



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

(An Autonomous Institution affiliated to VTU, Belgaum)

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

Semester End Examination; Dec. - 2015

High Voltage Engineering

Time: 3 hrs

Max. Marks: 100

Note: Answer any *FIVE* full questions, selecting at least *TWO* full questions from each *part*.

PART - A

- 1 a. Discuss the need for generation of high voltages in laboratory. 5
- 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. 10
- c. Discuss breakdown phenomena in electro negative gases. 5
- 2 a. What is Paschen's law? Discuss the effect of breakdown voltage over a wide range for the product of pressure and gap spacing. 10
- b. Explain suspended particle theory of breakdown in liquid dielectrics. 5
- c. Explain thermal breakdown phenomena in solid dielectrics. 5
- 3 a. Explain how HVAC can be generated using Tesla coil. 5
- b. Explain with neat sketch three stage cascade connection of transformer for producing HVAC. 10
- c. A 100 kVA, 400 V/250 kV testing transformer has 8% leakage reactance and 2% resistance on 100 kVA base. 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. 5
- 4 a. Explain photo ionization phenomena in gas discharges. 6
- b. Explain principle of operation of voltage doubler circuit to generate HVDC. 8
- c. A Cockcroft – Walton type voltage multiplier has eight stages with capacitances all equal to 0.05 μ F. The supply transformer secondary voltage is 125 kV at a frequency of 150 Hz. If the load current to be supplied is 5 mA, find; 6
 - (i) The percentage ripple
 - (ii) The regulation
 - (iii) The optimum number of stages for minimum regulation.

PART - B

- 5 a. Compare standard lightning impulse voltage with standard switching voltage. 5
- b. Explain the construction and principle of operation of five stage marx impulse generator. 10
- c. An Impulse current generator has a total capacitance of 8 μ F. The charging voltage is 25 kV. If the generator has to give an output current of 10 kA with 8/20 μ s wave form, Calculate: 5
 - (i) The circuit inductance
 - (ii) The dynamic resistance in the circuit.

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| 6 a. | Explain three electrode methods for triggering an impulse generator. | 10 |
| b. | Explain the construction and principle of operation of an electro static voltmeter for measuring HVAC. | 10 |
| 7 a. | Explain how sphere gap method is used to measure HVDC. | 5 |
| b. | Explain how capacitance dividers are used to measure Impulse voltages. | 10 |
| c. | Explain how surge current measurements are made using klydonograph. | 5 |
| 8 a. | Explain the high voltage Schering bridge used for capacitance and loss tangent measurements. | 8 |
| b. | Explain the basic principle of PD measurement using straight detector method. | 8 |
| c. | Discuss the various tests conducted on Insulators. | 4 |

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