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10EE73

Seventh Semester B.E. Degree Examination, Dec.2018/Jan.2019

High Voltage Engineering

Time: 3 hrs.

Max. Marks:100

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

PART - A

- 1 a. Discuss the important applications of high voltages. (06 Marks)
- b. Explain the need for generating high voltages in the laboratory. (06 Marks)
- c. What is electrostatic precipitator? Explain the operating principle of electrostatic precipitator and electrostatic painting. (08 Marks)
- 2 a. Define townsend's first and second ionization coefficient. Derive Townsend's current in air gap considering secondary ionization process. (08 Marks)
- b. State and explain Paschen's law with necessary diagram. (06 Marks)
- c. Explain breakdown mechanism in electronegative gases. (06 Marks)
- 3 a. List the important properties of liquid dielectrics. (04 Marks)
- b. Explain cavitation and bubble mechanism of breakdown in liquid dielectrics. (06 Marks)
- c. Explain the following breakdown mechanism in solid dielectrics: (10 Marks)
 - i) Avalanch breakdown
 - ii) Thermal breakdown
- 4 a. What is the necessity of cascade connection? With neat schematic diagram, explain cascade connection of transformers for generation of high voltages ac. (06 Marks)
- b. What is Tesla coil? How are damped high frequency oscillations obtained from Tesla coil? (06 Marks)
- c. A ten stage Cockroft-Walton circuit has all capacitors of $0.055 \mu\text{F}$ the secondary voltage of the supply is 125 KV at a frequency of 200 Hz. If the load current is 2 mA, determine: (08 Marks)
 - i) The voltage regulation
 - ii) The % ripple
 - iii) The optimum number of stages for maximum output voltage
 - iv) The maximum output voltage

PART - B

- 5 a. Explain Marx circuit arrangement for multistage impulse generator. (07 Marks)
- b. An 8-stage impulse generator has $0.12 \mu\text{F}$ capacitors rated for 167 KV. What is the maximum discharge energy? If it has to produce a $1/50 \mu\text{sec}$ waveform across a load capacitor of 15000 PF, find the values of wave front and wave tail resistances. (06 Marks)
- c. What is trigatron gap? Explain its function and operation. (07 Marks)
- 6 a. Explain with schematic diagrams, construction and working principle of generating voltmeter. (08 Marks)
- b. Explain how peak value of high voltage AC is measured using Chubb and Fortescue method. (06 Marks)
- c. Discuss the factors affecting the measurement of high voltage using sphere gap. (06 Marks)

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.

- 7 a. With the help of a neat schematic diagram describe how dielectric loss and capacitance of an insulator can be measured using a high voltage Schering bridge. (08 Marks)
- b. Define partial discharge. Explain how it is measured using straight detection method. (06 Marks)
- c. With the help of equivalent circuit describe resistance voltage divider for measurement of fast rising voltages. (06 Marks)
- 8 a. What are the various power frequency and impulse tests done on insulator? Describe the procedure for impulse tests. (08 Marks)
- b. Write short notes on the following:
- i) High voltage tests on cables
 - ii) Impulse current generator
 - iii) Rogowski coils
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- (12 Marks)
