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10EE73

Seventh Semester B.E. Degree Examination, June/July 2015
High Voltage Engineering

Time: 3 hrs. Max. Marks:100

Note: ***1. Answer any FIVE full questions, selecting atleast TWO questions from each part.***
2. Missing data may be suitably assumed.

PART – A

1 a. What are the advantages of transmitting electrical power at high voltages? **(06 Marks)**
b. Explain in brief the need for generating high voltages in the laboratory. **(06 Marks)**
c. What are the industrial applications of high voltages? **(08 Marks)**

2 a. Define Townsend's first and second ionization coefficients. Derive from fundamentals the coefficients. Derive from fundamentals the current growth equations and hence the Townsend's criterion for breakdown. **(10 Marks)**
b. Derive and explain Paschen's law. **(05 Marks)**
c. Explain briefly formative time lag and statistical time lag. **(05 Marks)**

3 a. Explain any two theories that explain breakdown in commercial liquid dielectrics. **(10 Marks)**
b. Explain the electromechanical breakdown of solid dielectrics. **(05 Marks)**
c. A solid specimen of dielectric has a dielectric constant 4.2 and tan $\delta = 0.001$ at frequency of 50Hz. If it is subjected to an alternating field 50kV/cm. Calculate the heat generated in the specimen due to the dielectric loss. **(05 Marks)**

4 a. Explain how high direct current, voltages can be generated using a Cockcroft Walton circuit. **(07 Marks)**
b. With the help of a neat sketch, explain the construction and working principle of cascading of transformers of three units. **(07 Marks)**
c. A Cockcroft-Walton type multiplier has right stages with capacitances, all equal to 0.05μF. The supply transformer secondary voltage is 125kV at frequency of 150 Hz. If the load current to be supplied is 5mA, find: i) the percentage of ripple and ii) Regulation. **(06 Marks)**

PART – B

5 a. Explain how impulse voltages are generated in a laboratory using Marx circuit. **(08 Marks)**
b. Explain the working principle of a Trigatron gap tripping circuit used for the impulse generator. **(06 Marks)**
c. A 12 stage impulse generator has 0.126 μF capacitors. The wave front and the wave tail resistances connected are 800 ohms and 5000 ohm respectively. If load capacitor is 1000pF. Find the front and tail times of the impulse wave produced. **(06 Marks)**

6 a. Describe with a neat sketch, the working of a generating voltmeter used to measure high D.C. voltages. **(08 Marks)**

b. Explain the principle and construction of an electrostatic voltmeter for the measurement of high voltages. **(08 Marks)**

c. What are the factors influencing the sparkover voltages of sphere gaps? **(04 Marks)**

7 a. Explain the construction and principle of operation of H.V. Schering bridge used for dielectric loss and loss angle measurements. Derive the expression used. **(08 Marks)**

b. Discuss the method of discharge detection using straight detectors. **(08 Marks)**

c. A Schering bridge was used to measure the capacitance and loss angle of an H.V. brushing. At balance, the observations were: the value of the standard condenser = 100 pF, $R_3 = 3180\ \Omega$, $C_3 = 0.00125\ \mu F$ and $R_4 = 636\Omega$. What are the values of capacitances and tan δ of the brushing? **(04 Marks)**

8 a. Mention the different electrical tests done on circuit breakers. **(10 Marks)**

b. Describe various electrical tests done on transformers. **(10 Marks)**

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