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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; Dec - 2017/Jan - 2018
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.	Explain the need for generation of high voltages in laboratory.	5
b.	Derive an expression for growth of current in gaseous medium under uniform field conditions assuming both Townsend's first and second ionisation process to be in progress.	10
c.	Write a note on time lags for breakdown.	5
2 a.	Bring out the limitations of Townsend's theory of breakdown of gases. Explain how streamer theory addresses the above limitations?	8
b.	Explain suspended particle theory and bubble theory in the context of liquid dielectric breakdown.	6
c.	Explain electromechanical and thermal breakdown of solid dielectrics.	6

UNIT - II

3 a.	With a neat sketch, explain three stage cascade connection of transformer for producing HVAC.	8
b.	A Cockroft-walton type voltage multiplier has eight stages with capacitances all equal to 0.05 µF. The supply transformer secondary voltage is 125 kV at a frequency of 150 Hz. If the load current to be supplied is 5mA. Find;	6
	i) Percentage Ripple	
	ii) Regulation	
	iii) Optimum number of stages for minimum regulation.	
c.	Explain voltage doubler circuit to generate HVDC.	6
4 a.	With a neat diagram, describe Tesla coil with its equivalent circuit and output waveforms. Show that $V_2 = V_1 \sqrt{\eta \dfrac{C_1}{C_2}}$	10
b.	Explain the working of series resonant transformer for the generation of high AC voltages. Mention their advantages and disadvantages.	10

UNIT - III

5 a.	Define: i) Standard lightening impulse voltage wave	8
	ii) Standard lightening impulse current wave.	

b. Explain how impulse voltages are generated in a laboratory using MARX circuit? 8

c. A 12 stage impulse generator has 0.126 µF capacitors. The wave front and the wave tail resistances connected are 800 Ω and 5000 Ω respectively. If the load capacitor is 1000 pF. Find front and tail times of the impulse wave produced. 4

6 a. Explain :

i) Three electrode gap method 8

ii) Trigatron gap method of tripping impulse generators.

b. An impulse generator has 8 stages with each condenser rated for 0.16 µF at 125 kV. The load capacitor available is 1000 pF. Find the series resistance and the 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? 6

c. Write a note on impulse current generators. 6

UNIT - IV

7 a. With a neat sketch, explain the construction and working of electrostatic voltmeter. Mention the advantages and disadvantages. 10

b. Explain the factors which will affect the breakdown voltage while measuring high voltage using sphere gap. 10

8 a. Explain the working principle of series capacitor peak voltmeter based on chubb-frotescue method. 5

b. Write a note on :

i) Capacitances voltage dividers for fast rising voltages

ii) Potential dividers for impulse voltage measurements 15

iii) Magnetic links for measurement of high impulse currents.

UNIT - V

9 a. What are partial discharges? With neat sketch, explain the principle of pulse current measurement of partial discharges using straight detectors. 12

b. Explain synthetic testing of circuit breakers. 8

10 a. Explain the method of measurement of capacitance and tan δ using high voltage Schering bridge. 10

b. Explain :

i) Power frequency tests conducted on insulators 10

ii) High voltage test conducted on cables.

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