



Name : .....

Roll No. : .....

Invigilator's Signature : .....

**CS/B.TECH(EE)/SEP.SUPPLE/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 experimental method for computing the field distribution is
  - a) solution of Laplace equation
  - b) electrolytic tank method
  - c) digital simulation
  - d) field intensity method.
- ii) Most suitable numerical method to solve electrostatic field problems is
  - a) Laplace equation method
  - b) charge simulation method
  - c) finite difference method
  - d) resistance analog method.



- iii) Breakdown voltage of 1 cm air gap at 760 mm of Hg and 20°C is
- a) 30 kVp
  - b) 21 kVp
  - c) 23 kVp
  - d) 32 kVp.
- iv) Breakdown is permanent in
- a) gases
  - b) liquids
  - c) solids
  - d) both gases and liquids.
- v) Partial discharge magnitude is
- a) quantity of charge measured at the terminals of the specimen
  - b) quantity of charge inside a specimen
  - c) voltage across the terminals of a specimen
  - d) average current through the terminals of the specimen.
- vi) Corona discharge is
- a) an internal discharge
  - b) surface discharge
  - c) a spark between conductors
  - d) partial discharge around a high voltage conductor.
- vii) The value of Townsend's second ionization coefficient has
- a) high value for low  $E/p$  ratio
  - b) low value for low  $E/p$  ratio
  - c) no relation with  $E/p$  ratio
  - d) none of these.



- viii) The time 't' which lapses between the application of high voltage and appearance of initiating electron is called
- a) total time lag                      b) formative time lag
  - c) statistical time lag                d) initial time lag.
- ix) In Cockcroft-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 supply voltage.
- x) An impulse voltage wave is defined by its
- a) wave front time
  - b) wave tail time
  - c) both wave front and wave tail times
  - d) wave front time, wave tail time and peak of its waveform.
- xi) The material used in gapless surge arrestor is
- a) silicon oxide                      b) aluminium oxide
  - c) zinc oxide                         d) ferric oxide.

**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 dielectric in the light of Paschen's law.
3. Write short notes on FDM.
4. Briefly explain the working principle of Cockcroft-Walton voltage doubler circuit.
5. Why is triggering required for impulse generator ? Describe a suitable triggering technique.
6. Discuss various factors which affect breakdown of gases.



**GROUP – C**

**( Long Answer Type Questions )**

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

7. What is PD ? Find out the relation between measured charge and apparent charge in case of a PD. Draw the PD equivalent circuit for a cavity within a dielectric. Write down different techniques for PD measurement.  $2 + 5 + 3 + 5$
8. What are the various high voltage tests done on transformers ? Explain the method of impulse testing of high voltage transformer. What is the procedure adopted for locating the failure ? State why it is sometimes necessary to apply chopped impulses on the transformer during tests.  $3 + 5 + 3 + 4$
9. A ten stage Cockcroft-Walton circuit has all capacitors of  $0.06 \mu\text{F}$ . The secondary voltage of the supply transformer is 100 kV at a frequency of 50 Hz. If the load current is 1 mA, calculate (i) voltage regulation, (ii) the ripple, (iii) the optimum number of stages for maximum output voltage, (iv) the maximum output voltage.
10. Define and explain Townsend's first and second ionization coefficients. Explain the Townsend's criterion for spark. Also explain three different conditions.  $8 + 4 + 3$
11. a) With a neat sketch describe the operating procedure of multi-stage Marx impulse generator circuit.  
b) State the disadvantage of single stage circuit for higher impulse voltage generation.  $12 + 3$

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