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Question Paper Code : 40499

B.E./B.Tech. DEGREE EXAMINATIONS, NOVEMBER/DECEMBER 2021.

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. List the different methods employed for lightning protection of overhead lines.
2. A 3-phase single circuit transmission line is 400 km long. If the line is rated for 220 kV and has the parameters. Resistance $R = 0.1$ ohms/km. Inductance $L = 1.26$ mH/km, Capacitance $C = 0.009 \mu$ F/km, find surge impedance value.
3. What is electro convection in liquid dielectrics?
4. Differentiate between photo-ionization and photo-electric emission.
5. Define the terms (a) Impulse voltages (b) Chopped wave.
6. Draw a simple voltage doubler circuit.
7. Why are capacitance voltage dividers preferred for high ac voltage measurements?
8. What is a mixed potential divider? How is it used for impulse voltage measurements?
9. List out various tests to be carried out on a circuit Breakers.
10. Compare the withstand voltage with flashover voltage.

PART B — (5 × 13 = 65 marks)

11. (a) What are the mechanisms by which lightning strokes develop and induce overvoltage on overhead power lines?

Or

- (b) Explain clearly with necessary equation, the theory and advantages of Bewley's lattice diagram.

12. (a) (i) Define corona discharge. (3)
(ii) Explain clearly Anode and Cathode Coronas. Also state its advantages and disadvantages. (10)

Or

- (b) (i) Explain Thermal breakdown in solid dielectrics. (7)
(ii) How this Thermal breakdown is more significant than the other mechanisms? (6)

13. (a) (i) Explain clearly the basic principle of operation of an electrostatic generator. (5)
(ii) Describe with neat diagram the principle of operation, application and limitations of Van de Graf generator. (7)

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Or

- (b) (i) Draw equivalent circuit of a 3-stage cascaded transformer and explain its working.
(ii) Determine the expression for short circuit impedance of the cascaded transformer. Hence, deduce an expression for the short circuit impedance of an n-stage cascaded transformer.

14. (a) (i) Discuss the effect of nearby earthed objects, humidity and dust particles on the measurements using sphere gaps. (7)
(ii) Explain how DC high voltage can be measured using series ammeter. (6)

Or

- (b) (i) Explain with neat diagram the principle of operation of an Electrostatic Voltmeter. Discuss its advantages and limitations for high voltage measurements. (8)
(ii) Draw a simplified equivalent circuit of a resistance potential divider. (5)

15. (a) (i) Write a short note on the cable sample preparation before it is subjected to various tests. (3)
(ii) Explain briefly the various tests to be carried out on a bushing. (10)

Or

- (b) Describe the various tests to be carried out on a Circuit Breaker.

PART C — (1 × 15 = 15 marks)

16. (a) An absolute electrostatic voltmeter has a movable circular plate 8 cms in diameter. If the distance between the plates during a measurement is 4 mm, determine the potential difference when the force of attraction is 0.2 gm wt.

Or

- (b) A ten stage Cockraft-Walton circuit has all capacitors of $0.06 \mu\text{F}$. The secondary voltage of the supply transformer is 100 kV at a frequency of 150 Hz. If the load current is 1 mA, determine (i) voltage regulation (ii) the ripple voltage.