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B.TECH
(SEM VII) THEORY EXAMINATION 2022-23
HIGH VOLTAGE ENGINEERING

Time: 3 Hours ***Total Marks: 100***

Note: Attempt all Sections. If require any missing data; then choose suitably.

SECTION A

1. Attempt *all* questions in brief. **2 x 10 = 20**

(a) Give the characteristic of liquid dielectrics.
(b) Explain the time lags for breakdown.
(c) What is the need of generating high AC and DC voltages?
(d) What is a resonant transformer? why it is used.
(e) Define the front and tail times of an impulse wave.
(f) What is a trigatron gap?
(g) Which factors that affect the spark over voltage of sphere gap.
(h) Define protective devices?
(i) Explain withstand voltage.
(j) Define complex permittivity.

SECTION B

2. Attempt any *three* of the following: **3x10=30**

(a) Explain the different types of solid dielectrics materials, Give their properties also.
(b) Why a Cockcroft-Walton circuit is preferred for voltage multiplier circuits? Explain its working with a schematic diagram.
(c) What is capacitance voltage transformer? Explain with phasor diagram how a tuned capacitance voltage transformer can be used for voltage measurements in power systems.
(d) An infinite rectangular wave on a line having a surge impedance of 500 Ω strikes a transmission line terminated with a capacitance of 0.004 μF. Calculate the extent to which the wave front is retarded?
(e) Explain three electrode arrangement used in dielectric measurement? Explain with sketches the electrode arrangements for (a) solid specimen (b) liquid specimen.

SECTION C

3. Attempt any *one* part of the following: **10x1=10**

(a) What will the breakdown strength of air be for small gaps (1 mm) and large gaps (20 cm) under uniform field conditions and standard atmospheric conditions?
(b) Differentiate between breakdown in pure liquid and commercial liquid.

4. Attempt any *one* part of the following:

(a) A 12 stage impulse generator has 0.120 μF capacitors. The wave front and the wave tail resistances connected are 700 ohms and 6000 ohms respectively. If the load capacitor is 1200 pF, Find the front and tail times of the impulse wave produced.
(b) Define the front and tail times of an impulse wave. What are the tolerances allowed as per the specifications?

5. Attempt any *one* part of the following: 10x1=10

(a) Discuss the different methods of measuring high dc voltages. What are the limitations in each method?
(b) A generating voltmeter has to be designed so that it can have a range from 20 to 200 KV DC if the indicating meter reads a minimum current of 2 μA and maximum current of 25 μA, what should the capacitance of the generating voltmeter be?

6. Attempt any *one* part of the following: 10x1=10

(a) Explain the causes for switching and power frequency overvoltage? How are they controlled in power systems?
(b) Write short notes on: (i) Rod gaps used as protective devices (ii) Ground wires for protection of overhead lines.

7. Attempt any *one* part of the following: 10x1=10

(a) The capacitance and loss angle of the above specimen were measured using the same electrode set up. The capacitance and tan δ with the specimen are 147 pF and 0.0012, respectively. The air capacitance of the electrode system was 35 pF. What is the dielectric constant and complex permittivity of Bakelite?
(b) Discuss the method of balanced detection for locating partial discharges in electrical equipment.