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17EE73

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

Time: 3 hrs.

Max. Marks: 100

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 $i = i_0 e^{\alpha x}$ considering Townsend first ionization coefficient. (06 Marks)
- b. State and explain Paschen's law. (06 Marks)
- c. In an experiment in a certain gas it was found that the steady state current is 5.5×10^{-8} A at 8 KV 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 . (08 Marks)

OR

- 2 a. Explain Cavitation and Bubble mechanism in liquid dielectric. (07 Marks)
- b. Explain Thermal breakdown in solid dielectric. (07 Marks)
- c. A solid specimen and dielectric has a dielectric constant of 4.2 and $\tan \delta = 0.001$ at a frequency of 50Hz. If it is subjected to an alternating field of 50KV/cm, calculate the heat generated in the specimen due to dielectric loss. (06 Marks)

Module-2

- 3 a. Explain the construction and working of cascade transformer set. (10 Marks)
- b. Why is Cockcroft Walton circuit is preferred for voltage multiplier circuits? Explain its working with a schematic diagram. (10 Marks)

OR

- 4 a. A Cockcroft – Walton type voltage multiplier has eight stages with capacitances, all equal to $0.05 \mu\text{F}$. If the full load current to be supplied is 5mA, find i) the percentage ripple ii) regulation iii) the optimum number of stages for minimum regulation or voltage drop. (10 Marks)
- b. Explain Construction and working principle of Van de Graff generator. (10 Marks)

Module-3

- 5 a. With the help of neat circuit, explain construction and working principle of series resistance with micro ammeter. (10 Marks)
- b. Explain with the help of neat circuit series capacitor peak voltmeter. (10 Marks)

OR

- 6 a. Explain how a sphere gap can be used to measure the Peak value of voltages. (10 Marks)
- b. Explain measurement of impulse currents by Rogowski coils and magnetic links. (10 Marks)

Module-4

- 7 a. Explain the different theories of charge formation in clouds. (10 Marks)
b. Explain with suitable figures the principles and functioning of
i) Expulsion gaps ii) Protector tubes. (10 Marks)

OR

- 8 a. Write short notes on :
i) Rod gaps used as protective devices. (10 Marks)
ii) Ground wires for protection of over head lines. (10 Marks)
b. What is meant by insulation co-ordination? How are the protective devices chosen for optimal insulation level in a power system? (10 Marks)

Module-5

- 9 a. What are the Partial discharges and how are they detected under power frequency Operating conditions? (10 Marks)
b. Explain the High voltage Schering bridge for $\tan \delta$ and capacitance measurement of insulators or bushings. (10 Marks)

OR

- 10 a. Explain Testing of Insulators and Bushings. (10 Marks)
b. Explain Testing of Surge Arrester. (10 Marks)
