

Code No: 07A70206

R07**Set No. 2**

IV B.Tech I Semester Examinations, December 2011
HIGH VOLTAGE ENGINEERING
Electrical And Electronics Engineering

Time: 3 hours**Max Marks: 80**

Answer any FIVE Questions
All Questions carry equal marks

1. (a) Define "Complex permittivity". What are the factors that govern the quantities "relative permittivity" and "loss factor"?
(b) Explain how the volume resistivity of a solid dielectric is determined? [8+8]
2. What is a surge arrester? Explain its function as a shunt protective device? [16]
3. Explain the special features and applications of Epoxy resin solid insulation. [16]
4. (a) Draw a typical impulse current generator circuit and explain its operation and application.
(b) A 10-Stage impulse generator has $0.250 \mu\text{F}$ condensers. The wave front and wave tail resistances are 75 ohms and 2600 ohms respectively. If the load capacitance is 2.5 nF, determine the wave front and wave tail times of the impulse wave. [8+8]
5. Derive an expression for current growth in gaseous medium due to primary and secondary ionization processes of Townsend's mechanism. [16]
6. Discuss in detail about the features and properties of liquid dielectrics. [16]
7. Explain the importance of radio interference voltage (RIV) measurements for EHV power apparatus. Explain with a schematic diagram one method of measuring RIV of Transmission line hardware? [16]
8. (a) What are the conditions to be satisfied by a potential divider to be used for impulse work?
(b) Give the schematic arrangement of an impulse potential divider with an oscilloscope connected for measuring impulse voltages. Explain the arrangement used to minimize the errors? [8+8]

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R07**Set No. 4**

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Time: 3 hours**Max Marks: 80**

Answer any FIVE Questions
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1. Explain various secondary ionization processes of Townsend's mechanism. Derive an expression for current growth due to these processes. [16]
2. (a) How is the circuit inductance minimized and controlled in impulse current generators.
(b) A 8-stage impulse generator has 0.12 pF capacitors rated for 167 kV. What is its maximum discharging capacity? [8+8]
3. What are treeing and tracking? Explain clearly the two processes in solid dielectrics. [16]
4. (a) Explain the different theories of charge formation in clouds?
(b) What are the mechanisms by which lightning strokes develop and induce over voltages on overhead power lines? [8+8]
5. Discuss the applications of gases and gaseous mixtures as insulating medium in high voltage switchgear. [16]
6. Briefly explain how partial discharges in an insulation system or equipment can be detected and displayed. [16]
7. (a) What are the different types of resistive shunts used for impulse current measurements? Discuss their characteristics and limitations.
(b) Explain the necessity of earthing and shielding arrangements to impulse measurements and to high voltage laboratories [8+8]
8. Explain the partial discharge tests on high voltage cables. How is a fault in the insulation located in this test? [16]

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R07**Set No. 1**

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Answer any FIVE Questions
All Questions carry equal marks

1. Explain briefly the algorithm of charge simulation method for estimating the potential distribution. [16]
2. Define Townsend's first and second ionization coefficients. Explain the Townsend's criterion for a spark breakdown. [8+8]
3. (a) Why are capacitance voltage dividers preferred for high AC voltage measurements?
(b) Explain series impedance voltmeters and series capacitance voltmeters for measurement of AC voltages? [8+8]
4. Explain the high voltage Schering bridge for the $\tan \delta$ and capacitance measurement of insulators (or) bushings? [16]
5. (a) What are the mechanisms that lead to intrinsic breakdown of a solid?
(b) Explain about the treeing in solid insulating materials. [8+8]
6. Explain the importance of switching over voltages in EHV power systems. How is protection against over voltages achieved? [16]
7. (a) Draw a neat diagram of high impulse current generator circuit (equivalent circuit) and through analysis of the circuit show how the wave form can be controlled.
(b) A 250 KVA, 230 V / 250 kV testing transformer having a resistance and leakage reactance of 1.5% and 6% respectively is to be used as a resonant transformer at 50 Hz to test a piece of cable at 500 kV. Neglecting the dielectric loss of the cable, determine the series inductance required if the load capacitance is $0.008 \mu\text{F}$. What will be the input voltage power to be fed to the transformer if the inductor coil is assumed to have 2% resistance, based on the rating of the transformer? Neglect the magnetizing current and core losses of the transformer. [8+8]
8. (a) What are the significance of power factor tests and partial discharge tests on bushings? How are they conducted in the laboratory?
(b) Explain the partial discharge tests on high voltage cables? [8+8]

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R07**Set No. 3**

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Electrical And Electronics Engineering

Time: 3 hours

Max Marks: 80

Answer any FIVE Questions
 All Questions carry equal marks

1. Explain the principle and construction of an electro static voltmeter for very high voltages. What are its merits and demerits for high voltage AC measurements? [16]
2. Discuss about the breakdown mechanisms of solid insulation that occur after prolonged operation. [16]
3. What is non destructive testing of insulating materials? Give very briefly the characteristics of these methods. [16]
4. Discuss the applications of solid insulating materials in high voltage dry type transformers. [16]
5. (a) Explain one method of controlled tripping of impulse generator.
 (b) A 12-stage impulse generator has $0.126 \mu\text{F}$ condensers. The wave front and wave tail resistances connected are 800 ohms and 5000 ohms respectively. If the load condenser is 1000 pF, find the front and tail times of the impulse wave produced. [8+8]
6. (a) State Pachen's law and explain about its Pachen's curve.
 (b) Derive an expression for the minimum 'pd' value of the Pachen's curve from the first principles. [8+8]
7. Explain the terms
 - (a) with stand voltage
 - (b) flash over voltage
 - (c) 50% flash over voltage
 - (d) wet and dry power frequency tests as referred to high voltage testing [16]
8. Define surge impedance of a line. Obtain the expressions for voltage and current waves at a junction or transition point? [16]
