Name : .....

Roll No. : .....

Invigilator's Signature : .....

CS/B.Tech(EE-OLD)/SEM-7/EE-702-D/2009-10

2009

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) Time lag for breakdown is

a) time difference between instant of applied voltage and occurrence of breakdown

b) time taken for the voltage to rise before breakdown occurs

c) time required for the gas to breakdown under pulse application

d) none of these.

ii) In testing with a resonant transformer, the output voltage is

a) rectangular wave b) triangular wave

c) trapezoidal wave d) pure sine wave.

iii) A generating voltmeter is used to measure
   a) impulse voltage
   b) AC voltage
   c) DC voltage
   d) high frequency AC voltage.

iv) Major insulation of transformer is tested by
   a) separate source withstand test
   b) induced over voltage test
   c) impulse test
   d) none of these.

v) Breakdown is permanent in
   a) gases b) liquids
   c) solids d) all of these.

vi) A generating voltmeter has
   a) linear scale b) non-linear scale
   c) cramped scale d) none of these.

vii) The fifty per cent flashover voltage is defined as
   a) the voltage at which the flashover probability is 0·5
   b) the voltage at which corona discharge appears before flashover
   c) average value of withstand voltage
   d) none of these.

viii) The breakdown criterion in a uniform fied electrode is
   a) $\alpha^{\gamma d} = 1$ b) $\gamma e^{\alpha d} = 1$
   c) $\gamma e^{-\alpha d} = 1$ d) none of these.

ix) The minimum breakdown voltage of air in uniform field at NTP is

a) 30 kV_p b) 21·1 $kV_{r.m.s.}$

c) 3000 volts d) 326 volts.

x) The gap distance between the spheres for the measurement of peak voltage by sphere gap should be

a) equal to the radius of the sphere

b) equal to the diameter of the sphere

c) none of these.

xi) Corona discharge is a

a) partial discharge b) disruptive discharge

c) dark discharge d) all of these.

GROUP – B

(Short Answer Type Questions)

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

2. a) What is an equipotential line in an electric field ?

   b) How is an electric field plotted by the electrolytic tank ?

3. Describe with a neat sketch, the working of a van de Graaff generator.

4. Explain with a neat sketch, the working principle of a Generating Voltmenter for the measurement of *d.c.* high voltage.

5. What are the high voltage tests conducted on a transformer ? Explain the utility of induced overvoltage test.

6. Explain how a cloud is electrified.

GROUP – C

(Long Answer Type Questions)

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

7. a) What are the advantages of series resonant circuit over a conventional testing transformer testing a cable length.

   b) Explain the working principle of a 2 stage series resonant circuit. Draw the circuit diagram. 8 + 7

8. a) What is CVT ? Explain how a power frequency high voltage is measured using CVT.

   b) Explain with neat diagram, the principle of operation of an electrostatic voltmeter. 8 + 7

9. a) Explain how a sphere gap can be used to measure the peak value of voltages.

   b) What are the parameters that influence such measurement ?

   c) What conditions are to be satisfied by a potential divider for use in high voltage measurement ? 6 + 6 + 3

10. a) What are the mechanisms involved in the breakdown of a solid dielectric ?

    b) Derive an expansion for the critical electric stress in Electromechanical breakdown mechanism of a solid dielectric. 3 + 12

11. Write short notes on any *three* of the following : 3 × 5 = 15

    a) Valve type lightning arrestor

    b) Insulation co-ordination

    c) Paschen's Law

    d) Limitations of Townsend Theory for breakdown of gases

    e) Triggering of Impulse Generator.