

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

00175 **Term-End Examination**
December, 2014

BIEE-018 : HIGH VOLTAGE ENGINEERING

Time : 3 hours

Maximum Marks : 70

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

1. What is a cascaded transformer ? Explain why cascading is done. Draw the equivalent circuit of a 3-stage cascaded transformer and determine the expression for short circuit impedance of the transformer. Hence, deduce an expression for the short circuit impedance of an n-stage cascaded transformer. 10

2. (a) What is a trigatron gap ? Explain its function and operation.

- (b) A 100 KVA, 400 V/250 KV testing transformer has 8% leakage reactance and 2% resistance on 100 KVA base. A cable has to be tested at 500 KV using the above transformer as a resonant transformer at 50 Hz. If the charging current of the cable at 500 KV is 0.4 A, find the series inductance required. Assume 2% resistance for the inductor to be used and the connecting leads. Neglect dielectric loss of the cable. What will be the input voltage to the transformer ? $2 \times 5 = 10$

3. (a) Give the schematic arrangement of an impulse potential divider with an oscilloscope connected for measuring impulse voltages. Explain the arrangement used to minimize errors.

- (b) What are the different types of resistive shunts used for impulse current measurements ? Discuss their characteristics and limitations. $2 \times 5 = 10$

4. (a) Compare the relative advantages and disadvantages of using a series resistance microammeter and a potential divider with an electrostatic voltmeter for measuring high dc voltages.

- (b) What is a Rogowski coil ? Explain with a neat diagram its principle of operation for measurement of high impulse currents.

$2 \times 5 = 10$

5. (a) Explain the partial discharge tests on high voltage cables. How is a fault in the insulation located in this test ?
- (b) Explain with a schematic diagram any one method of measuring RIV of transmission line hardware. $2 \times 5 = 10$
6. Explain the modifications to be made to the Schering bridge for the following situations : 10
- (i) High capacitance test objects
- (ii) One end of the test object to be grounded
7. Discuss the various tests carried out on a circuit breaker at HV labs. 10
8. (a) Derive the expression for Townsend's current growth equation. Also explain Townsend's criterion for breakdown.
- (b) What is Paschen's Law ? How do you account for the minimum voltage for breakdown under a given 'p x d' condition ? $2 \times 5 = 10$
9. Explain the phenomenon of breakdown in commercial liquid insulators using suspended particle theory. What are the other theories ? 10
10. Write short notes on any **two** of the following : $2 \times 5 = 10$
- (i) Streamer breakdown
- (ii) Thermal breakdown
- (iii) Corona discharge
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