

CBCS SCHEME

15EE73



USN

Seventh Semester B.E. Degree Examination, Dec.2019/Jan.2020 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. Derive an expression for the current in the air gap that is $i = i_0 e^{\alpha d}$ considering Townsend first ionization coefficient. (07 Marks)
- b. What are the limitation of Townsend's theory? (03 Marks)
- c. In an experiment in a certain gas it was found that the steady state current is 5.5×10^{-8} A at 8kV at a distance of 0.4cm between the plane electrodes. Keeping the field constant and reducing the distance to 0.1cm results in a current of 5.5×10^{-9} A. Calculate Townsend's primary ionization coefficient α . (06 Marks)

OR

- 2 a. Explain briefly suspended particle theory of breakdown in liquid dielectric. (06 Marks)
- b. Explain the following breakdown mechanism in solid.
- i) Electro mechanical breakdown
- ii) Thermal breakdown. (10 Marks)

Module-2

- 3 a. With the help of a neat sketch, explain how cascade transformer generates High Voltage AC. (06 Marks)
- b. What is Tesla coil? How are damped high frequency oscillation obtained from the Tesla coil? (06 Marks)
- c. A Cockcroft-Walton type voltage multiplier has eight stages with capacitances, all equal to $0.05 \mu\text{F}$. The supply transformer secondary voltage is 125kV at a frequency of 150Hz. If the load current to be supplied is 5mA, find i) The percentage ripple ii) the regulation. (04 Marks)

OR

- 4 a. With neat sketch, explain the Mark's circuit arrangement for multistage impulse generator. (07 Marks)
- b. With a neat diagram, explain the operation of trigatron gap. (06 Marks)
- c. Define wave front and wave tail times of an impulse voltage wave. (03 Marks)

Module-3

- 5 a. With neat sketch, explain principle, working and construction of electrostatic voltmeter. (06 Marks)
- b. Briefly explain the factors affecting measurement of voltage using sphere gap. (05 Marks)
- c. Explain the working principle of generating voltmeter with a neat sketch. (05 Marks)

OR

- 6 a. Explain the Chubb-Fortscue method for measurement of peak value of an ac voltage waveform. (06 Marks)
- b. With the help of a neat sketch, explain the working of Rogowski coil for high impulse current measurement. (06 Marks)
- c. A generating voltmeter has to be designed so that it can have a range from 20 to 200kV dc. If the indicating meter reads a minimum current of $2\mu\text{A}$ and maximum current of $25\mu\text{A}$, what should the capacitance of generating voltmeter be? (04 Marks)

Module-4

- 7 a. Explain the different theories of charge formation in clouds. (08 Marks)
- b. Explain with suitable figures the principles and functioning of
i) Expulsion gaps ii) Protector tubes. (08 Marks)

OR

- 8 a. What is a surge arrester? Explain its function as a shunt protective device. (08 Marks)
- b. Write short notes on:
i) Rod gaps used as protective devices. (08 Marks)
- ii) Ground wires for protection of overhead lines. (08 Marks)

Module-5

- 9 a. Discuss the method of discharge detection using straight detector. (08 Marks)
- b. Explain the method of measuring dielectric loss at power frequency using high voltage Schering bridge. (08 Marks)

OR

- 10 a. Describe the various electrical tests done on transformers. (08 Marks)
- b. Write a different methods of conducting a short circuit tests on circuit breakers. (08 Marks)