Dr Shaghaun Tripathi 2/5/2023

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राष्ट्रीय प्रौद्योगिकी संस्थान हमीरपुर
हमीरपुर (हि॰प्र॰) – 177 005 (भारत)
[भारत सरकार शिक्षा मंत्रालय के तहत एक राष्ट्रीय महत्व का संस्थान]
NATIONAL INSTITUTE OF TECHNOLOGY HAMIRPUR
HAMIRPUR (H.P.) - 177 005 (INDIA)
[An Institute of National Importance under Ministry of Education (Shiksha Mantralaya)]

End Semester Theory Examination May-2023
Semester: 8TH Code: EE-421 & Course: High Voltage Engineering
Total Marks: 50 **Time: 02:30PM-05:30PM** **Date: 02-05-2023**

Note: Attempt all questions. Assume any missing data suitably.

1. Differentiate between the following.
   a) Glow Discharge and Arc Discharge.
   b) Electrical Discharge and Partial Discharge.
   c) Field Uniformity Factor and Field Enhancement Factor.
   d) Pure Liquid and Commercial Liquid.
   e) Townsend's criterion for breakdown in uniform and non-uniform fields.
   f) Statistical and Formative time lags for breakdown.
   g) Secondary Ionization and Electron attachment process.
   h) Field Emission Mechanism and Clump Theory for vacuum breakdown.
   i) Breakdown due to Treeing and Tracking.
   j) Discharge inception and extinction applied voltage. **(1x10 = 10)**

2. Why dissipation factor is a criterion for the monitoring of the high voltage insulation? Draw the electrical equivalent circuit model of insulators with void and other imperfections for partial discharge measurements and find energy associated in a single discharge. **(1+2+2 = 5)**
3. Define complex relative permittivity of dielectric. Draw the series and shunt electrical equivalent circuit model of lossy dielectric and evaluate loss tangent (dissipation factor) and dissipation frequency for both models. **(1+1+1+1+1 = 5)**
4. Explain the high voltage Schering bridge for the measurement of dissipation factor and capacitance of lossy dielectric test object whose one end is grounded. **(5)**
5. What is meant by insulation co-ordination? Define basic and switching impulse level. Explain Surge Arresters function as a shunt protective device with its characteristics. **(1+2+2 = 5)**
6. Discuss the advantages of Capacitance Voltage Transformer for alternating high voltage measurements. Draw equivalent circuit and schematic representation of CVT with its phasor diagram under resonance conditions. Why this method is recommended when A.C. voltages are not pure sinusoidal? **(1+3+1 = 5)**
7. Explain principle of operation of generating voltmeter with its schematic diagram. Discuss advantages and limitations of generating voltmeter. **(3+2 = 5)**
8. Explain principle of operation of electrostatic generator with its schematic diagram. Differentiate the working of Van de Graff Generators from the electrostatic generator. **(3+2 = 5)**
9. Discuss Cockcroft-Walton voltage multiplier circuit along with schematic current and voltage waveforms. Find total ripple voltage, voltage drop on load and optimal number of stages in the multiplier circuit. **(1+1+1+1+1 = 5)**