

# CBGS 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  $5.5 \times 10^{-8}$  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  $5.5 \times 10^{-9}$  A. Calculate Townsend's primary ionization coefficient  $\alpha$ . (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  $0.05 \mu\text{F}$ . 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)

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 how Chubb and Fortescue 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 arrester? 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. (10 Marks)
- (ii) Ground wires for protection of overhead lines. (10 Marks)
- b. Explain with suitable figures the principle and functioning of,
- (i) Expulsion gaps (10 Marks)
- (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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