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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:

 $10 \times 1 = 10$ 

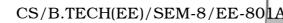
- i) An impulse voltage wave defined by its
  - a) wavefront time
  - b) wave tail time
  - c) both wavefront and wave tail time
  - d) wavefront time, wave tail time and peak of its waveform.
- ii) Most suitable neumerical method to solve electrostatic problem is
  - a) Laplace equation method
  - b) change simulation method
  - c) finte difference method
  - d) resistance analog method.

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- 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)  $(20-30) \mu s$
- c)  $(2-3) \mu s$
- d)  $(0.2 0.3) \mu s$ .
- vii) A numerical method to determine electric field in multiconductor 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  $20^{\circ}$ C is
  - a)  $30 \text{ kV}_{\text{rms}}$
- b)  $25 \text{ kV}_{\text{rms}}$
- c)  $21.2 \text{ kV}_{\text{rms}}$
- d)  $17.6 \text{ kV}_{\text{rms}}$ .
- 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.

 $3 \times 5 = 15$ 

- 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.

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## (Long Answer Type Questions)

Answer any three of the following.



- 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.

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