NTK/KW/15/7552

Faculty of Engineering & Technology
Seventh Semester B.E. (Electrical Engg.) (C.B.S.)
Examination
HIGH VOLTAGE ENGINEERING

Time—Three Hours] [Maximum Marks—80

INSTRUCTIONS TO CANDIDATES

(1) All questions carry marks as indicated.

(2) Solve Question No. **1 OR** Questions No. **2**.

(3) Solve Question No. **3 OR** Questions No. **4**.

(4) Solve Question No. **5 OR** Questions No. **6**.

(5) Solve Question No. **7 OR** Questions No. **8**.

(6) Solve Question No. **9 OR** Questions No. **10**.

(7) Solve Question No. **11 OR** Questions No. **12**.

(8) Due credit will be given to neatness and adequate dimensions.

(9) Assume suitable data wherever necessary.

(b) How sphere gap system is used for the measurement and calibration of high voltage in the laboratory ? Draw experimental set up and explain. 6

OR

10. (a) Explain principle of operation, construction and working of generating voltmeter for measurement of high D.C. voltages. 7

(b) What are the problems associated with measurement of very high impulse voltages ? Explain how these are taken care of during measurement. 6

11. (a) Explain measurement of dielectric constant and loss factor by high voltage schering bridge. 7

(b) Discus the significance of non-destructive tests and list the different non-destructive tests. 7

OR

12. (a) Explain how dry and wet flashover tests are performed on line insulator. 7

and inductance of 10 μH. Compute the surge voltage to which tower top is subjected if lightning stroke current is 30 kA. Compute the percentage reduction in this overvoltage if tower resistance is reduced to 5 ohms. 6

OR

4. (a) Explain gapless type lightning arresters write their probable ratings. 7

(b) Explain with suitable diagram, principle and working of :

(i) Expulsion gap arrester

(ii) Horn gap arrester. 6

5. (a) Explain the behaviour of travelling waves with voltage and current waveform for open ended transmission line. 7

(b) A surge of 25 kV travelling wave in a line of natural impedance 500 Ω arrived at a junction of two lines

of impedance 650 and 350 ohms respectively. Find the surge voltages and current into each branch line. 7

OR

6. (a) What is Bewley's Lattice diagram ? Explain its application. 7

(b) Explain in brief about Basic Impulse Insulation Level, reduced BIL and Switching Impulse insulation level. 7

7. (a) An 8 stage impulse generator has 0.12 μf capacitors rated for 167 kV. What is its Maximum Discharge Energy ? If it has to produce a 1/50 μsec, waveform across a load capacitor of 15000 pF, find the values of the waveform and wave tail resistances. 7

(b) Why is a Cockcroft-walton multiplier circuit preferred for high voltage circuits ? Explain its working with a schematic diagram. 6

OR

8. (a) A 500 kV Cockcroft-Walton multiplier circuit has the following circuit components :

No load output voltage = 500 kV, DC

Frequency = 150 Hz

Number of stages = 22

Load current = 2.5 mA

Stage Capacitor = 1 μF

Determine the magnitude of ripple voltage and DC voltage drop under full load condition. 7

(b) What is meant by Cascaded Transformer ? Enumerate disadvantages of cascaded transformer. 6

9. (a) Explain with neat diagram the principle of operation of an electrostatic voltmeter. Discuss the advantages and limitations for measurement of high voltages. 7

1. (a) What is Townsend's Breakdown Criterion ? Enumerate the limitations of Townsend's criterion. 6

(b) What is Paschen's Law ? Justify the existence of two values of (p × d) corresponding to the same breakdown voltage in Paschen's curve.

Determine $(p \times d)_{min}$ and V_{bmin} for Paschen's Law if constants for air are A = 12, B = 365 and r = 0.02. 7

OR

2. (a) What is Composite Dielectric ? Compare the effect of layer thickness and number of layers in composite dielectric. 7

(b) What are the desirable properties of transformer oil ? Enumerate the impurities which get added in this oil during use. Explain the purification process for the oil against these impurities. 6

3. (a) Explain the classification of lightning strokes according to their effect on Power System. 7

(b) A transmission line tower has resistance of 10 ohms

(b) Write short notes on any **two** :

(i) Partial discharge measurement in cable

(ii) Testing of surge diverters

(iii) Testing of high voltage AC circuit breakers

(iv) Testing of cables. 7