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GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–VI (NEW) - EXAMINATION – SUMMER 2017

Subject Code: 2160904 **Date: 05/05/2017**

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.**

MARKS

Q.1 **Short Question OR Multiple Choice Questions** **14**

1. Which of following gas is a electronegative gas?
(a) Air (b) O_2 (c) SF_6 (d) Both O_2 and SF_6

2. State expression for Paschen's Law.

3. Ionization coefficient α ,γ are function of
(a) applied voltage (b) Pressure and Temperature
(c) electric field (d) ratio of electric field to pressure

4. For a 1cm gap in air at 760 mm pressure and 20°C temperature, the breakdown voltage is
(a) 24 KV (b) 30.3 KV (c) 22.92 KV (d) 40 KV

5. The process of ionization brought about by
(a) positive ion only (b) photon only
(c) metastable particle (d) all of above

6. The breakdown duo to internal discharges develops
(a) in milliseconds (b) in few seconds
(c) over a long duration of several days (d) all of above

7. A trigetron gap is used with
(a)cascade transformer unit (b) impulse current generator
(c) impulse voltage generator (d) dc voltage doubler unit

8. In testing with a resonant transformer, the output voltage is
(a) rectangular wave (b) triangular wave
(c) trapezoidal wave (d) pure sine wave

9. A generating voltmeter is used to measure
(a) dc voltages (b) ac voltages
(c) impulse voltages (d) high-frequency ac voltages

10. Compensated capacitance divider for high voltage (1MV) generally has a bandwidth of (a) 100 MHz (b) 1 MHz
(c) 10 MHz (d) 1000 MHz

11. The peak value of lightning stroke currents are of order of
(a) 100 A (b) 1000 A (c) 10 to 100 KA (d) 10^6 A

12. The equivalent circuit of a lossy capacitor or dielectric is
(a) R-C series circuit (b) L-C series circuit
(c) R-C parallel circuit (d) L-C parallel circuit

13. Most important tests conducted on isolators and circuit breaker are
(a) voltage withstand tests (b) short circuit tests
(c) high current test (d) temperature rise tests

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14. Fault location in an HV cable is done by
(a) Voltage withstand tests (b) partial discharge scanning tests (c) life test (d) impulse testing

Q.2	**(a)**	Explain Tesla coil with its circuit & Waveform	**03**
	(b)	Differentiate between Marx & modified Marx circuit for multistage impulse generators with circuit.	**04**
	(c)	A 10 stage Cockcroft-Walton circuit has all capacitors of 0.06 μF. The secondary voltage of the supply transformer is100 KV at a frequency of 150Hz.If the load current is 1mA, determine: (1) percentage voltage regulation.(2) The ripple (c) The optimum number of stages for maximum output voltage.	**07**
		OR	
	(c)	Explain with neat diagram the principle & construction of of an electrostatic voltmeter.	**07**
Q.3	**(a)**	Explain advantages and disadvantages of capacitance voltage Transformer with equivalent circuit	**03**
	(b)	Discuss how to measure ac voltage using sphere gap.	**04**
	(c)	A steady current of 600 μA flows through the plane electrodes separated by a distance of 0.5 cm when a voltage of 10 KV is applied. Determine the Townsend's first ionization coefficient if a current of 60 μA flows when the distance of separation is reduced to 0.1 cm and the field is kept constant at previous value.	**07**
		OR	
Q.3	**(a)**	Explain breakdown test for Transformer oil.	**03**
	(b)	What is stressed oil volume theory ? How does it explain breakdown in large volumes of commercial liquid dielectrics?	**04**
	(c)	Explain solid breakdown due to treeing & tracking.	**07**
Q.4	**(a)**	Explain Thermal breakdown in solid dielectrics	**03**
	(b)	Give comparison between uniform and non-uniform field.	**04**
	(c)	Explain corona discharge. What are different factor affecting Corona losses. How Corona loss can be eliminated?	**07**
		OR	
Q.4	**(a)**	Define and explain the terms: Statistical time lag, formative time lag, total time.	**03**
	(b)	Discuss Measurement of Dielectric constant and loss tangent of capacitor.	**04**
	(c)	Explain High voltage Schering bridge for tan δ and capacitance measurement of Insulators.	**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)	Give classification of high voltage laboratory.	**07**
		OR	
Q.5	**(a)**	Write a comprehensive note on metal oxide arrestors.	**03**
	(b)	Discuss origin of switching surges and its characteristics.	**04**
	(c)	Explain the partial discharge tests for cables.	**07**

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