Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE – SEMESTER- VII EXAMINATION-SUMMER 2023

Subject Code: 3170917 Date: 26/06/2023

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)**	What is time-lag? Discuss its components	**03**
	(b)	Discuss the factors which affects the components of time lag.	**04**
	(c)	What is Finite Element Method for evaluation of field distribution? Discuss the procedure associated with this method and discuss its advantages and limitations.	**07**
Q.2	**(a)**	Define Townsend's first and second ionization coefficients	**03**
	(b)	Explain the Townsends criterion for a spark.	**04**
	(c)	Discuss various criteria suggested by researchers for transition from avalanche to streamer.	**07**
		OR	
Q.2	**(c)**	State and explain Paschen's law. Derive expression for $(pd)_{min}$ and Vb_{min}. Assume A = 12, B = 365 and $\gamma = 0.02$ for air. Determine $(pd)_{min}$ and Vb_{min}.	**07**
Q.3	**(a)**	Discuss its advantages and disadvantages of series parallel resonant circuit.	**03**
	(b)	Compare the performance of half wave rectifier and voltage doubler circuits for generation of high d.c. voltages.	**04**
	(c)	Explain with neat sketches Cockroft-Walton voltage multiplier circuit. Explain clearly its operation when the circuit is (i) unloaded (ii) loaded.	
		OR	
Q.3	**(a)**	Define the terms (i) Impulse voltages; (ii) Chopped wave; (iii) Impulse flash over voltage	**03**
	(b)	Draw two simplified impulse generator circuits.	**04**
	(c)	Describe the construction, principle of operation and application of a multistage Marx's Surge Generator	**07**
Q.4	**(a)**	What are the requirements of a sphere gap for measurement of high voltages?	**03**
	(b)	Discuss the disadvantages of sphere gap for measurements of high voltages.	**04**
	(c)	Explain with neat diagram how rod gaps can be used for measurement of high voltages. Compare its performance with a sphere gap.	**07**
		OR	
Q.4	**(a)**	Draw a simplified equivalent circuit of a resistance potential divider.	**03**
	(b)	What are the problems associated with measurement of very high impulse voltages?	**04**
	(c)	Discuss and compare the performance of (i) resistance (ii) capacitance potential dividers for measurement of impulse voltages.	**07**

Q.5	**(a)**	What are partial discharges? Differentiate between internal and external discharges.	**03**
	(b)	Write a short note on the cable sample preparation before it is subjected to various tests.	**04**
	(c)	Describe various tests to be carried out on a circuit breaker.	**07**

OR

Q.5	**(a)**	Explain clearly how the rating of a lightning arrester is selected.	**03**
	(b)	What are BILS? Explain their significance in power system studies.	**04**
	(c)	Draw a neat diagram of high voltage Schering bridge and analyse it for balanced condition. Draw its phasor diagram. Assume (i) Series equivalent (ii) Parallel equivalent representation of the insulating material.	**07**