Enrolment No./Seat No_____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE- SEMESTER–VII (NEW) EXAMINATION – WINTER 2024

Subject Code:3170917 Date:30-11-2024

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.**

			MARKS
Q.1	**(a)**	Why is the breakdown strength higher in electronegative gases than in other gases?	**03**
	(b)	Obtain current growth equation due to Townsend's first and second ionization coefficients.	**04**
	(c)	What are the mechanisms by which lightning strokes develop and induce over voltages on overhead power lines?	**07**
Q.2	**(a)**	Explain suspended particle theory related to liquid breakdown.	**03**
	(b)	What are the commercial liquids? Explain purification test cell system related to liquids.	**04**
	(c)	Explain corona discharge. What are different factor affecting Corona losses? How Corona loss can be eliminated?	**07**
		OR	
	(c)	What is paschen's law? Explain minimum voltage for breakdown under a given pd condition.	**07**
Q.3	**(a)**	Explain Metal Oxide Arrestor.	**03**
	(b)	Explain generating voltmeters used for measuring high voltage.	**04**
	(c)	Describe the working of a Van de Graff generator with a neat sketch.	**07**
		OR	
Q.3	**(a)**	What is surge arrester? Explain it's application in power system.	**03**
	(b)	Discuss the method of balanced detection for locating partial discharges in electrical equipments.	**04**
	(c)	Explain cascade transformer unit with isolating transformer for high alternating voltage generation.	**07**
Q.4	**(a)**	Explain how a sphere gap can be used to measure the peak value of voltages.	**03**
	(b)	List out the common test facilities available in High Voltage Lab.	**04**
	(c)	A 12 stage impulse generator has 0.126μF capacitors. The wave front and wave tail resistances connected are 800Ω and 5000Ω respectively. If the load capacitor is 1000pF, find the front and tail times of the impulse wave produced.	**07**
		OR	
Q.4	**(a)**	Explain Trigatron gap.	**03**
	(b)	Enlist factors affecting ionization process and state processes responsible for gaseous breakdown.	**04**
	(c)	Discuss the modified Marx circuit for generating an impulse wave and components used in it.	**07**
Q.5	**(a)**	Discuss power frequency tests of insulator.	**03**
	(b)	What is Finite Element Method? Brief it for solving the field problems	**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)** Discuss Hall effect in Hall generator. **03**

(b) Give comparison between uniform and non-uniform field. **04**

(c) A steady current of 600μA flows through the plane electrodes separated by a distance of 0.5cm when a voltage of 10kV is applied. Determine the Townsend's first ionization constant if a current of 60μA flows when the distance of separation is reduced to 0.1cm and the field is kept constant at previous value. **07**

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