Name : .....

Roll No. : .....

Invigilator's Signature : .....

CS/B.TECH(EE)/SEM-8/EE-801A/2012

2012

ADVANCED 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) An impulse voltage wave defined by its
      a) wavefront time
      b) wave tail time
      c) both wavefront and wave tail time
      d) wavefront time, wave tail time and peak of its waveform.

   ii) Most suitable neumerical method to solve electrostatic problem is
      a) Laplace equation method
      b) change simulation method
      c) finte difference method
      d) resistance analog method.

iii) The material used in gapless surge arrester is
   a) silicon oxide b) aluminium oxide
   c) zinc oxide d) ferric oxide.

iv) In Cockcrofts-Walton voltage doubler circuit, the voltage across the load is
   a) equal to supply voltage
   b) less than the supply voltage
   c) equal to double of the supply voltage
   d) less than the double of the supply voltage.

v) Dielectric strength of a specimen in uniform electric field is equal to
   a) breakdown voltage
   b) current during breakdown
   c) breakdown voltage per unit length
   d) current per unit length during breakdown.

vi) The operating time on breadown time of a sphere gap after application of suitable voltage is in the order of
   a) (200 – 300) μs b) (20 – 30) μs
   c) (2 – 3) μs d) (0·2 – 0·3) μs.

vii) A numerical method to determine electric field in multi-conductor geometry is
   a) Laplace equation method
   b) Electrolytic tank method
   c) Resistance analog method
   d) Finite element method.

viii) Corona discharge is
   a) an internal discharge
   b) surface discharge
   c) a spark between conductors
   d) partial discharge around a high voltage conductor.

ix) Breakdown voltage of 1 cm air gap at 760 mm of Hg and 20°C is

a) 30 kV_{rms} b) 25 kV_{rms}

c) 21·2 kV_{rms} d) 17·6 kV_{rms} .

x) Breakdown is permanent in

a) gases

b) liquids

c) solids

d) both gases and liquids.

xi) The value of Townsend's second ionization coefficient has

a) High value for low E/P ratio

b) Low value for high E/P ratio

c) Constant value for all E/P ratio

d) High value for high E/P ratio.

GROUP – B

(Short Answer Type Questions)

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

2. Explain dielectric strength *vs* pressure relationship of gaseous dielectrics in the light of Paschen's law.

3. Write short notes on CSM and FEM.

4. Why is triggering required for impulse generator ? Describe a suitable triggering technique.

5. a) Explain formitive and statistical time lag.

   b) Mention the factors which affects the breakdown of a gases.

6. Explain the breakdown procedure of electronegative gases.

GROUP – C

(Long Answer Type Questions)

Answer any *three* of the following. $3 \times 15 = 45$

7. a) What is the difference between real charge and apparent charge ? Establish a relation between these two charges.

   b) Explain in detail any one method of measurement of partial discharge.

8. a) With a neat sketch describe the operating procedure of multi-stage Marx impulse generation circuit.

   b) How-you control the wavefront and wave tail of the impulse waveform ?

9. a) Briefly explain the operation of Cockcroft-Walton voltage doubler with loaded condition and also find out voltage regulation of that circuit.

   b) Justify whether the Cockcroft-Walton circuit is symmetric or asymmetric.

10. a) Derive Townsend's current growth equation using Townsend's 1st and 2nd ionization coefficients.

    b) What is the condition for breakdown obtained in Townsend's discharge ?

11. Write short notes on any *two* of following : $7\frac{1}{2} \times 2$

    a) Capacitive Voltage Transformer

    b) Testing of Circuit Breaker

    c) Electric Stress Control Technique

    d) Measurement of Dielectric constant and Loss angle

    e) Generation of Switching surge.