

USN

--	--	--	--	--	--	--	--	--	--

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 $600\mu\text{A}$ 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 $60\mu\text{A}$ 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 $5\mu\text{f}$ and a load capacitance of 10,000pF for $1\mu\text{sec}$ front and $50\mu\text{s}$ 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-Frotschue 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:
- Rod gaps used as protective devices.
 - 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 $\tan \delta$ 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)
