

CBCS SCHEME

17EE73



Seventh Semester B.E. Degree Examination, Jan./Feb. 2021 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. Derive an expression for the current growth in the air gap considering Townsend First ionization co-efficient. (10 Marks)
- b. What is Paschen's law? How do you account for the minimum voltage for breakdown under a given PXD condition? (10 Marks)

OR

- 2 a. List the three important properties of liquid dielectrics and explain suspended particle theory of breakdown. (10 Marks)
- b. List the various breakdown mechanisms in solid dielectrics and explain Thermal breakdown mechanism. (10 Marks)

Module-2

- 3 a. What are the advantages of high frequency transformers? Explain the 3-stage cascaded transformer for generation of HVAC. (10 Marks)
- b. A Cockcroft – Walton type voltage multiplier has eight stages with capacitances, all equal $0.05\mu\text{F}$. The supply transformer secondary voltage is 125kV at 150Hz frequency. If the load current is 5mA find the i) Percentage Ripple ii) Regulation iii) Optimum number of stages for minimum regulation. (10 Marks)

OR

- 4 a. With a circuit diagram, explain the tripping of an impulse generation with three electrode gap arrangement. (10 Marks)
- b. An impulse generator has eight stages with each condenser rated for $0.16\mu\text{F}$ and 125kV . The load capacitor is of 1000pF . Find the series and damping resistance needed to produce $1.2/50\mu\text{s}$ impulse wave. What is the maximum output voltage of the generator, if the charging voltage is 120kV ? (10 Marks)

Module-3

- 5 a. With a neat diagram, explain the construction and working principle of Electrostatic voltmeter. (10 Marks)
- b. Explain the various factors that affect the spark over voltage of sphere gap. (10 Marks)

OR

- 6 a. With a block diagram, explain the cathode ray oscilloscope for impulse measurement. (10 Marks)
- b. A generating voltmeter has to be designed so that it can have a range from 20 to 200kV DC . If the indicating meter reads a minimum current of $2\mu\text{A}$ and maximum current of $25\mu\text{A}$, what should the capacitance of generating voltmeter be? (06 Marks)
- c. List the limitations of series resistance micro ammeter in measuring HVDC. (04 Marks)

Module-4

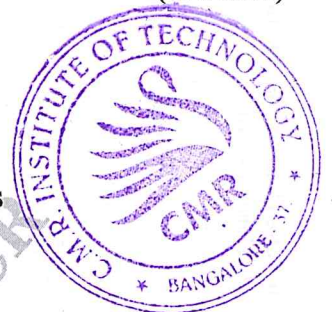
- 7 a. Explain the different theories of charge formation in cloud. (10 Marks)
 b. What is direct and indirect lighting stroke? Give reasons for induced voltage on the power line due to indirect stroke. (10 Marks)

OR

- 8 a. List the parameters to be considered for the selection of surge arrester voltage rating for EHV and UHV, also explain the types of surge arresters used. (10 Marks)
 b. A transmission line has the following line constant $R = 0.1 \text{ ohm/km}$, $L = 1.26 \text{ mH/km}$, $C = 0.009 \mu\text{F/km}$ and $G = 0$. If the line is a 3-phase line and is charged from one end at a line voltage of 230kV, find the rise in voltage at the other end, if the line length is 400km. (10 Marks)

Module-5

- 9 a. With a necessary circuit diagram and pattern, explain discharge detection using straight detector for partial discharge measurement. (10 Marks)
 b. A Schering bridge with following configuration.
 The electrode effective area 100 cm^2 at balance
 Arm AB – test object
 Arm BC – Standard capacitor 100 pF
 Arm CD – Variable capacitor 50 nF in parallel with resistor $\frac{1000}{\pi}$ ohms
 Arm DA – Variable resistance $62.0/\text{ohm}$ with 1 mm thick Bakelite at 50 Hz .
 Determine the dielectric constant and loss factor. (05 Marks)
 c. Write a note on :
 i) Power frequency spark over test
 ii) Hundred percent standard impulses spark over test in the view of surge arrester. (05 Marks)



(05 Marks)

OR

- 10 a. Explain the power frequency tests and impulse tests for i) Insulators ii) Bushings. (10 Marks)
 b. Explain the different methods of conducting short circuit tests on circuit breakers. (10 Marks)
