Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–VII (NEW) EXAMINATION – WINTER 2021

Subject Code:3170917 Date:15/12/2021

Subject Name:High Voltage Engineering

Time:10:30 AM TO 01:00 PM Total Marks: 70

Instructions:

1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**
4. **Simple and non-programmable scientific calculators are allowed.**

Q.1	**(a)**	What are the commercial liquids?	**03**
	(b)	Differentiate between Marx & modified Marx circuit for multistage impulse generators with circuit.	**04**
	(c)	Explain breakdown in solid due to Treeing and Tracking.	**07**
Q.2	**(a)**	Explain time lags for breakdown of gas.	**03**
	(b)	Explain purification test cell system related to liquids.	**04**
	(c)	Explain Voltage Multiplier Circuit for generation of High Voltage.	**07**
		OR	
	(c)	Describe the working of a Van de Graff generator with a neat sketch.	**07**
Q.3	**(a)**	Explain breakdown test for Transformer oil.	**03**
	(b)	Discuss Hall effect in Hall generator.	**04**
	(c)	Explain how a sphere gap can be used to measure the peak value of voltages and also explain factor influence such a voltage measurement?	**07**
		OR	
Q.3	**(a)**	Explain front and tail times of an impulse wave with neat sketch.	**03**
	(b)	How Potential Divider method used for measurement of high voltage DC with its limitations.	**04**
	(c)	Explain with neat diagram the principle of operation of an electrostatic voltmeter and its limitations for high voltage measurements.	**07**
Q.4	**(a)**	List out the causes of over voltage in power system.	**03**
	(b)	How are switching impulse generated in Laboratory, Explain in brief	**04**
	(c)	An impulse generator has 8 stages with each condenser rated for 0.16µF and 150 KV. The load capacitor available is 1000pF. Find the series resistance and the damping resistance needed to produced 1.2/50 µs impulse wave.	**07**
		OR	
Q.4	**(a)**	Draw block diagram of Digital PD Analyser.	**03**
	(b)	Explain corona discharge in brief.	**04**
	(c)	Explain with neat sketches the mechanism of lightning discharge.	**07**
Q.5	**(a)**	List out the common test facilities available in High Voltage Lab.	**03**
	(b)	What is insulation co-ordination?	**04**
	(c)	What is Finite Element Method? Brief it for solving the field problems	**07**
		OR	
Q.5	**(a)**	What is partial Discharges?	**03**
	(b)	Discuss High voltage Schering Bridge in brief.	**04**
	(c)	Explain high voltage test on Insulator.	**07**

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Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–VII (NEW) EXAMINATION – SUMMER 2022

Subject Code:3170917 Date:08/06/2022

Subject Name:High Voltage Engineering

Time:02:30 PM TO 05:00 PM Total Marks: 70

Instructions:

1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**
4. **Simple and non-programmable scientific calculators are allowed.**

			MARKS
Q.1	**(a)**	Which gases are generally observed while performing dissolved gas analysis of transformer oil?	**03**
	(b)	Draw and explore the Duval's triangle	**04**
	(c)	What is the present-day technique to monitor the mechanical integrity of big size power transformer? Discuss in detail.	**07**
Q.2	**(a)**	Sketch the graph for Breakdown voltage-PD curve for gaseous insulating media with proper indications and nomenclature on X and Y axis	**03**
	(b)	What will be standard breakdown strength of air for small gaps (1 mm) and large gaps (20 cm) under uniform field conditions and standard atmospheric conditions?	**04**
	(c)	Compare the breakdown mechanisms (Townsend's & Streamer Theory) for gaseous insulating medium	**07**
		OR	
	(c)	Explain any one numerical technique in detail with relevant equations (Charge simulation, Finite element, Finite difference, or Boundary element)	**07**
Q.3	**(a)**	Enlist the breakdown mechanisms for solid dielectric	**03**
	(b)	What is thermal breakdown in solid dielectric?	**04**
	(c)	How is the purification and breakdown test of liquid dielectric carried out?	**07**
		OR	
Q.3	**(a)**	A cascade transformer has four stages. What should be the power rating of the first (bottom most) transformer if the power rating of the last (Topmost) transformer is 'P'.	**03**
	(b)	Find out advantages and disadvantages of Resonant transformer	**04**
	(c)	Elucidate a generator which converts mechanical energy into electrostatic energy with relevant sketches? How is such generator fitted in laboratory?	**07**
Q.4	**(a)**	Enlist the techniques (at least three for each) for HVAC and HVDC generation	**03**
	(b)	Compare high voltage testing transformer with power transformer	**04**
	(c)	Sketch and explain Cockcroft Walton circuit for five stage (200 kV × 5 = 1000 kV) high voltage DC generation.	**07**
		OR	

Q.4	**(a)**	Represent the Chhub and Fortescue circuit	**03**
	(b)	Enlist a table for High voltage measurement techniques for DC Voltages, AC voltages (Power frequency) and Impulse voltages	**04**
	(c)	Sketch and explore generating voltmeter in detail	**07**
Q.5	**(a)**	What is the function of lightning arrester and how it serves the purpose?	**03**
	(b)	What are the components of lightning strike? Give a sketch of it.	**04**
	(c)	What is meant by insulation co-ordination? How are the protective devices chosen for optimal insulation level in a power system?	**07**
		OR	
Q.5	**(a)**	How to measure radio interference?	**03**
	(b)	Enlist the high voltage test on cables. Describe any one in brief	**04**
	(c)	Enlist the high voltage tests to be performed on power transformer and explain any one in detail with relevant sketch	**07**

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