CBCS SCHEME

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15EE73

Seventh Semester B.E. Degree Examination, July/August 2022
High Voltage Engineering

Time: 3 hrs. Max. Marks: 80

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

1 a. Define Townsend's first and second ionization co-efficient. Derive an expression for the current growth in a gas discharge due to secondary mechanism. **(07 Marks)**

b. The steady current of 600μA flows through the plane electrode separated by a distance of 0.5cm. When a voltage of 10kV is applied. Determine the Townsends's first ionization co-efficient if a current of 60μA flows when the distance of separation is reduced to 0.1cm and the field is kept constant at the previous value. **(04 Marks)**

c. What are electronegative gases? Why is the breakdown strength of these gases higher compared to that of other gases? **(05 Marks)**

OR

2 a. What is meant by time lag of breakdown? Explain statistical and formative time lag. **(04 Marks)**

b. Explain the suspended particle theory of breakdown in liquid. **(06 Marks)**

c. What is thermal breakdown in "solid dielectrics" and how it is practically more significant than other mechanisms? **(06 Marks)**

Module-2

3 a. With the help of a neat sketch, explain how cascade transformer generate high AC voltages. **(08 Marks)**

b. Describe with neat sketch, the working of Cockcraft-Walton voltage multiplier circuit. **(08 Marks)**

OR

4 a. With the help of the neat diagram, explain how lightening impulse voltage can be developed in the laboratory by marx circuit. **(06 Marks)**

b. Explain with a neat circuit diagram, the tripping of an impulse generator with a three electrode gap method. **(05 Marks)**

c. Calculate the front and tail resistance for 5 stages. 1000kV with the capacitance of each stage is 5μf and a load capacitance of 10,000pF for 1μsec front and 50μs tail ware. **(05 Marks)**

Module-3

5 a. Describe with a neat sketch the working of a generating voltmeter used to measure high DC voltages and list out merits and demerits. **(08 Marks)**

b. Explain the factors that influence the measurement of high voltage using the sphere gap. **(08 Marks)**

OR

6 a. Explain the working principle of series capacitor peak voltmeter based on Chubb-Frotscue method. **(06 Marks)**

b. Explain the principle and construction of an electrostatic voltmeter for the measurement of high voltages. **(06 Marks)**

c. An absolute electrostatic voltmeter has a movable circular plate 8cms in diameter. If the distance between the plates during a measurement is 4mm and the applied voltage is 1kV. Calculate the force on the plate. Assume medium as having $E_r = 1$. **(04 Marks)**

Module-4

7 a. Explain the different theories of charge formation in clouds. **(08 Marks)**

b. What are the causes for switching and power frequency over voltages? How are they controlled in power systems? **(08 Marks)**

OR

8 a. What is a surge diverter? Explain its function as a shunt protective device. **(08 Marks)**

b. Write a short notes on:

i) Rod gaps used as protective devices.

ii) Ground wires for protection of overhead lines. **(08 Marks)**

Module-5

9 a. With the help of a diagram of schering bridge explain how capacitance and tan δ can be measured. **(04 Marks)**

b. What is meant by partial discharge? Explain how it is measured using straight method and balance method. **(08 Marks)**

c. Discuss the factors affecting the discharge detection. **(04 Marks)**

OR

10 a. With a neat diagram, explain the impulse testing of transformers. How are faults detected and located? **(06 Marks)**

b. Mention the different power frequency tests that are carried out in practice on HV insulators. Explain the procedure of conducting each of these tests. **(06 Marks)**

c. Explain any one method of testing cables. **(04 Marks)**

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