B.E. ELECTRICAL ENGINEERING EXAMINATION, 2023

(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

Answer any three questions

(Two marks are reserved for neatness
and well organized answers)

1. Describe the experimental procedure to perform the power frequency dry flashover test of line insulator as per IS 731 and explain the tower simulation procedure and correction factor associated with this experimental setup.   16

2. Describe the impulse voltage withstand test performed on transformers and answer the questions (i) to (iv) associated with this test.   16

    i)   Connection of this test setup with neat diagram

    ii) Sequence of application of impulse voltages

    iii) Necessity of application of chopped impulses

    iv) Detection of failure after lightning impulse test

3. a) Describe with the help of a schematic how polarization and depolarization current (PDC) measurement can be performed on transformers.   8

   b) What is recovery voltage measurement? Explain the concept of recovery voltage spectra and central time constant.   8

4. a) Explain the following terms related insulation co-ordination.   8
       Factor of Earthing; Statistical Impulse Withstand Voltage; Rated Short Duration Power Frequency Withstand Voltage; Protective Level of Protective Device.

   b) A transformer has an impulse insulation level of 1100 kV and is to be operated with an insulation margin of 16% under lightning impulse conditions. The transformer has a surge impedance of 1200 Ω and is connected to a transmission line having a surge impedance of 500 Ω. A short length of overhead earth wire is to be used for shielding the line near the transformer from direct strikes. Beyond the shielded length, direct strokes on the phase conductor can give rise to voltage waves of the form 1000 $e^{-0.04t}$ kV (where t is expressed in μs). If the corona distortion in the line is represented by the expression $\frac{\Delta t}{x} = \frac{1}{B}\left[1 - \frac{e_0}{e}\right] \mu s/m$

, where B = 110 *m/μs* and e_0 = 220 kV, determine the minimum length of shielding wire necessary in order that the transformer insulation will not fail due to lightning surges.   8

5. a)   Describe in brief the basic theory of Frequency Domain Spectroscopy method   8

   b)   Briefly explain the different parameters for the selection of surge diverters.   8

Ex/EE/PE/B/T/421B/2023

B. E. ELECTRICAL ENGINEERING EXAMINATION, 2023

(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-II

Answer *any three* questions

Two marks are reserved for neatness and well organized answer script

1. a) How the classification of high voltage laboratories is done?   10

   b) Briefly discuss about the grounding techniques used in high voltage laboratories.   6

2. With respect to a high voltage impulse generator, briefly explain (i) trigatron-gap arrangement, (ii) conventional triggering arrangement, (iii) modern triggering arrangement and (iv) a comparative study between conventional and modern triggering arrangement. Accompany your answer with neat schematics.   4+4+4+4

3. a) Write a brief note on generating voltmeter.   10

   b) A generating voltmeter with a four pole synchronous motor drive has to be designed so that it can have a range of 20-200kVd.c. If the indicating meter reads a minimum current of 2μA, what should be the capacitance of the generating voltmeter? Also give the maximum range of the indicating instrument.   6

4. 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. With proper derivation, show how the capacitance and dielectric dissipation factor can be evaluated in a high voltage Schering bridge in the case of a grounded capacitor.   16