## Question Paper Code : 50545

B.E./B.Tech DEGREE EXAMINATIONS, APRIL/MAY 2023.

Seventh Semester

Electrical and Electronics Engineering

EE 8071 – HIGH VOLTAGE ENGINEERING

(Regulations 2017)

Time : Three hours                                          Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. What are the basic requirements of a lightning arresters?

2. What are the effects of corona on power system?

3. State Paschen's law.

4. Name the different types of breakdown mechanisms in commercial liquid dielectrics.

5. Why is controlled tripping necessary in impulse generators?

6. What are the applications of high voltages?

7. What are the design used in high resistive shunt for reducing stray effects?

8. What are the limitation of series resistance micro-ammeter method for high voltage measurements?

9. Define disruptive discharge voltage.

10. What is meant by insulation coordination?

PART B — (5 × 13 = 65 marks)

11. (a) (i) Discuss briefly about the various causes of power frequency overvoltage in power system and methods to control them. (8)

    (ii) Explain with neat sketches the mechanism of lightning discharge. (5)

Or

(b) (i) Explain how overvoltage in transmission line due to lightning can be minimized by ground rods and counterpoises? (8)

(ii) What is tower-footing resistance? Discuss the two methods to reduce this resistance. (5)

12. (a) (i) Explain the mechanism of development of anode and cathode streamers and explain how these lead to breakdown in gaseous dielectrics. (8)

(ii) Explain the breakdown due to internal discharges in solid dielectrics. (5)

Or

(b) (i) Explain the various mechanism of breakdown in composite dielectrics in detail. (8)

(ii) What are the important properties of composite dielectrics to be considered for their performance? (5)

13. (a) Give complete analysis of the given single-stage impulse voltage generator circuit and derive the condition for physical realization of wave front and wave tail resistances. (13)
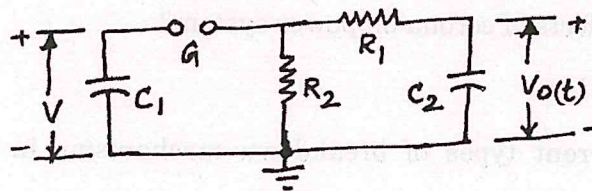


Or

(b) What is a Tesla coil? Derive an expression for damped high frequency oscillation output voltage in a Tesla coil. Also give its advantages. (13)

14. (a) (i) Explain with neat schematic diagram, the working principle and operation of generating voltmeter for measuring high DC voltages. (8)

(ii) Explain the operation of digital peak voltmeter for measurement of high AC voltages. (5)

Or

(b) (i) With phasor diagram, explain how a tuned capacitance voltage transformer can be used for measuring high alternating voltages in power system. (8)

(ii) Discuss the performance of various capacitance potential dividers for measurement of impulse voltages. (5)

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15. (a) Explain in details about the procedure for conducting power frequency, impulse voltages and pollution tests on high voltages insulators. (13)

Or

(b) Explain the method of impulse testing of high voltage transformers. What is the procedure adopted for locating failure? (13)

PART C — (1 × 15 = 15 marks)

16. (a) Consider a long transmission line is energized by a unit step voltage 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 voltage at the receiving end after a long time. Take the attenuation factor $\alpha = 0.8$. (15)

Or

(b) A ten stage cockcroft-Walton voltage multiplier circuit has all capacitors of 0.06 $\mu$ F. The secondary voltage of supply transformer is 100 kV at a frequency of 150 Hz. If the load current is 1 mA, determine the following (15)

(i) voltage regulation,

(ii) the ripple voltage,

(iii) the optimum number of stages for maximum output voltage, and

(iv) the maximum output voltage.

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