Code No: M0226/R07 **Set No. 1**

**IV B.Tech I Semester Supplementary Examinations, Feb/Mar 2011**
**HIGH VOLTAGE ENGINEERING**
**(Electrical & Electronic Engineering)**

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

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

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1. Indicate the solid insulation applications in:
   (a) Power cables
   (b) HV bushings
   (c) Small size rotating machines. [5+5+6]

2. The following observations were made in an experiment for determination of dielectric strength of transformer oil. Determine the power law equation. [16]

| Gap Spacing (mm) | 4 | 6 | 8 | 10 |
|---|---|---|---|---|
| Breakdown voltage (kV) | 88 | 135 | 165 | 212 |

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. Explain different schemes for cascade connection of Transformers for producing very high AC voltage. [16]

5. What are the problems associated with measuring very high impulse voltages? Explain how these can be taken care during measurments. [16]

6. Give the mathematical models for lightning discharges and explain them. [16]

7. Explain the concept of apparent charge in partial discharge measurements. Describe a simple experiment technique to measure partial discharge [16]

8. Describe the impulse current tests performed on lighting arrestors. How do you conclude that the arrester has passed the test? [16]

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Code No: M0226/R07 **Set No. 2**

**IV B.Tech I Semester Supplementary Examinations, Feb/Mar 2011**
**HIGH VOLTAGE ENGINEERING**
**(Electrical & Electronic Engineering)**

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

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

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1. Explain the applications of insulating materials in the construction of circuit breakers. [16]

2. (a) What are the various sources to get the initiatory electron? Explain why current growth in the gap of gaseous medium is not possible without an initiatory electron.
   (b) Explain breakdown mechanism in pure liquids. [8+8]

3. (a) Explain the phenomena of thermal breakdown in solid dielectrics.
   (b) Explain about the tracking in solid insulating materials. [8+8]

4. (a) Describe with a neat sketch, the working of a Van de Graaf generator
   (b) What are the factors that limit maximum voltage applied? [8+8]

5. What is capacitance voltage transformer? Explain with phasor diagram how a tuned capacitance voltage transformer can be used for voltage measurements in power systems? [16]

6. Give the mathematical models for lightning discharges and explain them. [16]

7. Explain the concept of apparent charge in partial discharge measurements. Describe a simple experiment technique to measure partial discharge [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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Code No: M0226/R07 **Set No. 3**

**IV B.Tech I Semester Supplementary Examinations, Feb/Mar 2011**
**HIGH VOLTAGE ENGINEERING**
**(Electrical & Electronic Engineering)**

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

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

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1. Discuss the applications of gases and gaseous mixture as insulating medium in high voltage cables. [16]

2. The first ionization coefficient $\alpha$, for a certain gas is given approximately by, $\alpha = 14pe^{\frac{-240p}{E}}$, where p is the gas pressure in mm of Hg and E is the electric field in V/cm. Find the pressure at which the electron multiplication is maximum. If this occurs at 3 mm of Hg, find the value of E and the multiplication obtained when the electrodes are 5 mm apart. [16]

3. What are treeing and tracking? Explain clearly the two processes in solid dielectrics. [16]

4. (a) Derive an expression for voltage efficiency of single stage impulse generator.
   (b) An impulse current generator has total capacitance of 15 $\mu$F, the charging voltage of 125 kV, the circuit inductance 2 mH and the dynamic resistance 1ohm. Find the peak current and wave shape of the wave. [8+8]

5. (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]

6. Give the mathematical models for lightning discharges and explain them. [16]

7. Explain the operation of high voltage Schering bridge when the test specimen
   (a) is grounded
   (b) has high loss factor? [8+8]

8. Mention the different electrical tests done on isolators and circuits breakers. [16]

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Code No: M0226/R07 **Set No. 4**

**IV B.Tech I Semester Supplementary Examinations, Feb/Mar 2011**
**HIGH VOLTAGE ENGINEERING**
**(Electrical & Electronic Engineering)**

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

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

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1. Discuss in detail about the features and properties of solid dielectrics and its composites. [16]

2. (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]

3. (a) Explain the properties and applications of paper and paper board solid dielectrics used in high voltage engineering.
   (b) Discuss briefly about the breakdown mechanism in composite solid dielectric materials. [8+8]

4. (a) Explain why the use of series resistant transformers are advantages over AC testing transformers.
   (b) The primary and secondary winding inductances of a Tesla coil are 0.093 H and 0.011 H respectively with a mutual inductance between the winding equal to 0.025 H. The capacitances included in the primary and secondary circuits are 1.5 $\mu$F and 18 nF. If the Tesla coil is changed through a 10 kV DC supply, find the output voltage and determine its output waveform. Neglect the winding resistance. [8+8]

5. (a) Describe the generating voltmeter used for measuring high d.c voltages. How does it compare with a potential divider for measuring high dc currents.
   (b) A generating voltmeter is to read 250kV with an indicating meter having a range of (0-20) $\mu$A Calibrated accordingly . Calculate the capacitance of the generating voltmenter when the driving motor rotates at a constant speed of 1500 Rpm [8+8]

6. Give the mathematical models for lightning discharges and explain them. [16]

7. Briefly explain the methods used for calibrating the partial discharge detectors[16]

8. Mention the different electrical tests done on isolators and circuits breakers. [16]

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