Code No: RR410209 **Set No. 1**

IV B.Tech I Semester Regular Examinations, November 2005
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. (a) Define and explain mobility of gaseous ions .
   (b) What is de-ionisation by diffusion in gases? Explain. [8+8]

2. (a) Explain with diagrams, different types of rectifier circuits for producing high d.c. voltages.
   (b) Determine the ripple voltage and regulation of a 10 stage Cockroft-walton type d.c. voltage Multiplier circuit having a stage capacitance = 0.01 μF , supply voltage = 100 KV at a frequency of 400 HZ and a Load Current = 10 mA. [8+8]

3. (a) Give different circuits that produce impulse waves.
   (b) An impulse current generator has a total capacitance of 8 μF. The charging voltage is 25 KV. If the generator has to give an output current of 10KVA with 8/20 μS wave form, calculate (a) the circuit inductance (b) the dynamic resistance in the circuit. [8+8]

4. (a) Deduce the condition for optimum number of stages of a maximum value of output Voltage is desired.
   (b) A Voltage double circuit has $c_1 = c_2 = 0.01\mu F$ and is supplied from a voltage of V=100 sin 314t k v. If the d.c. output current is to be 4mA, calculate the output voltage and ripple. [8+8]

5. (a) Explain with a neat sketch, three electrode gap requirement for high current switching.
   (b) Calculate the peak current and wave shape of the output current of the generator having the total capacitance of 53 μF. The charging voltage is 200 kv. The circuit inductance is 1.47mH, and the dynamic resistance of the test object is 0.05 ohms. [8+8]

6. Explain with a neat diagram the Principle of operation of an electrostatic voltmeter. Discuss its advantages and limitations for high voltages measurements. [16]

7. How do you measure the high frequencies and impulse currents? Explain. [16]

8. (a) Explain why the Schering Bridge is particularly suitable for measurement at high voltages and outline the precautions necessary to avoid errors.

(b) A sample of insulation is placed in one arm CD of the Schering Bridge. Under balanced the other three arms are as following: AD=109 pF, BC=100 Ω and AB=309 Ω in parallel with a loss free capacitance of 0.5 μF. Determine the capacitance equivalent series resistance and p.f. of the insulation in the arm CD. [6+10]

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Code No: RR410209 **Set No. 2**

IV B.Tech I Semester Regular Examinations, November 2005
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. (a) What is break down voltage ? Explain [4]
   (b) What are the types of electrical discharges in gases Explain. [8]
      i. Thermal ionization
      ii. Bhors Postulates [2+2]
2. What is a cascaded Transformer? Explain why cascading is done? Describe with a neat diagram a three stage cascaded Transformer. [16]
3. (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]
4. (a) How are damped high frequency oscillations obtained from a tesla coil.
   (b) Explain clearly cascaded voltage multiplier circuits for high voltage generation. [8+8]
5. (a) Draw and explain high current generator equivalent circuit.
   (b) A 6 stage impulse generator has capacitors each rated for 0.2 μF, 150 KV. The capacitance of the test specimen is 400pF. Find the maximum output voltage if the charging voltage is 110KV. [8+8]
6. (a) Give the basic circuit for measuring the peak voltage of
      i. a.c. voltage
      ii. impulse voltage

      What is the difference in measurement technique in the above two cases?
   (b) Compare the use of uniform field electrode spark gap and sphere gap for measuring peak values of voltages. [8+8]
7. What is Ragowskii Coil? Explain with a neat diagram, its principle of operation for measurement of high impulse currents. [16]
8. (a) Explain the method of impulse testing of high voltage transformers. What is the procedure adopted for locating the failure ?
   (b) Define "complex permittivity". What are the factors that govern the quantities "relative permittivity" and "loss factor" ? [8+8]

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Code No: RR410209 **Set No. 3**

IV B.Tech I Semester Regular Examinations, November 2005
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. (a) What is mean free path? Explain its importance
   (b) Discuss the principle of
      i. Photoionisation
      ii. Secondary lonisation [8+8]

2. (a) Discuss Resonant Transformers in detail.
   (b) A Cockroft-Walton type voltage multiplier has Eight stages with capacitances, all equal to $0.05\mu F$. The supply Transformer Secondary voltage is 125 kV at a frequency of 150 HZ. If the load current to be supplied is 5mA, find
      i. the percentage ripple
      ii. the regulation
      iii. the optimum no.of stages for minimum regulation or voltage drop [8+8]

3. (a) Give different circuits that produce impulse waves.
   (b) An impulse current generator has a total capacitance of 8 μF. The charging voltage is 25 KV. If the generator has to give an output current of 10KVA with 8/20 μS wave form, calculate (a) the circuit inductance (b) the dynamic resistance in the circuit. [8+8]

4. What is a cascaded transformer ? Explain why cascading is done ? Describe with a neat diagram, a three stage cascaded transformer. [16]

5. (a) Draw a typical impulse current generator circuit and explain its operation and application.
   (b) A $12-$ stage impulse generator has capacitors each rated at 0.3 μF, 150 KV. The capacitance of the test specimen is 400 pF. Find the wave front and wave tail resistances to produce 1.2/50 μsec impulse wave. [8+8]

6. Explain with neat diagram how rod gaps can be used for measurement of high voltages. Compare its Performance with a sphere gap. [16]

7. Discuss various methods of measuring high impulse currents. [16]

8. (a) Explain the modifications to be made to the Schering Bridge for high dissipation factor test objects and high capacitance test objects
   (b) What are partial discharges and how are they detected under power frequency operating conditions [8+8]

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

Answer any FIVE Questions
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1. (a) Define and explain mobility of gaseous ions .
   (b) What is de-ionisation by diffusion in gases? Explain. [8+8]

2. (a) Explain why the use of series Resonant Transformers are advantageous over A.C. 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 inductances between the windings equal to 0.025H. The capacitances included in the primary and secondary circuits are 1.5 μF and 18 nF. If the Tesla Coil is charged through a 10 KV d.c. supply, Find the output voltage and determine its waveform. Neglect the winding resistance. [8+8]

3. (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]

4. (a) How are damped high frequency oscillations obtained from a tesla coil.
   (b) Explain clearly cascaded voltage multiplier circuits for high voltage generation. [8+8]

5. (a) Give the Marx circuit arrangement for multi stage impulse generators.
   (b) An impulse current generator is rated for 50kW sec. The parameters of the circuit are C = 51 μF and L = 2 μH. Find the time to front, time to tail of the current wave form. [8+8]

6. Discuss the construction of a uniform field spark gap and discuss its advantages and disadvantages for high voltage measurements. [16]

7. Explain the necessity of earthing and shielding arrangements in impulse measurements and in high voltage laboratories. Give a sketch of the multiple shielding arrangements used for impulse voltage and current measurements. [16]

8. (a) Explain the modifications to be made to the Schering Bridge for the following situations:
      i. high dissipation factor test objects
      ii. high capacitance test objects
      iii. one end of the test object to be grounded

(b) Mention the different electrical tests done on isolators and circuit breakers and explain each briefly. [9+7]

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