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Question Paper Code : 51511

B.E/B. Tech. DEGREE EXAMINATION, MAY/JUNE 2016

Sixth Semester

Electrical and Electronics Engineering

EE 2353/EE 63/10133 EE 603 – HIGH VOLTAGE ENGINEERING

(Regulations 2008/2010)

(Common to PTEE 2353/10133 EE 603 – High Voltage Engineering for B.E. (Part-Time)

Fifth Semester – Electrical and Electronics Engineering Regulations 2009/2010)

Time : Three Hours

Maximum : 100 Marks

Answer ALL questions.

PART – A (10 × 2 = 20 Marks)

1. What are the causes for switching surges ?
2. What are the protective devices used to protect power system equipments against lightning ?
3. State Townsend's breakdown criterion.
4. Give the electrical properties that are essential in determining the dielectric performance of a liquid dielectric.
5. What is the need for HVDC generation ?
6. What is a 'Trigatron gap' ? What are its function ?
7. Draw the schematic diagram of a Generating voltmeter.
8. What are the advantages of digital techniques in high voltage measurements ?

9. Define 'Disruptive Discharge Voltage'.
10. Give the Indian Standard reference atmospheric conditions for high voltage testing.

PART – B (5 × 16 = 80 Marks)

11. (a) (i) Give the mathematical models for lightning discharges and explain them. (8)
- (ii) What are the causes for power frequency over voltages ? How are they controlled in power systems ? (8)

OR

- (b) A long transmission line is energized by a unit step voltage 1 V at the sending end and is open circuited at the receiving end. Construct the Bewley's lattice diagram and obtain the value of the voltage at the receiving end after a long time. Take the attenuation factor $\alpha = 0.8$. (16)

12. (a) (i) Explain the Streamer theory of breakdown in gases. (8)
- (ii) Describe any two mechanisms of Vacuum breakdown. (8)

OR

- (b) (i) Explain the various theories of breakdown in commercial liquid dielectrics. (10)
- (ii) State and explain the properties of composite dielectrics. (6)
13. (a) Describe, with a neat diagram, the working principle of the following high voltage producing apparatus : (10 + 6)
- (i) Van de Graaff generator
- (ii) Resonant transformer

OR

(b) (i) An impulse generator has eight stages with each condenser rated for 0.16 μF and 125 kV. The load capacitor available is 1000 pF. Find the series resistance and the damping resistance needed to produce 1.2/50 μs impulse wave. What is the maximum output voltage of the generator, if the charging voltage is 120 kV? (12)

(ii) What are the essential parts of an impulse current generator? (4)

14. (a) Explain the principle and construction of an electrostatic voltmeter for very high voltages. What are its merits and demerits for high voltage AC measurements? (10 + 6)

OR

(b) Draw the calibrated low ohmic shunt and its equivalent circuit for high impulse current measurements. Explain the different types of resistive shunts with their characteristics and limitations. (4 + 12)

15. (a) With neat diagram, explain the method of impulse testing of high voltage transformers. What is the procedure adopted for locating the failure? (10 + 6)

OR

(b) What is meant by Insulation Coordination? Explain how the protective devices are chosen for optimum insulation level in a power system. (4 + 12)