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BIEE-018

B.Tech. – VIEP – ELECTRICAL ENGINEERING (BTELVI)

Term-End Examination

00736

June, 2014

BIEE-018 : HIGH VOLTAGE ENGINEERING

Time : 3 hours *Maximum Marks : 70*

Note : *Attempt any **seven** questions. All questions carry equal marks.*

1. Explain with diagrams, different types of rectifier circuits for producing high dc voltages. What are the special features of high voltage rectifier valve ? How is proper voltage division between the valves ensured, if a number of tubes are used in series ? *10*

2. (a) Explain with neat diagram the principle of operation of (i) series (ii) parallel resonant circuits for generation of high ac voltages.

(b) A 12-stage impulse generator has 0·126 μF condensers. The wave front and the wave tail resistances connected are 800 Ω and 5000 Ω respectively. If the load condenser is 1000 pF, find the front and tail times of the impulse wave produced. *2×5=10*

3. What is capacitive voltage transformer ? Explain with phasor diagram how a tuned capacitive voltage transformer can be used for voltage measurements in power systems. State the merits and demerits of CVT measurement in HVAC. *10*

4. Explain the necessity of earthing and shielding arrangements in impulse measurements and in high voltage laboratories. Give a neat sketch of the multiple shielding arrangements used for impulse voltage and current measurements. *10*

5. (a) Explain the use of Hall Generators for the measurement of high direct currents.

   (b) A Rogowski coil is to be designed to measure impulse current of 10 kA having a rate of change of current of 10^{11} A/s. The current is read by a VTVM as a potential drop across the integrating circuit connected to the secondary. Estimate the values of mutual inductance, resistance and capacitance to be connected, if the meter reading is to be 10 V for full scale deflection. *2×5=10*

6. Explain how a sphere gap can be used to measure the peak value of voltages. What are the parameters and factors that influence such measurements ? Compare the use of uniform field electrode spark gap and sphere gap for measuring peak values of voltages. *10*

7. What are the tests conducted on circuit breakers and isolator switches ? Discuss any one of the tests in detail. *10*

8. Explain the high voltage Schering bridge for the tan δ and capacitance measurement of an insulator or bushing. Why are the earthing and shielding arrangements needed in the Schering bridge measurements ? *10*

9. Define Townsend's first and second ionization coefficients. How is the condition for breakdown obtained in a Townsend discharge ? Derive the criterion for breakdown in electronegative gases. Why is the breakdown strength of electronegative gases higher than other gases ? *10*

10. Describe the main requirements of solid insulating materials used for power apparatus and describe the dielectric characteristics of the following materials : *10*

    (i) PVC

    (ii) Mica

    (iii) Glass