BACHELOR OF ENGINEERING (ELECTRICAL ENGINEERING)
THIRD YEAR SECOND SEMESTER SUPPLEMENTARY EXAM 2023

HIGH VOLTAGE ENGINEERING

Full Marks 100

Time: Three hours   **(50 marks for each part)**

Use a separate Answer-Script for each part

No. of Questions	PART II Answer any three questions. (Two marks for neat and well organized answers.)	Marks

1.a) State the advantages of glass insulators.   **2**

b) Establish the relation between volume of copper and transmission level voltage.   **4**

c) An overhead transmission line having a surge impedance of 450 Ω runs between two substations A and B; at B it branches into two lines C and D, of surge impedances of 450 Ω and 60 Ω respectively. If a traveling wave of magnitude 50 kV travels along the line AB, calculate the magnitude of voltage and current waves which enters the line C and D. Deduce the formulae that have been used.   **10**

2.a) Explain the theory of corona formation. State two effects of corona.   **6+2**

b) In a string of 3 suspension insulators, the mutual capacitance of each disc is 9 times the shunt capacitance between the unit and earthed framework. Calculate the voltage across each insulator. Deduce the formulae you have used.   **8**

3.a) Derive an expression for the reactance of the Peterson coil in terms of the capacitance of the protected line. Calculate the reactance of a coil suitable for a 33 kV, 3-phase transmission system of which the capacitance to earth of each conductor is 5 μF.   **8**

b) State why solidly grounded system is not popularly used.   **5**

c) Arcing horns protect suspension insulators from surface flashover – justify.   **3**

[Turn over

BACHELOR OF ENGINEERING (ELECTRICAL ENGINEERING)
THIRD YEAR SECOND SEMESTER SUPPLEMENTARY EXAM 2023

HIGH VOLTAGE ENGINEERING

Time: Three hours

Full Marks 100
(50 marks for each part)

4.a) 'Low tower footing resistance reduces the chance of back flashover' – explain.   8

b) Explain two methods for improving string efficiency of a suspension insulator.   4+4

5. Write short notes on any two of the following: 8×2

     i) Advantages and disadvantages of hvdc transmission.
     ii) Condenser bushing.
     iii) Bewley's lattice diagram.

BACHELOR OF ENGINEERING (ELECTRICAL ENGINEERING) EXAMINATION, 2023

(3rd Year, 2nd Semester, Supplementary)

HIGH VOLTAGE ENGINEERING

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 answers*)

1. a) Give a comparative analysis between a high voltage power transformer and a high voltage testing transformer.   6

   b) With a neat sketch, explain the principle of a three-stage cascade connection in testing transformer for producing high a.c. power frequency voltage. Why the lowest unit is loaded more?   10

2. a) With a neat sketch explain the operation of multi stage impulse generator circuit.   10

   b) Why is triggering required in an impulse generator? Describe a typical triggering arrangement.   6

3. a) Draw a Cockcroft-Walton voltage multiplier circuit for HVDC generation and explain the principle of its operation.   8

   b) A Cockcroft-Walton voltage doubler circuit is used to test a cable at 175 kV. The insulation resistance of the cable is $2.5 \times 10^7 \Omega/m$ and the length of the cable is 15 m. Stage capacitances are 0.11 µF and 0.12 µF respectively. The doubler is supplied from a 500V/200kV testing transformer. Calculate the voltage to be applied to the input of the transformer at 50Hz.   8

4. a) Draw the circuit diagram of a Chubb-Fortescue peak voltmeter circuit. Describe the principal of operation of this peak voltmeter circuit and discuss about the limitation of peak voltage measurement with this method.   10

   b) With the help of circuit and phasor diagrams explain why capacitive voltage transformers are used in resonant condition.   6

5. Write short notes on any two of the following: 2×8

a) Electrostatic Voltmeter

b) High Voltage Potential Divider

c) High voltage generation using series resonance circuit

———O———