Reg No.:_____ Name:_____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

Fifth semester B.Tech degree examinations (S) September 2020

Course Code:EE369

Course Name: HIGH VOLTAGE ENGINEERING

Max. Marks: 100 Duration: 3 Hours

PART A

Answer all questions, each carries 5 marks. Marks

1		Using the first principles, explain the operation of a Van de Graff generator.	(5)
2		Outline the principle of operation of a resonant transformer?	(5)
3		Sketch the circuit for (i) switching impulse voltage of short duration (ii) switching impulse voltage of long duration.	(5)
4		Explain two methods of measuring impulse current.	(5)
5		Explain the method of measuring the RIV in a power apparatus.	(5)
6		Define the following terms:- Partial discharge, Discharge inception voltage, Discharge extinction voltage, Discharge magnitude, Quadratic rate.	(5)
7		Write a note on the classification of High voltage laboratory.	(5)
8		Explain one power frequency test and one impulse voltage test on Bushings	(5)

PART B

Answer any two full questions, each carries 10 marks.

9	a)	Deduce the expression for ripple voltage and voltage regulation in a Cockcroft Walton voltage multiplier circuit.	(6)
	b)	Determine the % ripple voltage of a 8 stage cockroft Walton voltage multiplier circuit having a stage capacitance of 0.05micro F. The supply voltage is 125kV at a frequency of 150Hz and a load current of 1.5 mA. Also find the optimum number of stages and maximum output voltage.	(4)
10	a)	State why a cascade transformer is used in HV AC power frequency testing. Elucidate the working of a 3-stage cascade transformer with a neat sketch. Label the power rating of the various stages of the transformer in the above circuit.	(6)
	b)	Derive the equivalent impedance expression for the cascade transformer.	(4)
11	a)	How are high frequency, high ac voltages with damped oscillations produced? State its application.	(5)
	b)	A cable test unit is required to test cables at 500kV. The testing transformer	(5)

available is 400V/250kV, 100kVA with 2.5% resistance and 6% reactance. Determine the inductance required for resonant testing and input voltage to the testing transformer. Assume the resistance of the inductor and leads to be 2%. Neglect dielectric loss of cable.

PART C

Answer any two full questions, each carries 10 marks.

12 a) Explain with a schematic operation of a Marx impulse generator used for producing high impulse voltage. (6)

b) An Impulse generator is used to carry out test on a transformer. Explain the effect of following parameters on its performance (4)

(1) Ratio of Generator and Load capacitance

(2) effect of circuit inductance and series resistance.

13 a) Sketch and Analyse the RC circuit representation of impulse generator. Derive the conditions for realisation of wave front and wave tail resistance. (7)

b) Explain the method of generating impulse current for testing purpose. (3)

14 a) 'In the context of Sustainable Engineering practice, there is a high concern about the 'DC and AC electric fields' on account of their biological and ecological effects and possible shock hazards'. State the principle by which you can measure the above mentioned electric fields? (5)

b) Explain the principle and construction of an Electrostatic Voltmeter for very high voltages. What are its merits and demerits for high voltage ac measurements? (5)

PART D

Answer any two full questions, each carries 10 marks.

15 a) A Partial Discharge test is done on a cable using the straight detector method. Outline the methodology used and explain the possible test outcomes which can be viewed on the oscilloscope. (7)

b) Explain the calibration procedure in a Partial discharge detector. (3)

16 a) Explain the procedure of impulse testing on HV transformer. What is the procedure adopted for locating the failure. (7)

b) Sketch the layout of UHV laboratory (3)

17 a) State the modifications to be made in Schering bridge for following conditions. (4)

(1) with High dissipation factor test objects (2) One end of test object to be grounded

b) A Schering-bridge was used to determine the dielectric constant and loss of a 1mm thick Bakelite sheet at 50 Hz using a parallel plate electrode configuration. The (6)

electrode effective area is 100 sq. Cm. At balance, the bridge arms are A1-test object, A2- standard capacitor of 100pF, A3-variable capacitor of 50nF in parallel with resistor of (1000/pi) ohms, A4- variable resistance of 62 ohm.

Determine the Dielectric constant and Loss factor.

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