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10EE73

Seventh Semester B.E. Degree Examination, Dec.2015/Jan.2016
High Voltage Engineering

Time: 3 hrs. Max. Marks:100

Note: ***Answer FIVE full questions, selecting at least TWO questions from each part.***

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
2. Any revealing of identification, appeal to evaluator and /or equations written eg, 42+8 = 50, will be treated as malpractice.

PART – A

1 a. Explain the need for generation of very high voltages in the laboratory. **(06 Marks)**

b. What are the advantages of transmitting electrical power at high voltages? **(06 Marks)**

c. Describe the various components of electrostatic precipitator (ESP) and its principle of working. **(08 Marks)**

2 a. Write the preferred properties of gaseous dielectric for high voltage applications. Give any three examples of gaseous dielectric. **(06 Marks)**

b. Explain the process of ionization by collision and hence obtain the Townsend's current growth equation. **(08 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 0.4 cm between the plane electrodes. Keeping the field constant and reducing the distance to 0.1 cm results in a current of 5.5×10^{-9} A. Calculate Townsend's primary ionization coefficient α. **(06 Marks)**

3 a. State and explain Paschen's law. **(06 Marks)**

b. Explain the following breakdown mechanism in solid:
i) Streamer breakdown. ii) Electromechanical breakdown. **(14 Marks)**

4 a. Explain with a neat figure, how cascade transformers generate high ac voltages. **(08 Marks)**

b. Explain the principle of operation of a resonant transformer. **(06 Marks)**

c. A Cockcroft-Walton type voltage multiplier circuit has eight stages with capacitances all equal to 0.05 μF. The supply transformer secondary voltage is 125 KV at a frequency of 150 Hz. If the load current to be supplied is 5 mA. Find
i) The voltage drop and regulation.
ii) The optimum number of stages for minimum voltage drop. **(06 Marks)**

PART – B

5 a. Explain the Marx circuit arrangement for multistage impulse generator. **(08 Marks)**

b. Explain the operation of a trigatron gap. **(06 Marks)**

c. A 12-stage impulse generator has 0.126 μF capacitors. The wavefront and wave tail resistances connected are 800 ohms and 5000 ohms respectively. If the load capacitor is 1000 pF, find the front and tail lines of the impulse wave produced. **(06 Marks)**

6 a. With a schematic diagram, explain the principle of operation of a generating voltmeter. **(08 Marks)**

b. Explain the Chubb and Forteswe method for measurement of peak value of an ac voltage waveform. **(06 Marks)**

c. Explain the principle of operation of an electrostatic voltmeter for measurement of very high dc and ac voltages. **(06 Marks)**

7 a. Explain the method of balanced detection for locating partial discharges in electrical equipment. **(10 Marks)**

b. Explain how capacitance and $\tan\delta$ can be measured using a Schering bridge. **(10 Marks)**

8 a. Define the following terminologies: i) Disruptive discharge voltage.
ii) Fifty percent Flashover voltage. iii) Impulse voltages. **(06 Marks)**

b. Write brief notes on: i) Testing on insulators. ii) Testing of cables. **(14 Marks)**

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