

**Seventh Semester B.E. Degree Examination, May/June 08**  
**High Voltage Engineering**

Time: 3 hrs.

Max. Marks:100

**Note : Answer any FIVE full questions.**

1.
  - a. List the advantages of very high voltage for power transmission purposes and mention the present highest transmission voltages (AC and DC) in India. (06 Marks)
  - b. Derive the Townsend's current growth equation considering both ionization processes with neat notations. (10 Marks)
  - c. Write briefly on the other applications of high voltage apart from transmission of power. (04 Marks)
2.
  - a. Explain "Cavitations and bubbles theory" in the context of liquid dielectric break down. (06 Marks)
  - b. Explain i) Electronegative gases ii) Time lags for break down in gases. (06 Marks)
  - c. In an experiment on certain gas, it was found that the steady state current is  $4.5 \times 10^{-8}$  amperes at 10 kV at a distance of 0.5 cm between the plane electrodes. Keeping the field constant and reducing the distance to 0.1 cm results in a current of  $4.5 \times 10^{-9}$  amperes. Calculate the Townsend primary ionization constant  $\alpha$ . (08 Marks)
3.
  - a. Explain "Streamer theory" of break down in gases enumerating the limitation of Townsend theory for break down in large air gaps. (08 Marks)
  - b. Explain in detail "Intrinsic break down" of solid dielectric. (06 Marks)
  - c. A solid specimen of dielectric has a dielectric constant of 4.2 and  $\tan \delta = 0.001$  at a frequency of 50 Hz. If it is subjected to an alternating field of 70 kV/cm, calculate the heat generated in the specimen due to the dielectric loss. (06 Marks)
4.
  - a. With a neat diagram explain the three stage cascade transformer connection to produce high voltages at 50 Hz. (06 Marks)
  - b. Three 350 kV, 350 kVA testing transformers are connected in cascade and have a short circuit impedance of 5%. Determine
    - i) The full load current.
    - ii) The short circuit current and
    - iii) The maximum capacitive load that can be tested without exceeding the power rating. (08 Marks)
  - c. With a neat sketch explain the working of 4-stage Cockroft – Walton DC generator. (06 Marks)
5.
  - a. Give the general equation of a standard impulse wave (double exponential wave) and explain the wave shape giving the percentage tolerances allowed for front, tail and the peak. (08 Marks)
  - b. A 12 stage impulse generator has 0.126  $\mu$ F capacitor per stage. The wave front and wave tail resistances connected are 400  $\Omega$  and 5500  $\Omega$  respectively. If the load capacitor is 1000 pF, find the front and tail times of the impulse wave produced and determine the error of front and tail time with that of standard impulse 1.2 / 50  $\mu$  sec. (08 Marks)
  - c. Explain why impulse voltages should be produced in the laboratory. (04 Marks)
6.
  - a. Discuss the method of measuring HVAC by Chubb and Fortescue method. (06 Marks)
  - b. Discuss the working of electrostatic voltmeter with a neat diagram. (06 Marks)
  - c. Explain the various factors that affect the spark over voltage of sphere gap. (08 Marks)
7.
  - a. Explain the operation of schering bridge for three terminal measurement. (06 Marks)
  - b. Explain discharge detection using straight detector for partial discharge measurement. (08 Marks)
  - c. Explain impulse testing of transformers describing the procedure of test. (06 Marks)
8. Write brief notes on:
  - a. Pascheris law.
  - b. Corona discharge.
  - c. Tesla coil.
  - d. Series resonant HVAC circuit. (20 Marks)