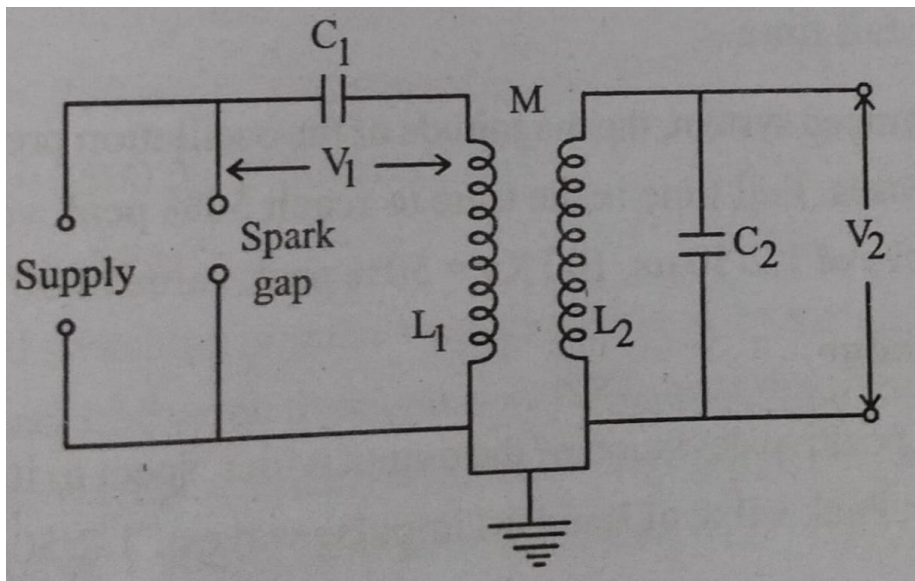
Voltage builds up slowly over a few cycles and hence no damage due to switching surges

- 4. What is cascaded transformer?**

Input of the first transformer unit is supplied from a motor generator or from a voltage regulator. The primary winding is supplied from a source. The high voltage winding of the first unit is connected to the tank of the second unit. The rating of the excitation winding is almost identical with that of primary winding voltage.

- 5. What is a tesla coil?**

Tesla coil is the commonly used high frequency resonant transformer, which is a doubly tuned resonant circuit.

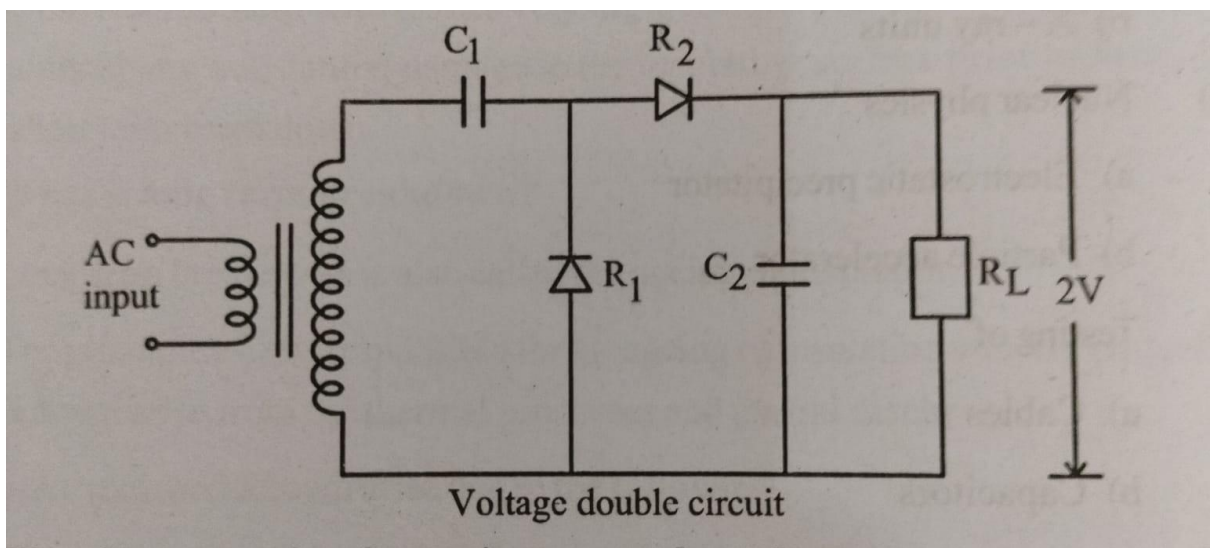


6. Define the terms (a) Impulse voltages (b) Chopped wave

Impulse voltage is a unidirectional voltage which usually has a rapid rise to the peak value and slowly falls to zero.

Chopped wave has a rapid rise to the peak value and oscillatory for some duration before falls to zero

7. Draw a simple voltage doubler circuit





Part – B

- 1. Explain the neat diagram the generation of high DC voltage using Vande-Graff generator. State the factors which limit the ultimate voltage developed.**
- 2. Explain the Marx circuit arrangement for multistage impulse generators. How is the basic arrangement modified to accommodate the wave time control resistances?**
- 3. Explain the cascaded connection of transformer for producing very high a.c. voltages**
- 4. Explain clearly the basic principle of operation of an electrostatic generator**

Unit-IV

Part – A

- 1. What are the advantages of generating voltmeters?**

No source loading by the meter. No direct connection to high voltage electrode. Scale is linear and extension of range is easy.

- 2. List some advantages of Faraday generator**

- There is no electric connection between the source and the device.
- No thermal problems even for large currents of several kilo amperes.
- There is no insulation problem, as the signal transmission is through an optical system

- 3. Why are the capacitive voltage dividers preferred for high AC voltage measurements?**

Harmonics are voltages and/or currents present in the output at some multiple of the fundamental frequency

- 4. List the disadvantages of series resistance micro ammeter method**

The drawbacks of this technique are (i) power dissipation and source loading, (ii) temperature effects and long time stability, (iii) voltage dependence of resistive elements, and (iv) sensitivity to mechanical stresses.

- 5. Why are capacitance voltage dividers preferred for high ac voltage measurements?**

It is used to eliminate the errors due to the harmonics with the help of an electrostatic voltmeter or high impedance voltmeter
Losses are minimised



Part – B

- 1. Explain the operation of electrostatic voltmeter with neat sketch**
- 2. Discuss the effect of nearby earthed objects, humidity and dust particles on the measurements using sphere gaps.**
- 3. Explain how DC high voltage can be measured using series ammeter**
- 4. Tabulate and explain the methods used for the measurement of high voltages and high currents.**
- 5. Explain the operation of a series capacitance voltmeter to measure high AC voltages**

Unit-V

Part – A

1. Define withstand voltage

The voltage which has to be applied to a test object under specified conditions the test object should withstand that voltage is called the withstand voltage

2. What is meant by insulation coordination

Insulation coordination means the correlation of the insulation of the various equipments in a power system, to the insulation of the protective devices used for protection of those equipments against overvoltages

3. What is Basic Impulse Insulation Level?

It is defined as the minimum insulation impulse withstands voltage of any power equipment or apparatus. The BIL of a power system is usually chosen as 25% to 30% more than the protective level Offered by the protective devices

4. What is the difference between type and routine test?

The type test is conducted on the sample to test the quality of the material with which the component is made. Routine test is conducted on the equipment or component periodically to check the deterioration in the quality during operation.

5. Compare the withstand voltage with flashover voltage

The equipment under test withstand upto a voltage in a healthy condition is called withstand voltage. The voltage at which flashover occurs over the surface of the insulation is called flashover voltage



Part – B

- 1. Describe the various tests to be carried out on a Circuit Breaker at HV labs**
- 2. Explain in detail the power frequency and impulse voltage test need to be conducted on bushings**
- 3. Explain in sequence the various high voltage tests being carried out in a power transformer**
- 4. Discuss in detail the dielectric power factor test and partial discharge test procedures for high voltage cables**

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