10EE73

Seventh Semester B.E. Degree Examination, June/July 2014

High Voltage Engineering

Time: 3 hrs.   Max. Marks:100

**Note: *Answer FIVE full questions, selecting
at least TWO questions from each part.***

PART – A

1   a. What are the needs for generating high voltages in laboratory? Mention the industrial applications of high voltage. **(08 Marks)**

    b. Write notes on:
      i) Electrostatic separation
      ii) Electrostatic painting **(12 Marks)**

2   a. Mention the important properties of gaseous, liquid and solid dielectrics. **(08 Marks)**

    b. In an experiment in a certain gas it was found that steady state current is 5.5×10^{-8} A at 8 kV at a distance of 0.4 cm between the plane electrodes. Keeping the field constant and reducing the distance to 0.1 cm results in a current of 5.5×10^{-9} A. Calculate Townsend's primary ionization coefficient. **(06 Marks)**

    c. Explain time lags for breakdown of gas. **(06 Marks)**

3   a. Larger the size of the particles, the lower were the breakdown strengths. Explain the theory related to this. **(08 Marks)**

    b. Write short notes on any two of the following:
      i) Electromechanical breakdown
      ii) Townsend's second ionization coefficient
      iii) Stressed oil volume theory **(12 Marks)**

4   a. A ten stage Cockraft-Walton circuit has all capacitors of 0.06 µF. The secondary voltage of the supply transformer is 100 kV at a frequency of 150 Hz. If he load current is 1 mA, determine:
      i) Voltage regulation
      ii) The ripple
      iii) The optimum number of stages for maximum output voltage
      iv) The maximum output voltage. **(10 Marks)**

    b. With a schematic diagram of cascade transformer connection, explain the generation of high alternating voltages. **(10 Marks)**

PART – B

5   a. Draw the neat sketch of Marx multistage impulse generator incorporating the series and wave tail resistances within the generator and explain. **(12 Marks)**

    b. A 12 stage impulse generator has 0.126 µF condensers. The wave front and wave tail resistances connected are 800 ohms and 5000 ohms respectively. If the load condenser is 1000 pF, find the front and tail timer of the impulse wave produced. **(08 Marks)**

6   a. Explain the factors influencing the spark over voltage of sphere gap.   **(10 Marks)**
    b. Explain the simple and accurate method of measuring peak values of ac voltages as suggested by Chubb and Fortescue.   **(10 Marks)**

7   a. What are the various high voltages tests that are carried on overhead line insulators and explain any one method?   **(10 Marks)**
    b. Explain in brief the "life expectancy test" on a cable.   **(05 Marks)**
    c. Write a brief note on testing of circuit breakers.   **(05 Marks)**

8   a. Draw the circuit diagram of transformer voltage ratio arm bridge and transformer current ratio arm bridge and explain.   **(10 Marks)**
    b. A 33 KV, 50 Hz, high voltage Schering bridge is used to test a sample of insulation. The various arms have the following parameters on balance. The standard capacitance 500 pF, the resistive branch 800 ohm and the branch with parallel combination of resistance and capacitance has values 180 ohms and capacitance of 0.15 µF. Determine the value of capacitance of this sample, its parallel equivalent loss resistance. The power factor and the power loss under these conditions.   **(10 Marks)**

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