

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) Discuss 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 $10 \mu\text{H}$. 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 500Ω 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 $0.12 \mu\text{f}$ capacitors rated for 167 kV. What is its Maximum Discharge Energy ? If it has to produce a $1/50 \mu\text{sec}$, 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

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Contd.

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 = $1 \mu\text{F}$

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

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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 $(p \times d)$ 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