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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. - 2019

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. Mention important applications of high voltages. 5

b. Explain the Streamer theory of breakdown in air at atmospheric pressure. 10

c. Explain Electromechanical breakdown in solid dielectrics. 5

2 a. Explain the need for generating high voltages in laboratory. 5

b. Explain the primary and secondary ionization processes in gases. Also derive the Townsend's criterion for breakdown. 10

c. Explain the Bubble's theory for breakdown in liquids. 5

UNIT - II

3 a. With a neat sketch, explain the cascade connection of transformers for generating high voltage AC. 10

b. Determine the ripple voltage and regulation of a 10 stage Cockcroft-Walton type DC voltage multiplier circuit having a stage capacitance = 0.01 μF, supply voltage 100 kV peak at a frequency of 400 Hz and a load current = 5 mA. 5

c. Explain the voltage doubler circuit for generating HVDC. 5

4 a. With a neat circuit diagram, explain the working of Cockcroft-Walton type voltage multiplier circuit for generating HVDC. Also Derive the expression for ripple. 10

b. A 100 kVA, 400 V/ 250 kV testing transformer has 8% leakage reactance and 2% resistance on 100 kVA lease, A cable has to be tested at 500 kV using the above transformer as a resonant transformer at 50 Hz. If the charging current of the cable at 500 kV is 0.4 A, find the series inductance required. 6

c. Explain the advantages of cascade connection of transformer for generating HVAC. 4

UNIT - III

5 a. Explain MARX circuit arrangement for multistage impulse generators. How is the basic arrangement modified to accommodate the wave time control resistances? 10

b. A 10 stage Impulse generator has 0.250 μF condensers. The wave front and wave tail resistances are 75 Ω and 2600 Ω respectively. If the load capacitance is 2.5 nF, determine the wave front and wave tail times of the impulse wave. 4

c. Explain Trigatron gap method of tripping impulse generators. 6

Contd…2

6 a. Derive an expression for output voltage of a single stage impulse generator. 10

b. An impulse current generator has a total capacitance of 8 μF. The charging voltage is 25 kV, if the generator has to give an output current of 10 kA with in 8/20 μs waveform, calculate; 5

i) The circuit inductance

ii) The dynamic resistance in the circuit

c. Explain any one method of generating switching impulse voltage. 5

UNIT - IV

7 a. Discuss the effect of; 10

i) Nearby earthed objects ii) Humidity

iii) Atmospheric pressure and temperature on the measurements using sphere gaps

b. Explain the Chubb-Frotescve method for HVAC measurement. 6

c. An absolute electrostatic volt meter has a movable circular plate 8 cm in diameter. If the distance between the plates during a measurement is 4 mm, determine the potential difference when the force of attraction is 0.2 gm. wt. 4

8 a. Explain with a neat diagram the principle, construction and operation of electrostatic voltmeter 10

b. 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 the capacitance of the generating voltmeter be? 5

c. Explain the measurement of surge current measurement using Klydono graph. 5

UNIT - V

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

b. Explain the different power frequency tests conducted on insulators. 10

10 a. Explain the method of impulse testing of high voltage transformers. How is fault in the insulation located in this test? 12

b. Explain the basic principle of PD measurement using straight detector method. 8

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