



SF-8341

**B. E. III (Sem. VI) (Elect.) Examination**  
**May / June – 2011**  
**High Voltage Engineering**  
**(New Syllabus)**

Time : 3 Hours]

[Total Marks : 100

**Instructions :**

(1)

नीचे दशावेक निशानीवाणी विगतो उत्तरवडी पर अवश्य क्षभवी. Fillup strictly the details of signs on your answer book.	Seat No. :
Name of the Examination :	<input type="text"/>
<input type="text" value="B. E. 3 (Sem. 6) (Elect.)"/>	<input type="text"/>
Name of the Subject :	<input type="text"/>
<input type="text" value="High Voltage Engineering (New)"/>	<input type="text"/>
Subject Code No. : <input type="text" value="8"/> <input type="text" value="3"/> <input type="text" value="4"/> <input type="text" value="1"/>	<input type="text"/>
Section No. (1, 2,.....) : <input type="text" value="1&amp;2"/>	<input type="text"/>
	Student's Signature

- (2) Attempt all questions.  
(3) Figure to the right indicate full marks.  
(4) Scientific calculator up to Casio-100D, 100MS series is permitted.

**SECTION - I**

- 1 (a) Do as directed : 10
- (i) Classify : Numerical methods.
  - (ii) What is corona discharge ? Give classification.
  - (iii) Classify : Ionization processes.
  - (iv) State : Solid dielectric materials.
  - (v) Classify : Breakdown in liquid dielectric.
- (b) Fill in the blanks : 5
- (i) Townsend Ionization co-efficient are function of \_\_\_\_\_ (applied voltage/pressure and temperature/ electric field/ratio of electric field to pressure).
  - (ii) Corona occurs before the breakdown in a sphere to ground air gap when ratio of gap distance to the radius of sphere is \_\_\_\_\_ ( $>1.0/>3.0/>10/<1.0$ ).
  - (iii) Minimum sparking potential of Air is about \_\_\_\_\_ (100 V/4.4kV/40 V/325 V)
  - (iv) Thermal classification of insulating materials is done for \_\_\_\_\_ (gases/liquids/solids/composite insulation).
  - (v) Maximum dielectric strength obtained with pure liquid is about \_\_\_\_\_ kV/mm (1000/100/50/10)
- (c) Explain : The need of High Voltage study. 5

- 2 (a) Explain the Streamer theory of breakdown in air at atmospheric pressure. 5
- (b) What is time-lag ? Discuss its components and the factors which affect these components. 5
- (c) Explain Penning effect when referred to gaseous discharge. 5

**OR**

- 2 (a) Describe briefly various mechanism of breakdown in Liquids. 5
- (b) Describe : Application of gases in Power Apparatus. 5
- (c) Explain Primary ionization processes. 5
- 3 Attempt any **three** : 15
- (i) Write short note : Voltage stresses.
- (ii) Write short note : Secondary ionization processes.
- (iii) What is time-lag ? Discuss its components and the factors which affect these components.
- (iv) Write short note : Intrinsic breakdown in solids.
- (v) Write short note : Thermal mechanism of breakdown in liquids.

**SECTION - II**

- 4 (a) Multiple choice questions : 10
- (i) Parallel resonant transformer test system is used when
- (a) Large test voltages are needed
- (b) Stable output voltage with high rate of rise of voltage is needed
- (c) Large current is needed
- (d) When high frequency test voltage is needed
- (ii) An oscillatory impulse waveform is represented by
- (a)  $e^{-at} \cos bt$
- (b)  $e^{+at} \cos bt$
- (c)  $e^{-at} - e^{-bt}$
- (d)  $e^{-at} - e^{-bt}$
- (iii) In an impulse current generator, the capacitors are connected in
- (a) series
- (b) parallel
- (c) connected in parallel while charging and in series while discharging.
- (d) connected in series while charging and in parallel while discharging
- (iv) Multi test kits used in high voltage laboratories consists of
- (a) ac, dc and impulse voltage test units
- (b) ac and dc test units

- (c) dc and impulse test units
  - (d) ac, dc, impulse voltage and current test units
  - (v) Impulse current generator output waveform is
    - (a) damped oscillatory wave
    - (b) Overdamped wave
    - (c) Critically damped wave
    - (d) can be damped wave or damped oscillatory wave
  - (vi) A trigetron gap is used with
    - (a) cascade transformer units
    - (b) impulse current generator
    - (c) impulse voltage generator
    - (d) dc voltage double units
  - (vii) A generating voltmeter is used to measure
    - (a) impulse voltages
    - (b) ac voltages
    - (c) dc voltages
    - (d) high-frequency ac voltages
  - (viii) A series capacitance voltmeter can measure
    - (a) dc voltages
    - (b) ac voltages (rms value)
    - (c) ac voltage (peak value)
    - (d) impulse voltages
  - (ix) Sphere gaps are used to measure
    - (a) dc voltages
    - (b) ac peak voltages
    - (c) dc, ac peak and impulse voltages
    - (d) only dc and ac peak voltages
  - (x) Hall generators are normally used to measure
    - (a) impulse voltages
    - (b) unidirectional impulse currents
    - (c) any type of impulse currents
    - (d) large ac currents
- (b) Answer the following questions in brief : 10
- (i) What are the partial discharges ? Differentiate between internal and external discharges
  - (ii) What is apparent charge in relation to partial discharge ?
  - (iii) Write a short note on measuring impedance circuit for estimation of partial discharge.
  - (iv) Explain clearly how the rating of a lightning arrester is selected ?
  - (v) What is the best location of a lightning arrester and why ?

- 5 (a) What are partial discharges and how are they detected under power frequency operating conditions ? 6
- (b) What is meant by insulation co-ordination ? How are the protective devices chosen for optimal insulation level in a power system ? 6

OR

- 5 (a) Explain the importance of switching overvoltages in EHV power systems. 6
- (b) Explain how a sphere gap can be used to measure the peak value of voltages. What are the parameters and factors that influence such voltage measurement ? 6
- 6 Attempt any **three** : 18
- (i) Why is a Cockcroft-Walton circuit preferred for voltage multiplier circuits ? Explain its working with a schematic diagram.
- (ii) Describe, with a neat sketch, the working of a Van de Graaff generator. What are the factors that limit the maximum voltage obtained ?
- (iii) Explain the different schemes for cascade connection of transformers for producing very high ac voltages.
- (iv) What is a trigatron gap ? Explain its function and operation.
- (v) What is capacitance voltage transformer ? Explain with phasor diagram how a tuned capacitance voltage transformer can be used for voltage measurements in power systems.
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