Reg. No.															

Question Paper Code	13519

B.E. / B.Tech. - DEGREE EXAMINATIONS, APRIL / MAY 2025

Sixth Semester

Electrical and Electronics Engineering

20EEEL602 - HIGH VOLTAGE ENGINEERING

Regulations - 2020

Duration: 3 Hours | Max. Marks: 100

PART - A (MCQ) (10 × 1 = 10 Marks)

Answer ALL Questions

		Marks	K – Level	CO
1.	The main effect of corona in power transmission lines is (a) Increased insulation strength (b) Decrease in voltage (c) Power loss and radio interference (d) Increase in conductor resistance	1	K1	CO1
2.	A traveling wave hits a junction between two transmission lines of different surge impedances. To minimize reflections, what should be done? (a) Terminate with a high resistance (b) Match surge impedances of the lines (c) Short the junction (d) Insert a capacitor at the junction	1	K2	CO1
3.	In a uniform electric field, the breakdown in gases follows which mechanism? (a) Corona discharge (b) Streamer mechanism (c) Townsend avalanche mechanism (d) Thermal ionization	1	K1	CO2
4.	Which impurity has the most significant effect on breakdown strength of liquid dielectrics? (a) Salt (b) Dissolved oxygen (c) Moisture (water content) (d) Hydrocarbons	1	K1	CO2
5.	One of the main limitations of the Van de Graaff generator in power applications is (a) Its heavy weight (b) Low voltage capacity (c) Low current output (d) Need for high frequency	1	K1	CO3
6.	The primary purpose of using cascaded transformers is _____ (a) To increase current output (b) To reduce core losses (c) To generate very high AC voltages (d) To reduce harmonics	1	K1	CO3
7.	A high resistance connected in series with an ammeter is typically used to measure _____. (a) High impulse currents (b) Low-frequency harmonics (c) High DC voltages (d) Peak values of AC voltages	1	K1	CO4
8.	A generating voltmeter is primarily used to measure (a) Very low DC voltages (b) Very high DC voltages without drawing current (c) High-frequency AC voltages (d) Harmonic content in DC voltage	1	K1	CO4
9.	The standard which is primarily used for high voltage testing of electrical equipment in India is (a) IEC 60060 (b) IS 2071 (c) IEEE 100 (d) ANSI C84.1	1	K1	CO5
10.	The main objective of the insulation coordination process in high voltage systems is (a) To ensure the equipment operates with minimum energy loss (b) To coordinate the insulation levels to withstand the expected surge voltages (c) To balance the operational temperature of equipment (d) To synchronize the operating frequencies of various equipment	1	K1	CO5

PART - B (12 × 2 = 24 Marks)

Answer ALL Questions

		Marks	K – Level	CO
11.	Identify protective devices used to protect power system equipment against lightning.	2	K2	CO1
12.	Define the term Corona Critical Disruptive Voltage.	2	K1	CO1
13.	Classify the lightning strokes.	2	K2	CO1
14.	Write the properties of composite dielectrics.	2	K1	CO2
15.	Define Townsend's first ionization coefficient.	2	K1	CO2
16.	Enumerate the factors which affect breakdown of gaseous dielectrics.	2	K2	CO2

17.	Mention the advantages of Vande-Graff generator.		*2*	*K1*	*CO3*
18.	Draw the impulse voltage waveform with its specifications.		*2*	*K2*	*CO3*
19.	What type of measuring devices preferred for measurement of high frequency impulse current?		*2*	*K1*	*CO4*
20.	Point out the reason for capacitance voltage dividers being preferred for high AC voltage measurements.		*2*	*K2*	*CO4*
21.	Write the atmospheric conditions for HV testing as per the Indian Standard.		*2*	*K1*	*CO5*
22.	Distinguish between flash over and puncture.		*2*	*K2*	*CO5*

PART - C (6 × 11 = 66 Marks)

Answer ALL Questions

23.	a)	Frequent switching surges during capacitor bank operations in a substation is a major issue. Examine the cause of these temporary over voltages and suggest ways to suppress them.	*11*	*K2*	*CO1*
		OR			
	b)	A 220 kV transmission line is struck by lightning. Analyze the possible consequences on the system and propose suitable protection schemes.	*11*	*K2*	*CO1*
24.	a)	A high voltage laboratory is testing new transformer oil under AC conditions. Apply your understanding to outline and explain the breakdown mechanisms in both pure and commercial insulating liquids.	*11*	*K2*	*CO2*
		OR			
	b)	A Gas Insulated Substation system using vacuum insulation experiences failure during switching operations. Describe the mechanism of vacuum breakdown and apply your knowledge to suggest how electrode surface finish and material selection can improve the reliability and performance of the system.	*11*	*K2*	*CO2*
25.	a)	A 1.2/50 μs standard lightning impulse voltage is required for testing insulator strings. Illustrate the working of a multistage impulse generator and explain how triggering and synchronization are achieved.	*11*	*K2*	*CO3*
		OR			
	b)	Explain with neat circuit, the generation of high DC voltages using an n-stage Cockroft-Walton circuit. Derive an expression for the total ripple content in the output voltage.	*11*	*K2*	*CO3*
26.	a)	It is required to measure the RMS value of a high voltage accurately. Analyze and compare the use of electrostatic voltmeters and capacitance voltage transformers for this purpose. Evaluate the limitations of each method.	*11*	*K2*	*CO4*
		OR			
	b)	Analyze the working of sphere gaps as a voltage measuring device and evaluate the factors influencing the measurement	*11*	*K2*	*CO4*
27.	a)	Explain the method of impulse testing of high voltage transformers. Mention the procedure adopted for locating the failure.	*11*	*K2*	*CO5*
		OR			
	b)	Discuss the different aspects of insulation design and insulation coordination adopted for EHV systems.	*11*	*K2*	*CO5*
28.	a) i)	Analyze the suitability of mixed voltage divider circuit for impulse voltage measurements.	*6*	*K2*	*CO4*
	ii)	Explain the procedure to perform DC voltage testing on a bushing.	5	*K2*	*CO5*
		OR			
	b) i)	Write short notes on digital techniques employed in high voltage measurement.	*6*	*K2*	*CO4*
	ii)	In a high voltage laboratory, both routine and type tests are scheduled for a 33 kV insulator. Describe the differences between these tests.	5	*K2*	*CO5*