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17EE73

Seventh Semester B.E. Degree Examination, June/July 2024
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 growth in the air gap considering Townsend First ionization co-efficient. **(10 Marks)**
    b. What is Paschen's law? How do you account for the minimum voltage for breakdown under a given PXD condition? **(10 Marks)**

OR

2   a. List the three important properties of liquid dielectrics and explain suspended particle theory of breakdown. **(10 Marks)**
    b. List the various breakdown mechanisms in solid dielectrics and explain Thermal breakdown mechanism. **(10 Marks)**

Module-2

3   a. With a neat diagram, explain the construction and working principle of Marx generator. **(07 Marks)**
    b. With a neat figure, explain the tripping of an impulse generator with three Electrode gap methods. **(07 Marks)**
    c. A 12 – stage impulse generator has 0.126 µF condensers. The wave front and the wave tail resistances connected are 800 ohms and 5000 ohms respectively. If the load condenser is 1000PF, find the front and tail times of the impulse wave produced. **(06 Marks)**

OR

4   a. With neat diagram, explain how the damped high frequency oscillations are obtained from Tesla coil. **(07 Marks)**
    b. Explain the working of Cockcroft – Walton, voltage multiplier circuit with schematic diagram. **(07 Marks)**
    c. Explain the cascade connection of transformer for producing very high ac voltages. **(06 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 cloud. **(10 Marks)**

b. What is direct and indirect lighting stroke? Give reasons for induced voltage on the power line due to indirect stroke. **(10 Marks)**

OR

8 a. List the parameters to be considered for the selection of surge arrester voltage rating for EHV and UHV, also explain the types of surge arresters used. **(10 Marks)**

b. A transmission line has the following line constant R = 0.1 ohm/km, L = 1.26mH/km, C = 0.009μF/km and G = 0. If the line is a 3-phase line and is charged from one end at a line voltage of 230kV, find the rise in voltage at the other end, if the line length is 400km. **(10 Marks)**

Module-5

9 a. Explain the high voltage Schering bridge for the tan δ and capacitance measurement of insulators or bushings. **(08 Marks)**

b. Explain the balanced detection for locating partial discharges in electrical equipment. **(06 Marks)**

c. Explain the transformer ratio arm bridge for audio frequency range measurement. **(06 Marks)**

OR

10 a. Write a short note on testing of cables. **(08 Marks)**

b. Explain the i) Withstand voltage   ii) Flashover voltage. **(06 Marks)**

c. A Schering bridge was used to measure the capacitance and loss angle of a HV bushing. 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 capacitance and tan δ of the bushing? **(06 Marks)**

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