Seventh Semester B.E. Degree Examination, Dec.2017/Jan.2018
High Voltage Engineering

Time: 3 hrs.   Max. Marks:100

Note: Answer any FIVE full questions, selecting
atleast TWO questions from each part.

PART – A

1   a. What are the industrial applications of high voltage?   **(05 Marks)**
   b. Explain the need of high voltage in the laboratory.   **(05 Marks)**
   c. With a neat sketch explain the principle and working of electrostatic painting.   **(10 Marks)**

2   a. Derive an expression for the current in the air gap $i = i_0 e^{\alpha d}$ considering townsend first ionization coefficient.   **(08 Marks)**
   b. In an experiment in certain gas it was found that the steady state current is 6×10^{-8}A at 10kV at a gap spacing of 0.4cms between the electrodes keeping the field constant and reducing the gap spacing to 0.2cm a current of 10×10^{-9}A was obtained. Calculate the townsend primary ionization co-efficient of 'λ'.   **(06 Marks)**
   c. What is meant by time lag of breakdown? Explain statistical and formative time lag.   **(06 Marks)**

3   a. What are the limitations of townsend theory and explain the streamer's theory.   **(10 Marks)**
   b. Briefly explain electro mechanical break down and thermal breakdown in solid insulating materials.   **(10 Marks)**

4   a. With the help of a neat sketch, explain how cascade transfer generates high voltage AC.   **(06 Marks)**
   b. Derive an expression for average ripple and voltage drop of a three stage HVDC circuit.   **(08 Marks)**
   c. Determine the average ripple and voltage drop of a 4 stage HVDC circuit with a stage capacitance of 4 μF and a load current of 500mA. Supply frequency is 50Hz.   **(06 Marks)**

PART – B

5   a. Define the wave front and wave-tail times of an impulse voltage wave. What are the percentage tolerances for a standard lighting impulse wave?   **(06 Marks)**
   b. With the help of a neat sketch how impulse voltage can be developed in the laboratory by Marx circuit.   **(08 Marks)**
   c. Calculate the front and tail resistance for 5 stages, 1000kV with the capacitance of each stage is 5μF and a load capacitance of 10,000 pF for 1μs front and 50μs tail wave. **(06 Marks)**

6   a. Explain the working principle of generating voltmeter with a figure.   **(08 Marks)**
   b. A generating voltmeter is required to measure voltage between 15 kV to 250kV. If the indicating meter reads a minimum current of 2μA and a maximum of 35μA, determine the capacitance of the generating voltmeter. The speed of the drive motor is 1500 rpm. **(04 Marks)**
   c. Explain the factors that influence the measurement of high voltage using the sphere gap.   **(08 Marks)**

7 a. With the help of a diagram of Schering bridge explain how capacitance and $\tan\delta$ can be measured. **(08 Marks)**

b. Explain the transformer ratio arm bridge for audio frequency range measurements. **(06 Marks)**

c. Discuss the factors affecting the discharge detection. **(06 Marks)**

8 a. Explain in detail the testing of circuit breakers. **(10 Marks)**

b. What are the tests on transformer and explain in detail the impulse testing of transformer? **(10 Marks)**

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