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Question Paper Code : 40584

B.E./B.Tech. DEGREE EXAMINATIONS, NOVEMBER/DECEMBER 2025.

Seventh Semester

Electrical and Electronics Engineering

EE8701 — HIGH VOLTAGE ENGINEERING

(Regulations 2017)

Time : Three hours

Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. List the various schemes of protection against over voltages.
2. Mention the specifications of the standard impulse voltage.
3. State the factors affecting the breakdown of gaseous dielectrics.
4. Define Townsend's first ionization coefficient.
5. What are the different forms of high voltages required for testing electrical apparatus?
6. How are the wave front and wave tail times controlled in impulse generator circuits?
7. List the various digital techniques used in high voltage measurement.
8. What kind of problems that are associated with the measurement of very high impulse voltage.
9. Define the air density correction factor.
10. Distinguish between flashover and puncture.

PART B — (5 × 13 = 65 marks)

11. (a) Develop the wave equation of travelling waves in a transmission line and discuss the behaviour of travelling waves in an open-circuited line.

Or

- (b) A long transmission line is energized by a unit step voltage of 1.0 V at the sending end and is open-circuited at the receiving end. Construct the Bewley lattice diagram and obtain the value of the voltage at the receiving end after a long time. Take the attenuation factor $\alpha = 0.9$.

12. (a) Explain thermal breakdown mechanisms in solid dielectrics. Derive expressions for the critical thermal breakdown voltage (V_c) and critical electric field (E_c). Clearly mention the assumptions made.

Or

- (b) Explain the “stressed oil volume theory” and discuss how it explains breakdown in large volumes of commercial liquid dielectrics.
13. (a) Describe the Cockcroft – Walton voltage multiplier circuit in detail. Derive the expression for voltage regulation of an n -stage multiplier.

Or

- (b) An impulse generator has 10 stages, each with a capacitor of $0.18 \mu\text{F}$ rated at 150 kV per stage. The load capacitor is 200 pF . Estimate the values of series and parallel resistances required to produce an impulse with a wave shape of $1.2/50 \mu\text{s}$.
14. (a) With relevant diagram, explain the sphere gap arrangement method of high-voltage measurement in detail. State the factors influencing the measurements.

Or

- (b) Discuss in detail about the arrangements of the Rogowski coil and magneto-optic methods for high-current measurement.
15. (a) Explain in detail the various tests to be conducted on cables as per IS10810?

Or

- (b) State the necessity of volt-time curves. Explain the procedure for constructing volt-time curves with a neat sketch, and discuss their significance in power system studies.

PART C — ($1 \times 15 = 15$ marks)

16. (a) An underground cable of inductance 0.150 mH/km and of capacitance $0.2 \mu\text{F/km}$ is connected to an overhead line having an inductance of 1.2 mH/km and capacitance of $0.006 \mu\text{F/km}$. Calculate the transmitted and reflected voltage and current waves at the junction if a surge of 200 kV travels to the junction, (i) Along the cable (ii) Along the overhead line.

Or

- (b) A Rogowski coil is required to measure impulse current of 8 kA having rate of change of current of 10^{10} (A/sec) . The voltmeter is connected across the integrating circuit which reads 8 kV for full scale deflection. The input to integrating circuit is from Rogowski coil. Determine the mutual inductance of coil, R and C for the integrating circuit.