Name : .....

Roll No. : .....

Invigilator's Signature : .....

CS/B.Tech (EE-NEW)/SEM-7/EE-704A/2010-11

2010-11

HIGH VOLTAGE ENGINEERING

Time Allotted : 3 Hours Full Marks : 70

The figures in the margin indicate full marks.

Candidates are required to give their answers in their own words as far as practicable.

GROUP – A

(Multiple Choice Type Questions)

1. Choose the correct alternatives for any *ten* of the following : 10 × 1 = 10

i) Corona is

a) dark discharge b) partial discharge

c) disruptive discharge d) none of these.

ii) Sphere gap is used for the measurement of

a) r.m.s. value of *ac* voltage

b) peak value of *ac* voltage

c) average value of *ac* voltage

d) none of these.

iii) A high tower footing resistance will result

a) back flashover

b) reduction of number of lighting surges

c) no switching surge

d) none of these.

iv) A Generating Voltmeter has

a) linear scale b) non-linear scale

c) none of these d) all of these.

v) A 132 kV transmission line is designed based on

a) switching surge b) lightning impulse

c) corona d) radio interference.

vi) The mechanism responsible for dielectric loss in a dielectric martial is due to

a) conduction current b) absorption current

c) displacement current d) none of these.

vii) The surge impedance of a overhead transmission line is

a) 50 Ω b) 400 Ω

c) 4000 Ω d) none of these.

viii) A standard lightning impulse wave should be

a) 1·2/50 μs b) 1/50 μs

c) 1·2/500 μs d) 8/20 μs.

ix) In a single stage impulse generator, to produce standard impulse wave

a) Wavefront resistance is equal to wave tail resistance

b) Wavefront resistance is greater than wave tail resistance

c) Wave tail resistance is greater than wavefront resistance

d) None of these.

x) An electrostatic voltmeter can measure

a) impulse voltage

b) peak value of *ac* voltage

c) *dc* voltage

d) none of these.

xi) The material used in gapless arrester in EHV power system is

a) Iron oxide b) Aluminium oxide

c) Zinc oxide d) None of these.

GROUP – B

(Short Answer Type Questions)

Answer any *three* of the following. 3 × 5 = 15

2. The disruptive discharge voltage for rod-rod gap assembly for a given gap distance is lesser for positive polarity than that for negative polarity voltage application. Justify the statement.

3. How would you determine the wavefront and wave tail time of a lightning impulse voltage as per Indian Standard specifications ?

4. Explain the separate source withstand test of a distribution transformer.

5. Explain the mechanisms involved in the production of charged particles in a gaseous medium.

6. Explain the electrification of cloud and hence explain direct stroke and indirect stroke.

GROUP – C

(Long Answer Type Questions)

Answer any *three* of the following. 3 × 15 = 45

7. a) What are the advantages of a Series Resonant circuit over a cascaded testing transformer for testing a length of a cable ?

   b) Explain the operation of a two-stage series resonant circuit.

   c) A series resonant circuit is used to test a cable of length 10 m of capacitance 0·01 μF/metre at 100 kV. The unit has a resistance of 100 Ω. Find the equivalent inductive reactance needed in the circuit and the input voltage if the feed transformer is 250 V/2500 volts. 5 + 5 + 5

8. a) State and prove Pashen's law.

   b) Explain how does it help in the design of electrical apparatus.

   c) Determine the Paschen's minimum voltage. 5 + 2 + 8

9. a) What conditions are to be satisfied for the measurement of voltage by sphere gaps ? Explain.

   b) Explain generating voltmeter for the measurement of *dc* high voltage. 8 + 7

10. a) Explain the mechanism of breakdown of a gaseous medium according to Townsend.

    b) Explain the physical significance of the condition of breakdown according to Townsend.

    c) What are the limitations of the Townsend theory ?

    8 + 3 + 4

11. a) Explain the operation of a Cockroft Watton voltage doubler circuit.

    b) Drive an expression of its output under loaded condition. 7 + 8