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Question Paper Code : 80580

B.E./B.Tech. DEGREE EXAMINATIONS, APRIL/MAY 2024.

Seventh Semester

Electrical and Electronics Engineering

EE 8701 — HIGH VOLTAGE ENGINEERING

(Regulations 2017)

Time : Three hours

Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Differentiate between different types of over voltages in a power system.
2. Write the cause of Corona.
3. State the properties of composite dielectric.
4. What is thermal breakdown in solid dielectrics?
5. What is the principle of operation of a resonant transformer?
6. Define trigatron gap.
7. A resistance divider of 1400 kV [impulse] has a high-voltage arm of 16 kilo-ohms and a low-voltage arm consisting 16 members of 250 ohms, 2 watt resistors in parallel. The divider is connected to a CRO through a cable of surge impedance 75 ohms and is terminated at the other end through a 75 ohm resistor. Calculate the exact divider ratio.
8. Capacitance voltage dividers are preferred for high ac voltage measurements. Justify.
9. What is insulation coordination?
10. Compare type and routine tests.

PART B — (5 × 13 = 65 marks)

11. (a) Describe the various methods implemented for protection against lightning over-voltages in an electrical power system.

Or

- (b) (i) Describe about surge arresters with their general characteristics. (9)

- (ii) Explain the reasons for power frequency over voltages in an electrical power system. (4)

12. (a) Discuss the various breakdown theories involved in commercial liquid dielectrics.

Or

- (b) Describe the current growth phenomenon in a gas subjected to uniform electric fields.

13. (a) Explain with diagrams, different types of rectifier circuits for producing high dc voltages.

Or

- (b) (i) Sketch the Marx circuit arrangement for multistage impulse generators. (4)

- (ii) How is the basic arrangement modified to accommodate the wave time control resistances? (9)

14. (a) Describe the generating voltmeter used for measuring high dc voltages. How does it compare with a potential divider for measuring high dc voltages?

Or

- (b) Summarize with schematic diagrams how dc current can be measured using dc current transformers.

15. (a) Explain the various HV testing's carried out on Insulators and Bushings.

Or

- (b) Narrate in sequence the various high voltage tests being carried out in a Power Transformer.

PART C — (1 × 15 = 15 marks)

16. (a) (i) A Cockcroft-Walton type voltage multiplier has eight stages with capacitances, all equal to $0.05 \mu\text{F}$. The supply transformer secondary voltage is 125 kV at a frequency of 150 Hz. If the load current to be supplied is 5 mA, find
- (1) the percentage ripple, (2)
 - (2) the regulation, and (1)
 - (3) the optimum number of stages for minimum regulation or voltage drop. (2)
- (ii) Give the mathematical model for lightning discharges and explain them. (10)

Or

- (b) Derive Townsend's criteria for the breakdown of gaseous dielectric medium.