Name : .....

Roll No. : .....

Invigilator's Signature : .....

CS/B.TECH(EE)/SEP.SUPPLE/SEM-7/EE-704A/2012

2012

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 : $10 \times 1 = 10$

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

   a) 30 KV_p/cm b) 3 KV_p/cm

   c) 21·1 KV_p/cm d) 2·1 KV_p/cm.

   ii) Electrostatic voltmeters can measure

   a) only DC voltage

   b) only AC voltage

   c) only impulse voltage

   d) both DC and AC voltages.

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

   a) iron oxide b) aluminium oxide

   c) zinc oxide d) calcium oxide.

iv) A standard lightning impulse wave can be mathematically represented by

a) an exponentially decaying function

b) a double exponential function

c) an exponentially growing function

d) a logarithmic function.

v) Breakdown of commercial liquid is affected by

a) solid particles b) air bubbles

c) electrode geometry d) all of these.

vi) As per Indian Standard (IS) lighting impulse wave is characterized by

a) 1·0 / 50 μ s b) 1·2 / 40 μ s

c) 1·2 / 50 μ s d) 1·2 / 60 μ s.

vii) A trigatron gap is used with

a) cascade transformer unit

b) impulse voltage generator

c) electrostatic voltmeter

d) capacitance voltage transformer.

viii) Surge impedance is equal to

a) $\frac{L}{C}$ b) $L \cdot C$

c) $\frac{L}{Z}$ d) $\sqrt{\frac{L}{C}}$.

ix) All parameters remaining same, the breakdown voltage is

a) higher with negative polarity at all pressures

b) lower with negative polarity at all pressures

c) higher with negative polarity at low pressures

d) none of these.

x) Corona is

a) dark discharge b) partial discharge

c) disruptive discharge d) none of these.

xi) The most commonly used liquid in transformer insulation is

a) mineral oil b) silicon oil

c) askarel d) polyester oil.

GROUP – B

(Short Answer Type Questions)

Answer any *three* of the following. $3 \times 5 = 15$

2. Explain the operation of electrostatic voltmeter.
3. Briefly explain the working principle of Cockcraft-Walton voltage doubler circuit.
4. Explain Streamen mechanism for the breakdown of gases.
5. Explain the phenomenon of electrical conduction in liquids.
6. Define the front and tail times of an impulse wave. What are the tolerances allowed as per the specifications ?

GROUP – C

(Long Answer Type Questions)

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

7. What is capacitance voltage transformer ? Explain with phasor diagram how a tuned capacitance voltage transformer can be used for voltage measurement in power system ? 2 + 13
8. Define Townsend's first and second ionization coefficients. How is the condition for breakdown obtained in a Townsend's discharge ? 11 + 4
9. a) How is the wave front and wave tail times controlled in impulse generator circuits ?

b) An impulse generator has eight stages with each condenser rated for 0·16 μF and 125 kV. The load capacitor available is 100 pF. Find the series resistance and 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 ? 7 + 8

10. a) Neatly draw the schematic diagram for cascade connection of transformers for *ac* high voltage generation. Explain its operation.

b) What is the advantage of resonant transformer over cascade connected transformer ? 10 + 5

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

a) Time-lag for breakdown of gases

b) Protection of overhead lines using ground wires

c) Induced overvoltage test of a transformer

d) Peak voltage measurement of *ac* voltage using capacitor divider.

e) Suspended Particle Mechanism for breakdown in commercial liquid dielectric.

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