R07

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

Time: 3 hours

Code No: 07A70206

Max Marks: 80

Answer any FIVE Questions All Questions carry equal marks * * * * *

- 1. (a) What are partial discharges? Differentiate between internal and external discharges?
 - (b) Develop and draw equivalent circuit of insulating material during partial discharge? [16]
- 2. Explain in detail electromechanical breakdown in solid insulating materials. [16]
- 3. (a) Explain clearly the basic principle of operation of an electrostatic generator.(b) Discuss the advantages and limitations of Van de Graaf generator. [8+8]
- 4. Explain, in detail about, suspended particle theory in commercial liquids. [16]
- 5. Discuss in detail about the features and properties of solid dielectrics and its composites. [16]
- 6. Discuss the problems associated with peak voltmeter circuits using passive elements. Draw the circuit developed by Rabus and explain how this circuit overcomes these problems?
 [16]
- 7. Derive the expressions for the voltage and current waves on long transmission lines and obtain the surge impedance of the line? [16]
- 8. Why is synthetic testing advantageous over other testing methods for short circuit tests? Give the lay out for synthetic testing [16]

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- 1. (a) What are the advantages and disadvantages of an electrostatic voltmeter when used to measure high voltages.
 - (b) What is a mixed potential divider? How is it used for impulse voltage measurements. [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. (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]
- 4. Discuss the applications of gases and gaseous mixture as insulating medium in high voltage cables. [16]
- 5. What are the different methods employed for lightning protection of over head lines? Explain any two in detail. [16]
- 6. Explain in detail the various tests to be conducted on circuit breakers? [16]
- 7. State and explain Pachen's law. Derive the expressions for $(pd)_{min}$ and $(V_b)_{min}$. Assume A=12, B=365 and γ =0.02 for air. Determine the $(pd)_{min}$ and $(V_b)_{min}$.[16]
- 8. (a) What are partial discharges and how are they detected under power frequency operating conditions?
 - (b) Discuss the method of balanced detection for locating partial discharges in electrical equipment? [8+8]

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- 1. Mention the different electrical tests done on isolators and circuits breakers. [16]
- 2. Explain in detail about the long-term breakdown in composite dielectrics. [16]
- 3. Give the mathematical models for lightning discharges and explain them. [16]
- 4. Explain briefly about the following:
 - (a) Mobility of ions and electrons
 - (b) Diffusion coefficient
 - (c) Collision cross section
 - (d) Mean free path.

[16]

- 5. Explain with neat diagram basic principle of pulse current measurement for estimation of partial discharges? [16]
- 6. Discuss and compare the performance of
 - (a) Resistance
 - (b) Capacitance potential dividers for measurement of impulse voltages? [8+8]
- 7. Write the basic equations of electric filed and electric potential in electrostatic filed and explain the numerical techniques applied to solve these equations. [16]
- 8. Give different circuits that produce impulse waves explaining clearly their relative merits and demerits. [16]

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- 1. (a) Explain clearly the basic principle of operation of an electrostatic generator.
 - (b) Discuss the advantages and limitations of Van de Graaf generator. [8+8]
- 2. Discuss the applications of modern solid insulating materials for low voltage rotating machines. [16]
- 3. (a) Explain in detail about the Townsend's secondary ionization processes.
 - (b) Explain two important conditions to be satisfied for a collision of an electron with an atom to be an ionizing one. [8+8]
- 4. (a) Explain the principle and operation of generating voltmeters for measurement of high DC voltages? Enumerate the advantages and disadvantages of the meters?
 - (b) A generating voltmeter has to be designed so that can have a range from 20 to 200kv DC. If the indicating meter reads a minimum current of 2 micro amperes and maximum current of 25 μA , what should be the capacitance of the generating voltmeter? [8+8]
- 5. Explain the operation of high voltage Schering bridge when the test specimen
 - (a) is grounded
 - (b) has high loss factor?
- 6. Explain the different electrical tests done on isolators and surge arresters? [16]
- With suitable illustrations, explain how insulation level is chosen for various equipment in a 230/132 KV substation. [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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