

BACHELOR OF ENGINEERING IN ELECTRICAL ENGINEERING EXAMINATION, 2018

(4th Year, 2nd Semester)

HIGH VOLTAGE TECHNIQUE II

Time : Three hours

Full Marks : 100

(50 marks for each Part)

Use a separate Answer-script for each Part

PART - I (50 MARKS)

Answer any three questions. Two marks for neat and well organized answers.

1. (a) Explain with the help of diagrams how ferro-resonance can damage equipment causing excessive current and voltage. 06
(b) Explain how series ferro-resonance can occur when a 3-phase transformer on no-load is charged through cables. Derive the single phase equivalent circuit for the scheme. 10
2. (a) Explain why modal transformation is necessary while calculating the transient response of a three phase power system, and describe the mathematical basis of the transformation matrices. 08
(b) Demonstrate with a suitable scheme, how non-linear elements can be handled while computing the transient response of a circuit with the help of EMTP. 08
3. (a) Explain why during the surge test of a h.v. winding, all the secondary l.v. windings are kept short-circuited and state how the magnetic flux lines are distributed within and around the windings, as a result of this. 06
(b) Through a detailed circuit analysis in response of a unit step function, comment on the voltage distribution along a transformer winding and the desirable condition therein. 10
4. Discuss in details about the operation, location and selection of Surge arrestors in a substation. 16
5. Write short notes on any two. (a) Ferro-resonance in grounded and ungrounded systems, (b) Impulse withstand voltages, (c) Representation of long transmission lines in EMTP. 08+08

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PART-IIAnswer *any three* questions*Two marks* are reserved for neatness and well organized answer script

1. Discuss (i) modern triggering arrangement and (ii) tail chopping arrangement in relation to lightning impulse generator. 16

2. a) It is required to measure the output of a 100kV testing transformer with HV winding impedance of $10\text{ k}\Omega$ with a compensated RC divider. The HV arm of the divider has 15 numbers of $100\text{ k}\Omega$ resistors with a 20 pF capacitor to ground from each of the junction points. The LV arm resistance is $50\ \Omega$. Determine the capacitance needed in the LV arm for correct compensation. 8

- b) Explain the terms (i) Insulation Level, (ii) Statistical Impulse Withstand Voltage, (iii) Effectively Earthed System and (iv) Factor of Earthing, with respect to insulation coordination. 8

3. a) Briefly state the various methods of measurement of high DC, AC and impulse voltages and currents in a laboratory. 10

- b) Write a brief note on non-contact type high voltage measuring instrument. 6

4. Explain the phenomena of overvoltage in a line conductor due to lightning. What is Klydonograph? With the help of suitable diagrams, explain its principle of operation. What is the significance of Lichtenberg figures in lightning impulse voltage measurement? 16

5. Write short notes on any two of the following: 8×2
 - (i) Measurement of lightning impulse voltage by sphere-gap method.
 - (ii) Test with lightning impulse chopped on the tail (LIC).
 - (iii) Surge diverters.