

Reg. No. : 

--	--	--	--	--	--	--	--	--	--	--	--

**Question Paper Code : 40499**

B.E./B.Tech. DEGREE EXAMINATIONS, NOVEMBER/DECEMBER 2021.

Seventh Semester

Electrical and Electronics Engineering

EE 8701 — HIGH VOLTAGE ENGINEERING

(Regulations 2017)

Time : Three hours

Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. List the different methods employed for lightning protection of overhead lines.
2. A 3-phase single circuit transmission line is 400 km long. If the line is rated for 220 kV and has the parameters. Resistance  $R = 0.1$  ohms/km. Inductance  $L = 1.26$  mH/km, Capacitance  $C = 0.009 \mu$  F/km, find surge impedance value.
3. What is electro convection in liquid dielectrics?
4. Differentiate between photo-ionization and photo-electric emission.
5. Define the terms (a) Impulse voltages (b) Chopped wave.
6. Draw a simple voltage doubler circuit.
7. Why are capacitance voltage dividers preferred for high ac voltage measurements?
8. What is a mixed potential divider? How is it used for impulse voltage measurements?
9. List out various tests to be carried out on a circuit Breakers.
10. Compare the withstand voltage with flashover voltage.

PART B — (5 × 13 = 65 marks)

11. (a) What are the mechanisms by which lightning strokes develop and induce overvoltage on overhead power lines?

Or

- (b) Explain clearly with necessary equation, the theory and advantages of Bewley's lattice diagram.

12. (a) (i) Define corona discharge. (3)  
(ii) Explain clearly Anode and Cathode Coronas. Also state its advantages and disadvantages. (10)

Or

- (b) (i) Explain Thermal breakdown in solid dielectrics. (7)  
(ii) How this Thermal breakdown is more significant than the other mechanisms? (6)

13. (a) (i) Explain clearly the basic principle of operation of an electrostatic generator. (5)  
(ii) Describe with neat diagram the principle of operation, application and limitations of Van de Graf generator. (7)

Or

- (b) (i) Draw equivalent circuit of a 3-stage cascaded transformer and explain its working.  
(ii) Determine the expression for short circuit impedance of the cascaded transformer. Hence, deduce an expression for the short circuit impedance of an n-stage cascaded transformer.

14. (a) (i) Discuss the effect of nearby earthed objects, humidity and dust particles on the measurements using sphere gaps. (7)  
(ii) Explain how DC high voltage can be measured using series ammeter. (6)

Or

- (b) (i) Explain with neat diagram the principle of operation of an Electrostatic Voltmeter. Discuss its advantages and limitations for high voltage measurements. (8)  
(ii) Draw a simplified equivalent circuit of a resistance potential divider. (5)

15. (a) (i) Write a short note on the cable sample preparation before it is subjected to various tests. (3)  
(ii) Explain briefly the various tests to be carried out on a bushing. (10)

Or

- (b) Describe the various tests to be carried out on a Circuit Breaker.

PART C — (1 × 15 = 15 marks)

16. (a) An absolute electrostatic voltmeter has a movable circular plate 8 cms in diameter. If the distance between the plates during a measurement is 4 mm, determine the potential difference when the force of attraction is 0.2 gm wt.

Or

- (b) A ten stage Cockraft-Walton circuit has all capacitors of  $0.06 \mu\text{F}$ . The secondary voltage of the supply transformer is 100 kV at a frequency of 150 Hz. If the load current is 1 mA, determine (i) voltage regulation (ii) the ripple voltage.



Reg. No. :

--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

**Question Paper Code : X10406**

B.E./B.Tech. DEGREE EXAMINATIONS, NOVEMBER/DECEMBER 2020  
Seventh Semester  
Electrical and Electronics Engineering  
EE8701 – HIGH VOLTAGE ENGINEERING  
(Regulations 2017)

Time : Three Hours

Maximum : 100 Marks

Answer ALL questions

PART – A

(10×2=20 Marks)

1. Draw the mathematical model for lightning discharge.
2. What is meant by corona ?
3. What are the factors which affect the breakdown voltage of a gaseous dielectrics ?
4. What are the insulating materials used in power transformer ?
5. Mention the specifications of impulse current as per Indian Standards.
6. What are the advantages of high frequency transformers for generating high AC voltage ?
7. Why are the capacitive voltage dividers preferred for high AC voltage measurements ?
8. What are the requirements of digital storage oscilloscope for impulse and high frequency measurements ?
9. What is Basic Impulse Insulation Level ?
10. How is salt-fog test conducted on insulators ?

X10406

-2-



PART – B

(5×13=65 Marks)

11. a) i) Explain the two theories of charge formation in a thunderclouds. (7)  
ii) Explain the techniques to be used for controlling the switching over voltages in a power system. (6)  
(OR)
- b) i) What are the requirements of a ground wire for protection of transmission line against direct lightning stroke ? Explain how they are achieved in practice. (7)  
ii) Describe the various steps to draw the Bewley-Lattice diagram of successive reflections. (6)
12. a) i) State and explain Paschen's law. How do you account for the minimum voltage for breakdown under a given (pd) condition ? (7)  
ii) Explain the breakdown due to 'treeing' and 'tracking' process in a solid insulating materials. (6)  
(OR)
- b) i) Explain any two theories which explain breakdown in commercial liquid dielectrics. (7)  
ii) Illustrate the field emission theory of breakdown mechanism in vacuum dielectrics. (6)
13. a) i) With a neat sketch, explain the construction and working of a Van de Graff generator. (7)  
ii) Why is controlled tripping necessary in impulse generators ? Discuss how is it performed using Trigatron gap ? (6)  
(OR)
- b) i) From the basic Marx circuit develop the modern multistage impulse generator circuits and explain the significance of its various parameters. (7)  
ii) With a neat circuit diagram, explain any one method of generating switching surges in HV laboratory. (6)
14. a) i) Explain with neat diagram, the working principle and operation of an electrostatic voltmeter for measuring high voltages. (7)  
ii) Explain the operation of a series capacitance voltmeter to measure high AC voltages. (6)  
(OR)
- b) i) What are the different types of resistive shunt used for impulse current measurements ? Discuss their characteristics and limitations. (7)  
ii) Discuss the detailed procedure for measuring peak value of very high DC, AC and impulse voltages using standard sphere gaps. (6)



15. a) Explain in details about the procedure for conducting power frequency, impulse voltage and thermal tests on high voltage bushings. (13)  
(OR)
- b) Explain in details about the procedure for conducting dielectric, impulse voltage and short circuit current tests on high voltage circuit breakers. (13)

## PART – C

(1×15=15 Marks)

16. a) A ten stage Cockcroft-Walton voltage multiplier circuit has all capacitors of  $0.05 \mu\text{F}$ . The secondary voltage of the supply transformer is 120 kV at a frequency of 150 Hz. If the load current is 1.2 mA, determine the following  
i) voltage regulation, ii) percentage of ripple voltage, iii) the optimum number of stages for maximum output voltage, iv) the maximum output voltage. (3+4+4+4)  
(OR)
- b) A 100 kVA, 250 V/200 kV feed transformer has resistance and reactance of 1% and 5% respectively. This transformer is used to test a cable at 400 kV at 50 Hz. The cable takes a charging current of 0.5 A at 400 kV. Determine the series inductance required. Assume 1% resistance of the inductor. Also determine input voltage to the transformer. Neglect dielectric loss of the cable. (15)
-