Reg. No. :

## **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 —  $(10 \times 2 = 20 \text{ marks})$ 

- 1. List the different methods employed for lighting 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 — $(5 \times 13 = 65 \text{ marks})$

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)

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)

 $\mathbf{Or}$ 

- (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)

 $\mathbf{Or}$ 

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

PART C — 
$$(1 \times 15 = 15 \text{ marks})$$

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.

 $\mathbf{Or}$ 

(b) A ten stage Cockraft-Walton circuit has all capacitors of 0.06  $\mu$  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.