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P.E.S. College of Engineering, Mandya - 571 401

(An Autonomous Institution affiliated to VTU, Belagavi)

Seventh Semester, B.E. - Electrical and Electronics Engineering

Semester End Examination; Jan. / Feb. - 2021

High Voltage Engineering

Time: 3 hrs *Max. Marks: 100*

***Note**: Answer **FIVE** full questions, selecting **ONE** full question from each unit.*

UNIT - I

1 a.	Discuss the need for generation of high voltages in laboratory and mention the applications of high voltages in laboratory.	8
b.	Derive an expression for growth of current in gaseous medium under uniform field condition assuming both Townsend's first and second ionization process to be in progress.	8
c.	Discuss the time lag of breakdown in gas discharge.	4
2 a.	Explain Streamer's theory of breakdown in gas medium under uniform field conditions.	8
b.	Explain Bubbles theory of breakdown in liquid dielectrics.	6
c.	Explain breakdown due to internal discharges in solid dielectrics.	6

UNIT - II

3 a.	Explain with neat sketch, three stage cascade connection of transformer for producing HVAC.	10
b.	Device an expression for ripple voltage and regulation using Cockroft-Walton voltage multiplier circuit.	10
4 a.	What is Tesla coil? How is damped high frequency oscillations obtained from a Tesla coil?	8
b.	A ten stage Cockroft-Walton circuit has all capacitors of 0.06 μF. The secondary voltage of the supply transformer is 100 kV at a frequency of 150 Hz. If the load current is 1 mA, determine; i) Voltage drop ii) Ripple voltage iii) Optimum number of stages	8
c.	Mention the advantages of Resonant transformers.	4

UNIT - III

5 a.	Define; i) Standard lightening impulse voltage wave ii) Standard switching impulse voltage wave	10
b.	With a neat sketch, explain the working of four stage Marx's impulse generator circuit and also explain the components of multistage impulse generator.	10
6 a.	An impulse generator has eight stages with each condenser rated for 0.16 μF and at 125 kV. The load capacitance available is 1000 pF. Find the series resistance and damping resistance needed to produce 1.2/50 μs impulse wave. What is the maximum output voltage of the generator, if the charging voltage is 120 kV?	7

Contd….2

b. Explain Trigatron gap method for triggering an impulse generator. 6

c. Describe the method of generation of impulse currents. Derive the related mathematical formulae. How are the capacitors arranged in such circuits? 7

UNIT - IV

7 a. With a neat sketch, explain the construction and working principle of an electro static voltmeter employed for measurement of high AC voltages. 10

b. List the chief sources of errors in potential dividers for impulse voltage measurements. Describe the method of measurement of impulse voltages using potential dividers. 10

8 a. Explain the working principle of series capacitor peak voltmeter based on Chubb-Frotscue method. 8

b. Explain the various factors that affect spark over voltage of sphere gap. 8

c. A generating voltmeter has to be designed so that it can have a range from 20 to 200 kV DC. If the indicating meter reads a minimum current of 2 μA and maximum current of 25 μA, what should be the capacitance of generating voltmeter? Assume driving motor Synchronous speed as 1500 rpm. 4

UNIT - V

9 a. Briefly explain the factors affecting the discharge detection. 5

b. What are the partial discharges? Explain the straight detection method principle for discharge detection. 10

c. A Schering bridge was used to measure the capacitance and loss angle of a HV bushing. At balance, the observations were;

The value of the standard condenser = 100 pF, R_3 = 3180 Ω, C_3 = 0.00125 Micro F and R_4 = 636 Ω. What are the values of capacitance and tan delta of the bushing? 5

10 a. Explain the high voltage Schering bridge used for capacitance and loss tangent measurements. 10

b. Discuss the various tests conducted on insulators. 10

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