CBCS SCHEME

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18EE56

Fifth Semester B.E. Degree Examination, Jan./Feb. 2021
High Voltage Engineering

Time: 3 hrs. Max. Marks: 100

Note:1. Answer any FIVE full questions, choosing ONE full question from each module.
2. Assume missing data suitably.

Module-1

1 a. Mention the desired properties of gaseous dielectric for HV applications. Give any three examples of gaseous dielectric. **(06 Marks)**

b. Derive an expression for the current in the air gap, that is $I = I_0 e^{\alpha d}$, considering Townsend's first ionization coefficient. **(08 Marks)**

c. 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 Townsend's primary ionization coefficient α. **(06 Marks)**

OR

2 a. State and explain Paschen's law. **(06 Marks)**

b. Explain the following breakdown mechanism in solid:
(i) Streamer breakdown (ii) Electro mechanical breakdown. **(14 Marks)**

Module-2

3 a. Explain the need for generation of very high voltages in the laboratory. **(06 Marks)**

b. Explain with a neat sketch, how cascade transformers generates high ac voltages (show 3 stages). **(08 Marks)**

c. Explain the principle of operation of a resonant transformer. **(06 Marks)**

OR

4 a. With a neat sketch, explain the Marx circuit arrangement for multistage impulse generator. **(08 Marks)**

b. What is a Tesla coil? How are damped high frequency oscillations can be obtained using the Tesla coil? **(06 Marks)**

c. A cock craft Walton type voltage multiplier has eight stages with capacitances, all equal to 0.05 μF. The supply transformer secondary voltage is 125 kV at a frequency of 150 Hz. If the load current to be supplied is 5 mA, find (i) Percentage ripple (ii) The regulation. **(06 Marks)**

Module-3

5 a. Explain the principle of operation of an electrostatic voltmeter for measurement of very high dc and ac voltages. **(10 Marks)**

b. With a schematic diagram, explain the principle of operation of a generating voltmeter. What are its advantages and limitations? **(10 Marks)**

OR

6 a. Explain how Chubb and Fortescne circuit can be used to measure the peak value of ac voltages. **(08 Marks)**

b. Explain the factors influencing the sparkover voltages of sphere gaps. **(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 different theories of charge formation in clouds. **(10 Marks)**

b. What is a surge arrestor? Explain its function as a shunt protective device, with a neat sketch. **(10 Marks)**

OR

8 a. Explain the following :

(i) Rod gaps used as protective devices.

(ii) Ground wires for protection of overhead lines. **(10 Marks)**

b. Explain with suitable figures the principle and functioning of,

(i) Expulsion gaps

(ii) Protector tubes. **(10 Marks)**

Module-5

9 a. Explain the method of measuring capacitance and tan delta using Schering bridge. **(10 Marks)**

b. Discuss the method of discharge detection using straight detector method. **(10 Marks)**

OR

10 a. What are the various tests done on transformers? Explain in detail impulse testing of transformer. **(10 Marks)**

b. Explain in detail the testing of, (i) Circuit breaker and (ii) Insulators. **(10 Marks)**

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