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Seventh Semester B.E. Degree Examination, June/July 2018
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. Explain the need for generating high voltages in the laboratory. (05 Marks)
b. Mention the industrial applications of high voltage. (05 Marks)
c. With the help of necessary sketches, explain the operation of pipe-type electrostatic precipitator. (10 Marks)
- 2 a. Define Townsend's first and second ionization coefficients. Derive an expression for the current growth in a gas discharge due to secondary mechanism. (10 Marks)
b. With the help of necessary equations and curve, state and explain Paschen's law. (05 Marks)
c. A steady current of 600 μA flows through the plane electrode separated by a distance of 0.5 cm when a voltage of 10 KV is applied. Determine the Townsend's first ionization coefficient if a current of 60 μA flows when the distance of separation is reduced to 0.1 cm, and the field is kept constant at the previous value. (05 Marks)
- 3 a. Explain the mechanism of thermal breakdown in solids. (08 Marks)
b. Explain the mechanism of bubble theory in liquids. (07 Marks)
c. What is time lag? Describe its components and the factors which affect these components. (05 Marks)
- 4 a. Explain the principle of operation of resonant transformer for producing high voltages. Mention its advantages over the cascade connected transformers. (10 Marks)
b. Why a Cockcroft – Walton circuit is preferred for voltage multiplier circuit? Explain its working with three stage schematic diagram. (10 Marks)

PART – B

- 5 a. Define the front and tail time of an impulse voltage wave. What are its tolerances allowed as per the specifications? (04 Marks)
b. With the help of neat diagram, explain the construction and working principle of a multistage Marx Impulse generator. (10 Marks)
c. An impulse current generator has total capacitance of 15 μF , the charging voltage 125 KV, the circuit inductance 2 mH and the dynamic resistance 1 ohm. Determine the peak current and wave shape of the wave. (06 Marks)
- 6 a. Describe method of measurement of HVAC voltages by chubb and fortescue method. What are the errors that can be present in measurement? (10 Marks)
b. Explain the factors influencing the spartover voltage of sphere gaps. (10 Marks)
- 7 a. With the help of a neat sketch, explain construction and principle of operation of HV schering bridge for measurement of capacitance and loss angle. (10 Marks)
b. What are partial discharges? Describe the balanced detection schemes for locating partial discharges in electrical equipment. (10 Marks)
- 8 a. A Rogowski coil is to be designed to measure impulse currents of 10 KA having a rate of change of current of 10^{11} A/S. The current is read by a TVM as a potential drop across the integrating circuit connected to the secondary. Estimate the values of mutual inductance, resistance and capacitance to be connected, if the meter reading is to be 10 V for full-scale deflection. (08 Marks)
b. Write briefly about testing of, (i) Insulators. (ii) Cables. (12 Marks)

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