

Code No: 07A70206

R07**Set No. 2****IV B.Tech I Semester Examinations, November 2010****HIGH VOLTAGE ENGINEERING****Electrical And Electronics Engineering****Time: 3 hours****Max Marks: 80**

Answer any FIVE Questions
All Questions carry equal marks

1. Mention the different electrical tests done on isolators and circuits breakers. [16]
2. Discuss various capacitance, potential dividers and compare their performance for measurement of impulse voltages? [16]
3. (a) Obtain the number of collision/second and the average time between two collisions, if the average velocity of the gas in the gap is 500m/s and mean free path is 10^{-7} m.
 (b) Derive the expression for collision cross-section in terms of mean free path. [8+8]
4. (a) Explain the advantages of ground wires in lightning protection to overhead lines
 (b) Comment on the rating of an arrester [10+6]
5. Briefly explain how partial discharges in an insulation system or equipment can be detected and displayed [16]
6. (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]
7. Explain the application of paper based insulation and polymeric insulation in the construction of high voltage (above 33 kV) cables. [16]
8. (a) What is thermal breakdown in solid dielectric? How is it practically more significant than other mechanisms?
 (b) A solid specimen of dielectric has a dielectric constant of 4.2, and $\tan \delta = 0.0001$ at a frequency of 50 Hz. If it is subjected to an alternating field of 50 kV/cm, calculate the heat generated in the specimen due to the dielectric loss. [8+8]

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1. Briefly explain the methods used for calibrating the partial discharge detectors [16]
2. Give the temperature classification of solid insulating materials. Why is this classification not done for liquids and gases? [16]
3. Give the mathematical models for lightning discharges and explain them. [16]
4. (a) Explain the properties and applications of Fibre solid dielectric materials used in practice in the high voltage engineering.
(b) Explain about the avalanche breakdown in solid dielectric material. [8+8]
5. Explain the procedure for testing string insulator? [16]
6. Draw chubb-fortescue circuit for measurement of peak value of AC voltages and discuss its advantages over other methods? [16]
7. Explain in detail about thermal breakdown mechanism in commercial liquids. [16]
8. (a) How are the wave front and wave tail times controlled in impulse generator circuits.
(b) An impulse generator has eight stages with each condenser rated for $0.16 \mu\text{F}$ and 125 kV. The load capacitor available is 100 pF. Find the series Resistance and damping Resistance needed to produce $1.2/50 \mu\text{s}$ impulse wave. What is the maximum output voltage of the generator, if the charging voltage is 120 kV? [8+8]

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R07**Set No. 1****IV B.Tech I Semester Examinations, November 2010****HIGH VOLTAGE ENGINEERING****Electrical And Electronics Engineering****Time: 3 hours****Max Marks: 80**

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1. Define Townsend's first and second ionization coefficients. Explain the Townsend's criterion for a spark breakdown. [8+8]
2. What is a cascaded Transformer? Explain why cascading is done? Describe with a neat diagram a three stage cascaded Transformer. [16]
3. What is a surge arrester? Explain its function as a shunt protective device? [16]
4. (a) Discuss various methods of measuring high d.c and a.c currents.
(b) Mention various methods of measuring high impulse currents. [8+8]
5. Explain with neat diagram basic principle of pulse current measurement for estimation of partial discharges? [16]
6. Discuss in detail about the features and properties of liquid dielectrics. [16]
7. (a) Describe the mechanism of short-term breakdown of composite solid insulating material.
(b) A coaxial cylindrical capacitor is to be designed with an effective length of 20 cm. The capacitor is expected to have a capacitor of 1000 pF and to operate at 150 kHz. Select a suitable insulating material and give the dimensions of the electrode. [8+8]
8. Describe the impulse current tests performed on lightning arrestors. How do you conclude that the arrester has passed the test? [16]

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1. What is non destructive testing of insulating materials? Give very briefly the characteristics of these methods. [16]
2. (a) Explain short term and long term breakdown mechanisms that occur in a composite solid dielectrics.
(b) Explain briefly about various solid dielectrics used in practice. [8+8]
3. Write short notes on:
(a) Photo-ionization
(b) Secondary ionization. [8+8]
4. Discuss and compare the performance of
(a) Resistance
(b) Capacitance potential dividers for measurement of impulse voltages? [8+8]
5. (a) Derive an expression of Ripple voltage of a multistage Cockroft-Walton circuit.
(b) A ten stage Cockroft-Walton circuit has all capacitors of $0.06 \mu\text{F}$. The secondary voltage of the supply transformer is 100 kV at frequency of 150 Hz. If the load current is 1 mA, find
 - i. the optimum number of stages for maximum output voltage
 - ii. the maximum output voltage. [8+8]
6. Discuss the applications of solid insulating materials in high voltage dry type transformers. [16]
7. Define surge impedance of a line. Obtain the expressions for voltage and current waves at a junction or transition point? [16]
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]
