BABA BANDA SINGH BAHADUR ENGINEERING COLLEGE

FATEHGARH SAHIB

Paper Code: BTEE-802 **Subject: High Voltage Engineering**

Question Bank Set-I

Q.1

(a) What are bundled conductors? Write different types.

(b) What is GMD.How bundle spacing and Bundle radius defined?

(c) What are the factors on which the power that can be transmitted through an EHV line depends?

(d) How the size of conductor is reduced when we use high voltage line? Explain with specific formula.

(e) What is the significance of Peek's formula in Corona loss?

(f) Differentiate bipolar link from Homopolar link considering at least two salient features?

(g) Write down the major converter station equipments required in HVDC transmission system.

(h) What is the permanent breakdown? In which insulating material it occurs.

(i) Which plastic materials are preferred for high frequency applications?

(j) Under which conditions/requirements epoxy resins are used in insulation?

(k) Write down the material used for HV cable insulation.

(l) Why Askerals are not used as transformer or capacitor insulation in recent years.

(m) Which class of insulation is used for generator coil insulation?

(n) Write the advantages of using plastic film insulation over paper insulation.

Q.2 Compare EHV AC with HVDC transmission on five salient points.

Q.3 Explain the phenomenon of CORONA and what are the factors affecting the CORONA

losses in HVAC and DC system. How it can be reduced.

Q.4 Explain radio interference due to EHVAC and HVDC system. What are their adverse effects and how these can be reduced?

Q.5 Describe the various types of HVDC links.

Q.6 Write a brief note: On the need of EHV-AC transmission.

Q.7 What is Insulation coordination?

Q.8 What is reactive power? Define shunt compensation with suitable diagram?

Q.9 How transformer insulation is divided? Briefly indicate the insulation arrangement indicating the insulating materials chosen.

Q.10 Explain the applications of insulating materials in rotating machines.

Question Bank Set-II

.1

(a) Write the various factors by which the conduction and breakdown of commercial liquids affected.
(b) Define Intrinsic strength in solid dielectrics.
(c) What is the cause of long - term deterioration and breakdown in solid dielectrics?
(d) What will be the maximum dielectric strength obtained with pure liquids?
(e) What is "stressed oil volume theory"?
(f) What are common liquid insulants used in electrical apparatus?
(g) What are electronegative, gases?
(h) Explain the term electron attachment.
(i) Write Paschen's Law.
(j) Explain the difference between photo-ionization and photo-electric emission.
(k) Describe the various factors that influence breakdown in a gas.
(l) Give applications of power capacitors.
(m) What is a composite dielectric?
(n) What is a Vaccum?

Section B: Long answer type questions:

Q2. Indicate the solid insulation applications in power cables and small size rotating machines.

Q3. Name the different mechanism by which breakdown occurs in solid dielectrics in practice. Explain the following mechanism

(a) Electromechanical breakdown

(b) Breakdown due to Treeing and Tracking

Q4. What do you understand by "intrinsic strength" of solid dielectric? How does breakdown occur due to electrons in a solid dielectric?

Q5. How do the temperature and moisture affect the breakdown strength of solid dielectrics? Write the special features of epoxy resin insulation.

Q6. Explain various theories that explain breakdown in commercial liquid dielectrics?

Q7. What are the commercial liquid dielectrics and how are they different from pure liquids?

Q8. Explain the ionization processes responsible for the electrical breakdown of gaseous medium.

Q9. Define Townsend's first and second ionization coefficients. How is the condition for breakdown obtained in a Townsend discharge?

Q10. Explain the Streamer theory of breakdown in air at atmospheric pressure.What are the anode and the cathode streamers? Explain the mechanism of their formation and development leading to breakdown.

Q11. What is Paschen's law? How do you account for the minimum voltage for breakdown under a given 'p x d' condition?

Q 12. A steady current of 600 micro-ampere flows through the plane electrodes separated by a distance of 0.5 cm when a voltage of 10 KV is applied. Determine the Townsend's first ionisation coefficient if a current of 30 micro ampere flows when the distance of separation is reduced to 0.2 cm and the field is kept constant at the previous value.

Question Bank Set-III

Q.1

(a) What is peak to peak ripple?

(b) What is a Tesla coil?

(c) Give significance of impulse tests.

(d) What are the special features of high voltages rectifier valves?

(e) What is the principle of operation of a resonant transformer? How is it advantageous over the cascade connected transformers?

(f) Compare at least two of the relative advantages and disadvantages of using a series resistance micro ammeter and a potential divider with an electrostatic voltmeter for measuring high d.c. voltages?

(g) How is a lossy dielectric represented?

Section B: Long answer type questions:

Q1. Explain with diagrams, different types of rectifier circuits for producing high d.c. voltages.

Q2. Give the expression for ripple and regulation in voltage multiplier circuits. How are the ripple and regulation minimized?

Q3. Explain the different schemes for cascade connection of transformers for producing very high a.c. voltages.

Q4. What is a Tesla coil? How are damped high frequency oscillations obtained from a Tesla coil?

Q5. Give the Marx circuit arrangement for multistage impulse generators. How is the basic arrangement modified to accommodate the wave time control resistances?

Q6. Discuss the different methods of measuring high d.c. voltages. What are the limitations in each method?

Q7. Give the basis circuit of measuring the peak voltage of (a) a.c. voltage, and (b) impulse voltages. What is the difference in measurement technique in the above two cases?

Q8. A 200KVA, 400V/ 250 kV testing transformer has 8% leakage reactance and 2% resistance. A cable has to be tested at 500kV using the above transformer as a resonant transformer at 50 Hz. If the charging current of the cable at 500 kV is 0.4 A, find the series inductance required, assuming 3% resistance of the inductor to be used and the connecting leads. Neglect the dielectric loss of the cable. Calculate the input voltage to the transformer.

Q 9. Why capacitance voltage dividers preferred for high ac voltage measurement?

Q10. Compare resistance and capacitance potential divider showing relevant circuit configuration for high voltage measurement. Draw and explain the schematic arrangement of an impulse potential divider connected with an oscilloscope connected for measuring impulse voltage.

Q.11. A Cockcroft- Walton type voltage multiplier has 8 stages with capacitance, all equal to 0.05 micro-farad. The supply transformer secondary voltage is 125 KV at a frequency of 150 Hz. If the load current to be supplied is 5 mA, find

(i) The percentage ripple,

(ii) The regulation

(iii) Optimum number of stage for minimum regulation.

Q.12 Explain how a sphere gap can be used to measure the peak value of voltages. What are the parameters and factors that influence such voltages measurement?