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**Fifth Semester B.E. Degree Examination, June/July 2024**  
**High Voltage Engineering**

Time: 3 hrs.

Max. Marks: 100

**Note: Answer any FIVE full questions, choosing ONE full question from each module.**

**Module-1**

- 1 a. Define Townsends first and second ionization co-efficient. Derive an expression for the current growth in a gas discharge due to secondary mechanism. (10 Marks)
- b. Explain the following Breakdown mechanism in solid. (10 Marks)
- Thermal breakdown
  - Elector-mechanical breakdown.

**OR**

- 2 a. In an experiment in a certain gas, it was found that the steady state current is  $5.5 \times 10^{-8}$  A at 8KV at a distance of 0.4cm between the plane electrodes keeping the field constant and reducing the distance to 0.1cm results in a currents of  $5.5 \times 10^{-9}$  A. Calculate Townsends primary ionization coefficient  $\alpha$ . (06 Marks)
- b. Explain the bubbles theory and suspended particle theory of breakdown in liquid. (08 Marks)
- c. State and explain Paschens law. (06 Marks)

**Module-2**

- 3 a. Explain with a neat sketch, how cascade transformers generates high AC voltages (show 3 stages). (06 Marks)
- b. A cock craft Walton type voltage multiplier has eight stages with capacitances, all equal to  $0.05\mu\text{F}$ . The supply transformer secondary voltage is 125KV at a frequency of 150Hz. If the load current to be supplied is 5mA, Find : (08 Marks)
- Percentage ripple
  - The regulation
  - The optimum number of stages for minimum regulation or voltage drop.
- c. Explain the principle of resonant transformer. (06 Marks)

**OR**

- 4 a. With a neat sketch, explain the Marx circuit arrangement for multistage impulse generator. (07 Marks)
- b. Explain the construction and working of a three electrode gap tripping circuit used for the impulse generator. (07 Marks)
- c. A 12 stage impulse generator has  $0.12\mu\text{f}$  capacitors. The wave front and wave tail resistances are  $800\Omega$  and  $5K\Omega$  respectively. If the load capacitor is  $1000\text{pF}$ , Find the front and tail times of the impulse wave produced. (06 Marks)

**Module-3**

- 5 a. With a schematic diagram, explain the principle of operation of a generating voltmeter. What are its advantages and limitations? (10 Marks)
- b. Explain the principle of operation of an electrostatic voltmeter for measurement of very high DC and AC voltages. (10 Marks)

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.  
 2. Any revealing of identification, appeal to evaluator and /or equations written eg, 42+8 = 50, will be treated as malpractice.

OR

- 6 a. Explain the factor influencing the spark over voltages of sphere gap. (08 Marks)  
b. Explain how Chubb and Fortescue circuit can be used to measure the peak value of AC voltages. (06 Marks)  
c. With a neat sketch explain the working of Rogowski coil for high impulse current measurement. (06 Marks)

**Module-4**

- 7 a. Explain the principle of insulation co-ordination on HV and EHV power systems. (10 Marks)  
b. Explain the surge arrestor with neat diagram. (10 Marks)

OR

- 8 a. Explain different theories of charge formation in clouds. (10 Marks)  
b. Explain with suitable figures the principle and functioning of :  
i) Expulsion gaps  
ii) Protector tubes. (10 Marks)

**Module-5**

- 9 a. With the help of a diagram of Schering bridge, explain how capacitance and  $\tan \delta$  can be measured. (10 Marks)  
b. Explain in brief the method of discharge detection using straight detector. (10 Marks)

OR

- 10 a. Explain in detail the testing of circuit breakers and isolators. (10 Marks)  
b. What are the tests on transformers and explain in detail the impulse testing of transformers. (10 Marks)

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