

This question paper contains 4 printed pages.]

Your Roll No.

8487

A

B.Tech. (E)/III

Paper EEE-305 - HIGH VOLTAGE ENGINEERING

Time : 3 Hours

Maximum Marks : 70

*(Write your Roll No. on the top immediately
on receipt of this question paper.)*

Answer any five questions.

All questions carry equal marks.

Assume missing data, if any, suitably.

1. (a) Define Townsend's first and second ionization coefficients.
Explain the Townsend's criterion for a spark. 7
- (b) Explain Penning Effect when referred to gaseous discharges. 4
- (c) A study current of $600 \mu\text{A}$ flows through a plane electrode separated by a distance of 0.5 cm when a voltage of 10 kV is applied. Determine the Townsend's first coefficient if a current of $60 \mu\text{A}$ flows when the distance of separation is reduced to 0.1 cm and the field is kept constant at the previous value. 3

[P.T.O.]

2. Explain with neat sketches Cockcroft-Walton voltage multiplier circuit. Explain clearly its operation when the circuit is (i) unloaded, and (ii) loaded. 7
- (b) Explain clearly the basic principle of operation of an electrostatic Generator. 7
3. (a) Describe the construction, principle of operation and application of multistage Marx's surge generator. 7
- (b) Explain with neat diagram triggering and synchronization of the impulse generator with the CRO. 7
4. (a) Explain clearly the procedure for measurement of (i) impulse (ii) a.c. high voltages using sphere gap. 7
- (b) Draw a neat schematic diagram of a generating voltmeter and explain its principle of operation. 4
- (c) An absolute electrostatic voltmeter has a movable circular plate 8 cm in diameter. If the distance between the plates during a measurement is 4 mm, determine the potential difference when the force of attraction is 0.2 gm wt. 3
5. (a) Explain briefly various tests to be carried out on a brushing 7

- (b) Draw a neat diagram of High Voltage Schering Bridge and describe various features of the bridge. 4
- (c) A 33 kV, 50 Hz high voltage Schering bridge is used to test a sample of insulation. The various arms have the following parameters on balance. The standard capacitance 500 pF, the resistor branch 800 ohm and branch with parallel combination of resistance and capacitance has values of 180 ohm and 0.15 μ F. Determine the value of the capacitance of this sample, its parallel equivalent loss resistance and p.t. under these test conditions. 3
6. (a) What are partial discharges? Develop and draw equivalent circuit of insulating material during partial discharge. 7
- (b) Explain with neat sketches the mechanism of lightning discharge. 7
7. (a) What are volt-time curves? What is their significance in power system studies? 7
- (b) What is a travelling wave? Explain the development of such a wave on an overhead line. 4

(c) A surge of 15 kV magnitude travels along a cable towards its junction with an overhead line. The inductance and capacitance of the cable and overhead line are respectively 0.3 mH, 0.4 μ F and 1.5 mH, 0.012 μ F per km. Find the voltage rise at the junction due to the surge. 3

8. Write short notes on :

(a) Break down mechanism in liquid dielectrics 7

(b) Sphere gap measurements. 7