Question Paper Code : 91499

B.E./B.Tech. DEGREE EXAMINATIONS, NOVEMBER/DECEMBER 2019

Seventh Semester

Electrical and Electronics Engineering

EE6701 – HIGH VOLTAGE ENGINEERING

(Regulations 2013)

(Common to PTEE6701 – High Voltage Engineering for B.E. (Part-Time) – Fifth
Semester – Electrical and Electronics Engineering Regulations – 2014)

Time : Three Hours
Maximum : 100 Marks

Answer ALL questions

PART – A
(10×2=20 Marks)

1. Classify the lightning stroke.

2. What are the factors to be considered for the effective protection of transmission
line using ground wire ?

3. State Paschen's law.

4. How does long-term breakdown occur in a composite dielectric ?

5. Why is controlled tripping necessary in a multistage impulse generator ?

6. What are the advantages of cascaded transformer over two winding transformer
for generating high AC voltages ?

7. Give the requirements of an Oscilloscope used for impulse and high frequency
high voltage measurements.

8. What are the different types of resistive shunts used for impulse current
measurements ?

9. Write the standard atmospheric conditions for HV testing as per Indian standard.

10. What are volt-time curves ?

PART – B   (5×13=65 Marks)

11. a) i) What are the causes for switching and power frequency over voltages ? How are they controlled in power systems ?   (7)

   ii) List out the problems caused by corona discharges.   (6)

(OR)

   b) i) Consider an overhead transmission line is connected to a cable. Obtain the expression of reflection and refractions of travelling waves at the junction. (7)

   ii) What is tower-footing resistance ? Discuss the two methods to reduce this resistance.   (6)

12. a) Derive the expression of current growth equation in a uniform field due to Townsend's first and second ionization process and thereby deduce the condition for breakdown of gaseous dielectrics.

(OR)

   b) i) Explain the intrinsic breakdown mechanism in solid dielectrics.   (7)

   ii) Explain how breakdown occurs due to internal discharges in a solid dielectric ?   (6)

13. a) i) Explain the working principle of Cockroft-Walton voltage multiplier circuit under no-load and loaded conditions.   (7)

   ii) Derive an expression for total voltage drop and total ripple voltage of n-stage voltage multiplier circuit and hence deduce the condition for optimum number of stages.   (6)

(OR)

   b) i) From the basic Marx circuit develop the modern multistage impulse generator circuits and explain the significance of its various parameters.   (7)

   ii) Explain the principle of operation of resonant transformer for generating high alternating voltages.   (6)

14. a) i) Describe the working principle and operation of Generating Voltmeter for measuring high DC voltages.   (7)

   ii) With phasor diagram, explain how a tuned Capacitance Voltage Transformer can be used for high alternating voltage measurements in power system.   (6)

(OR)

   b) With an equivalent circuit and its step response, discuss how are resistance, capacitance and mixed R-C potential dividers used for impulse voltage measurements. Explain the arrangement used to minimize the errors in each case.

15. a) i) With a neat circuit diagram, explain the procedure of synthetic testing of circuit breakers. Also give its advantageous over other testing methods for short circuit test.   (7)

   ii) Discuss the arrangement, procedure and specification of water for conducting impulse voltage wet withstand test on insulator.   (6)

(OR)

   b) i) Discuss the arrangement and detailed procedure for impulse voltage testing of power transformer.   (7)

   ii) Explain the procedure adopted for detection and location of fault in a transformer during impulse testing.   (6)

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 terminated through a resistance R. Construct the Bewley Lattice diagram and obtain the value of voltage at the receiving end after a long time. Also draw the voltage-time and current time curves at the receiving end. Take reflection coefficient at receiving end is 0.4.

(OR)

   b) What do you mean by insulation coordination ? With suitable illustrations, explain how insulation level is chosen for various equipments in a 400/230 KV substation.