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B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2007.

Seventh Semester

Electrical and Electronics Engineering

EE 433 — HIGH VOLTAGE ENGINEERING

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. What is meant by insulation coordination?

2. What are the difference between lightning and switching surges?

3. What are electronegative gases? Give examples.

4. Define statistical time lag and formative time lag.

5. What is the front and tail time of a standard impulse wave? What are the tolerances allowed as per the specifications?

6. What are the advantages of isolating transformer over cascade transformer units for generating high a.c voltages?

7. List the elements that constitute error in the measurement of impulse voltage using potential dividers.

8. What are various devices used to measure high D.C currents?

9. Define Creepage Distance.

10. What do you mean by Disruptive Discharge Voltage?

PART B — (5 × 16 = 80 marks)

11. (a) Explain with neat sketch the various theories of charge generation and discharge in a thunder cloud. (16)

Or

(b) Explain the different methods adopted for protection against over voltages. (16)

12. (a) (i) Discuss the various theories that explain the breakdown of Vacuum insulation. (10)

(ii) Derive from the basics the condition for breakdown in Townsend's discharge. (6)

Or

(b) (i) A solid dielectric specimen of dielectric constant of 4.0 has an internal void of thickness 1 mm at its center. The specimen is 1 cm thick and is subjected to a voltage of 80 kV(rms). If the void is filled with air and if the breakdown strength of air can be taken as 30 kV (peak)/cm, find the voltage at which internal discharge can occur. (6)

(ii) Explain the different mechanism by which breakdown occurs in solid dielectrics in practice. (10)

13. (a) (i) A Cockroft — Walton type voltage multiplier has eight stages with capacitance, all equal to 0.05 μF. The supply transformer secondary voltage is 125 kV at frequency of 150 Hz. If the load current to be supplied is 5 mA, find (1) the percentage ripple (2) the regulation (3) the optimum number of stages for minimum voltage drop. (6)

(ii) Describe the circuit arrangement for producing lightning current waveforms in laboratories. (10)

Or

(b) (i) Draw a circuit for producing impulse waves. Also, prove that the output voltage of the circuit is an impulse wave. (8)

(ii) Explain with neat sketch the principle of operation of Resonant Transformer for generating High AC. Voltages (8)

14. (a) (i) Draw a neat schematic diagram of a generating voltmeter and explain its principle of operation. Discuss its application and limitation. (10)

(ii) Determine the breakdown voltage for air gaps of 2 mm and 15 mm lengths under uniform field and standard atmospheric conditions. Also, determine the voltage if the atmospheric pressure is 750 mm Hg and temperature 35°C. (6)

Or

(b) Explain how a sphere gap can be used to measure the peak value of voltages. Explain parameters and factors that influences such voltage measurement? (16)

15. (a) (i) Draw a neat diagram of High Voltage Schering Bridge and describe various features of the bridge. (8)

(ii) Explain, with schematic diagram any one method of measuring RIV of transmission line. (8)

Or

(b) Explain, with neat diagram the impulse testing of a transformer. What is procedure adopted in location of fault? (16)

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