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EEE021

(Following Paper ID and Roll No. to be filled in your Answer Book)

PAPER ID : 120651

Roll No.

B. Tech.

(SEM. VI) THEORY EXAMINATION, 2014-15

HIGH VOLTAGE ENGINEERING

Time : **2** Hours] [Total Marks : **50**

Note : Attempt all questions. All questions carry equal marks.

1 Attempt **any four** parts. **3.5×4=14**

(a) State Paschen's law? Derive expression for the Paschen's minimum breakdown voltage?

(b) Explain Streamer's theory as regards the breakdown of gaseous dielectrics in the uniform field gap.

(c) The first ionization coefficient α, for a certain gas is given approximately by $\frac{\alpha}{P} = 14\, e^{-240 p/E}$ where p = pressure in mmHg and E = electric field in V/cm. Find the pressure at which the electron multiplication is maximum. If this occurs at 3 mm. Hg, find the value of E and the multiplication obtained when the electrodes are 5 mm apart.

(d) Define the following terms in the context of breakdown of insulating materials :

(i) Photo-ionization

(ii) Thermal-ionization

(e) Explain the phenomenon of thermal breakdown in solid dielectrics.

(f) Define the Townsend's first ionization coefficient. Will it remain constant in a nonuniform field?

2 Attempt **any two** parts. **6×2=12**

(a) Explain the principles of a generating voltmeter.

(b) What is a CVT? Explain how a power frequency, high voltage is measured using a CVT.

(c) Explain how a sphere-gap is used to measure the peak value of voltages. What precautions need to be taken?

3 Attempt any two parts. **6×2=12**

(a) Explain the concept of apparent charge in partial discharge measurements. Describe a simple experimental technique to measure partial discharge.

(b) Describe the procedure to perform power frequency dry and wet tests on line insulators.

(c) A Schering bridge used to measure the capacitance and dissipation factor of a high voltage bushing at 50 Hz gave the following results at balance :

Arm I Standard condenser of 100 pF

Arm II Resistance of 720 ohm

Arm III a capacitance of 1200 pF in parallel with a resistance of 3315 ohms . Determine the capacitance and dissipation factor of the bushing.

4 Attempt **any two** parts : **6×2=12**

(a) What are mechanisms by which lighting strokes develop and induce over-voltages on over head power lines?

(b) Describe the impulse current test performed on lighting arresters. How do you conclude that the arrester has passed the test?

(c) Comment on the following in connection with impulse testing of transformers:

(i) Connections of non-impulse terminals.

(ii) Sequence of application of impulse voltages.

(iii) Necessity of application of chopped impulses.

(iv) Wave shapes of switching impulses.

(v) Detection of failures after lighting and switching impulse tests.