

GUJARAT TECHNOLOGICAL UNIVERSITY**BE SEM-VIII Examination May 2012****Subject code: 180805****Subject Name: High Voltage Engineering****Date: 08/05/2012****Time: 10.30 am – 01.00 pm****Total Marks: 70****Instructions:**

1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.

- Q.1** (a) Define the Townsend first & second ionization co-efficient. Also derive the equation for second ionization co-efficient $I = I_0 e^{\alpha d} / (1 - \gamma (e^{\alpha d} - 1))$? **07**
- (b) Why is a Cockcroft – Walton circuit preferred for voltage multiplier circuits ? Explain its working with a schematic diagram. **07**

- Q.2** (a) Explain Purification & Breakdown Tests for Liquid Dielectric. **07**
- (b) What are “ Treeing” & “Tracking”? Explain clearly the two processes in solid dielectrics. **07**

OR

- (b) What are the special features of epoxy resin insulation ? **07**

- Q.3** (a) An impulse generator has 8 stages with each condenser rated for 0.16 μ F and 125 kV. The load capacitor available is 1000 pF. Find the series resistance and damping resistance needed to produce 1.2/50 μ S impulse wave. What is the max. output voltage of the generator, if the charging voltage is 120kV ? **07**
- (b) Describe with a neat sketch, the working of a Van de Graff generator. What are the factors that limit the maximum voltage obtained ? **07**

OR

- Q.3** (a) In a certain gas the steady state current is 5.5×10^{-8} A at 8kV at a distance of 0.4 cm between the plain electrodes. Keeping the field constant and reducing the distance to 0.1 cm from 0.4 cm results in a current of 5.5×10^{-9} A. Calculate Townsend’s primary ionization co-efficient α . **07**
- (b) Explain with neat diagram the principle of operation of an Electrostatics Voltmeter. Discuss its advantages and limitations for high voltage measurements. **07**

- Q.4** (a) A Cockcroft Walton type voltage multiplier has 10 stages with capacitances, all equal to 0.06 μ F. The supply transformer secondary voltage is 100kV at a frequency of 150Hz. If the load current to be supplied is 1mA. Find **07**
- (i) the % ripple
 - (ii) the regulation
 - (iii) the optimum no. of stages for minimum regulation or voltage drop.

- (b) What is meant by insulation co-ordination ? How are the protective devices chosen for optimal insulation level in a power system ? **07**

OR

- Q.4** (a) Draw the layout of High voltage Laboratory & write the specification of **07**

High voltage laboratory equipments

- (b) A 20kV, 50 Hz Schering bridge has a standard capacitance of $106 \mu\text{F}$. In a test on a Bakelite sheet balance was obtained with a capacitance of $0.35 \mu\text{F}$ in parallel with a non inductive resistance of 318 ohms, the non inductive resistance in the remaining arm of the bridge being 130 ohms. Determine the equivalent series resistance and capacitance and the p.f of the specimen. **07**
- Q.5 (a)** Explain High voltage Test on insulator. **07**
- (b)** Discuss measurement of Dielectric Constant & Loss tangent of capacitor also derive the equation. **07**
- OR**
- Q.5 (a)** 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 ? **07**
- (b)** Define the front and tail times of an impulse wave. What are the tolerances allowed as per the specifications? **07**
