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PRESIDENCY UNIVERSITY BENGALURU

Department of Research & Development

Mid - Term Examinations - AUGUST 2024

Odd Semester: Ph.D. Course Work

Course Code: EEE822

Course Name: High Voltage Engineering

Department: EEE

Date: 13-08-2024

Time: 09.30am to 11.00am

Max Marks: 50

Weightage: 25%

Instructions:

- (i) Read the all questions carefully and answer accordingly.
 - (ii) Do not write any matter on the question paper other than roll number.
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PART A (THOUGHT PROVOKING)

Answer all the Questions. Each question carries 5 marks.

(4Qx 5M= 20M)

1. Explain Townsend's Breakdown Mechanism and its importance for designing high voltage equipment
(CO:01 BL: Comprehension)
2. Understanding the breakdown mechanism of commercial insulation liquids is crucial for the design and maintenance of high voltage equipment, ensuring reliability and longevity of the electrical systems. Explain various breakdowns that can happen in commercial liquid insulators.
(CO:01 BL: Comprehension)
3. Explain the role of spark gaps in the triggering of impulse generators and also describe the operation of a triggered spark gap.
(CO:02 BL: Comprehension)
4. Explain the principle, construction and operation of Capacitance Voltage Transformers (CVTs)
(CO:02 BL: Comprehension)

PART B (PROBLEM SOLVING)

Answer all the Questions. Each question carries 10 marks.

(3Qx 10M= 30M)

1. In an experiment in a certain gas it was found that the 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 (i) Townsend's primary ionization coefficient α (ii) if the breakdown occurred when the gap distance was increased to 0.9 cm, compute the value of γ ?
(CO:01 BL: Application)

2. A Capacitance Voltage Transformer (CVT) has a primary capacitor $C_1=100$ pF and a secondary 1 pF. The voltage across the secondary capacitor V_{C_2} is measured as 10 V. Calculate the voltage on the high voltage line if the CVT is operating with a nominal voltage ratio of 1000:1.
(CO:02 BL: Application)
3. Two spherical electrodes with a diameter of 25 cm each are used to measure a high voltage. The distance between the spheres is set to 1 cm. Given that the breakdown voltage of air at standard atmospheric conditions (20°C, 101.3 kPa) is approximately 30 kV/cm, calculate the breakdown voltage for this sphere gap setup. Assume standard atmospheric conditions.
What factors affect the breakdown voltage of a sphere gap? (CO:02 BL: Application)