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Question Paper Code : 91043

B.E./B.Tech. DEGREE EXAMINATIONS, APRIL/MAY 2025.

Seventh Semester

Electrical and Electronics Engineering

EE 3701 – HIGH VOLTAGE ENGINEERING

(Regulations 2021)

Time : Three hours

Maximum : 100 marks

Answer ALL questions.

PART A — ($10 \times 2 = 20$ marks)

1. Draw the mathematical model of lightning.
2. List the causes of over voltages in power system.
3. What is pure liquid di-electrics?
4. List factors affecting the breakdown voltage of gaseous dielectrics.
5. What is tesla coil?
6. What are the requirements of digital storage oscilloscope for impulse and high frequency measurements?
7. What is the difference between type and routine test?
8. How is salt-fog test conducted on insulators?
9. What are the different applications of electrostatics?
10. List the applications of high voltage in biomedical field.

PART B — ($5 \times 13 = 65$ marks)

11. (a) Explain the different theories of charge formation in the cloud.

Or

- (b) Describe the various steps to draw the Bewley-Lattice diagram of successive reflections.

12. (a) Explain the Townsend's first and second ionization processes.

Or

- (b) Explain about the breakdown mechanisms in vacuum dielectrics with neat sketches.

13. (a) Develop and explain the modern multistage impulse generator circuits.

Or

- (b) With a neat diagram explain the sphere gap arrangement method of high voltage measurement in detail and give the factors influencing the measurement.

14. (a) Explain in detail about the various high voltage tests being carried out in a power transformer.

Or

- (b) Describe the procedure for conducting dielectric, impulse voltage, and short circuit current tests on high voltage circuit breakers.

15. (a) Explain the working principle of electrostatic precipitator with neat diagram. Also list the applications of electrostatic precipitator.

Or

- (b) With neat block diagram, describe about basic components of electrostatic paint spraying equipment.

PART C — (1 × 15 = 15 marks)

16. (a) A ten stage Cockcroft-Walton voltage multiplier circuit has all capacitors of $0.045 \mu\text{F}$. The secondary voltage of the supply transformer is 120 kV at a frequency of 150 Hz. If the load current is 1.25 mA, determine the following:

- (i) Voltage regulation,
- (ii) percentage of ripple voltage,
- (iii) the optimum number of stages for maximum output voltage,
- (iv) the maximum output voltage. (4+4+4+3)

Or

- (b) A Rogowski coil is required to measure impulse current of 10 kA having rate of change of current of 10° A/s . The voltmeter is connected across the integrating circuit which reads 8V 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.