Reg. No. : | | | | | | | | | | | | |

Question Paper Code : 71784

B.E./B.Tech. DEGREE EXAMINATION, APRIL/MAY 2017.

Seventh Semester

Electrical and Electronics Engineering

EE 6701 — HIGH VOLTAGE ENGINEERING

(Regulations 2013)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Define: Corona Critical Disruptive Voltage.

2. What are the different methods employed for protection of over head lines against lightning?

3. State Paschen's Law.

4. Define Townsends first ionization coefficient

5. A 12 stage impulse generator has $0.12\mu F$ capacitors. The Wave front and wave tail resistances connected are 400Ω and 600Ω respectively. If the load capacitor is 800pF, find the front and tail time of the impulse wave produced.

6. What is trigatron gap?

7. What are the different types of resistive shunts used for impulse and high frequency measurements?

8. What are the problems associated with measurement of very high impulse voltages?

9. List out the various electrical tests to be carried out for bushings.

10. Define: Air density correction factor.

PART B — (5 × 16 = 80 marks)

11. (a) (i) Explain the construction and working principle of expulsion gaps and protector tubes. (10)

(ii) Describe the causes for switching and power frequency over voltages. (6)

Or

(b) Explain the different theories of charge formation in clouds. (16)

12. (a) Discuss about the Various mechanisms of Vacuum breakdown. (16)

Or

(b) (i) Explain the various theories that explain breakdown in commercial liquid dielectrics. (10)

(ii) Discuss about the various properties of composite dielectrics. (6)

13. (a) (i) A Cockroft Walton type voltage multiplier has eight stages with capacitances, all equal to 0.05 μF. The supply transformer secondary voltage is 125 kV at a frequency of 125Hz. If the load current to be supplied is 4.5mA. Find (1) the % ripple, (2) the regulation. (8)

(ii) Describe the construction and working principle of a Van de Graff generator with a neat sketch. (8)

Or

(b) Describe the construction and principle of operation of a multistage Marx Generator. (16)

14. (a) (i) Explain how a sphere gap can be used to measure the peak value of voltages. (8)

(ii) A co axial shunt is to be designed to measure an impulse current of 40kA. If the bandwidth of the shunt is to be at east 10 MHz and if the voltage drop across the shunt should not exceed 50V.Find the ohmic value of the shunt and its dimensions. (8)

Or

(b) Explain the principle and construction of a generating voltmeter for the measurement of high dc voltages. List out its advantages and disadvantages. (16)

15. (a) Explain the method of impulse testing of high voltage transformers. What is the procedure adopted for locating the failure? (16)

Or

(b) (i) Write short notes on statistical methods for insulation coordination. (6)

(ii) Draw the layout for synthetic testing and explain the procedure. (10)

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Reg. No. : | | | | | | | | | | | | |

Question Paper Code : 52964

B.E./B.Tech. DEGREE EXAMINATIONS, APRIL/MAY 2019.

Seventh Semester

Electrical and Electronics Engineering

EE 6701 — HIGH VOLTAGE ENGINEERING

(Regulation 2013)

(Common to PTEE 6701 — High Voltage Engineering for B.E. (Part-Time) Fifth Semester – Electrical and Electronics Engineering – Regulation 2014)

Time : Three hours | Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Define the term 'Isokeraunic level'.
2. Draw the equivalent circuit of a surge diverter.
3. What is 'Burst corona'?
4. State the properties of a composite dielectrics.
5. A tesla coil has a primary winding rated for 10 kV with 2 μF capacitance on primary side and 1 nF capacitance on secondary side. If the energy efficiency is 5%, determine the output voltage.
6. Show the types of impulse current waveforms.
7. Give the advantages of a Generating voltmeter.
8. List the advantages of digital techniques in high voltage measurements.
9. Write the standard atmospheric conditions for HV testing as per Indian Standard.
10. What is meant by 'Insulation coordination'?

PART B — (5 × 13 = 65 marks)

11. (a) (i) Describe the mechanism of lightning strokes inducing high over voltage on transmission lines. (8)

(ii) What are the sources of switching surges? (5)

Or

(b) A long transmission line is energized by a unit step voltage 1 V at the sending end and is open circuited at the receiving end. Construct the Bewley lattice diagram and obtain the value of the voltage at the receiving end after a long time. Take the attenuation factor $\alpha = 0.8$. (13)

12. (a) (i) Derive the Townsend's current growth equation in uniform gaseous dielectric field. (6)

(ii) Discuss the phenomenon of thermal breakdown in solid dielectrics. (7)

Or

(b) (i) What are the different mechanisms of breakdown in vacuum? Explain any one mechanism in detail. (7)

(ii) Explain the Suspended particle mechanism of breakdown in commercial liquid dielectrics. (6)

13. (a) Explain with neat circuit the generation of high DC voltages using an n-stage Cockroft-Walton circuit. Derive an expression for the total ripple content in the output voltage. (8+5)

Or

(b) (i) Explain the working principle of parallel resonant transformer. (6)

(ii) Explain the working principle of cascaded transformers for producing very high a.c. voltages. (7)

14. (a) (i) Write short notes on Mixed R-C potential dividers. (6)

(ii) Explain the operation of peak reading voltmeters for impulse voltages. (7)

Or

(b) Explain with neat diagram how a sphere gap can be used to measure the peak value of voltages. What are the parameters and factors that influence such voltage measurements? (8+5)

15. (a) Explain the various tests conducted on isolators and circuit breakers. (13)

Or

(b) Explain the method of impulse testing of high voltage transformers. What is the procedure adopted for locating the failure? (13)

PART C — (1 × 15 = 15 marks)

16. (a) Explain with neat diagram the principle of operation, advantages, limitations and applications of Van de Graff generator. (15)

Or

(b) A ten-stage impulse generator has 0.250 μF condensers. The wave front and wave tail resistances are 75 Ω and 2600 Ω respectively. If the load capacitance is 2.5 nF, determine the wave front and wave tail times of the impulse wave. (15)

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Reg. No. : | | | | | | | | | | | | |

Question Paper Code : 80385

12/11/16 FN

B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2016.

Seventh Semester

Electrical and Electronics Engineering

EE 6701 — HIGH VOLTAGE ENGINEERING

(Regulations 2013)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. What is back flashover?
2. Define Isokeraunic level or thunderstorm days.
3. What is ionization by collision?
4. Define Gas law.
5. What is a tesla coil?
6. What is Deltatron circuit?
7. What are the advantages of generating voltmeters?
8. List some advantages of Faraday generator.
9. Define 50% flash over voltage.
10. What are the tests need to be conducted on power transformer?

PART B — (5 × 16 = 80 marks)

11. (a) (i) Explain the mechanism of lightning stroke. (10)

(ii) Give the mathematical model for lightning discharges and explain them. (6)

Or

(b) Explain the different methods employed for lightning protection of overhead lines. (16)

12. (a) From the fundamental principles, derive Townsend's criteria for the breakdown of gaseous dielectric medium. (16)

Or

(b) Explain the various breakdown theories involved in commercial liquid dielectrics. (16)

13. (a) (i) Mention the necessity of generating high DC voltages. (4)

(ii) Explain with a neat diagram the generation of high DC voltages using Van-de-graff generator. State the factors which limit the voltage developed. (12)

Or

(b) Explain the working principle of Cockroft-Walton voltage multiplier circuit. Derive an expression for total voltage drop and total ripple voltage of n-stage voltage multiplier circuit and hence deduce the condition for optimum number of stages. (16)

14. (a) (i) Enumerate digital peak voltmeter. (8)

(ii) What is CVT? Explain how CVT can be used for high voltage AC measurement. (8)

Or

(b) Explain how a sphere gap can be used to measure the peak value of voltages? Also discuss the parameters and factors that influence such voltage measurement? (16)

15. (a) Discuss the various tests carried out in a circuit breaker at HV labs. (16)

Or

(b) Explain in sequence the various high voltage test being carried out in a power transformer. (16)

PART – B (5×16=80 Marks)

11. a) Explain in detail about the protection of transmission lines against over voltage. (16)

(OR)

b) i) Explain the theories of charge formation in clouds. (10)

ii) Derive the mathematical model for lightning discharges. (6)

12. a) Explain in detail about the various mechanisms of breakdown in vacuum. (16)

(OR)

b) Explain the various theories of breakdown mechanism of the commercial liquid dielectrics. (16)

13. a) What is Tesla coil ? How is damped high frequency oscillations obtained from a Tesla coil ? (16)

(OR)

b) Describe with a neat sketch the working of a Vande Graff generator. What are the factors that limit the maximum voltage obtained ? (16)

14. a) Explain the construction features and operation of generating type voltmeter. (16)

(OR)

b) Explain the operation of Electrostatic voltmeter with neat sketch and give its advantages and limitations. (16)

15. a) Explain the direct and synthetic testing of isolators and circuit breakers in detail. (16)

(OR)

b) Explain in detail about the insulation coordination. (16)

25/11/17 FN

Reg. No. : | | | | | | | | | | | | |

Question Paper Code : 50493

B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2017
Seventh Semester
Electrical and Electronics Engineering
EE 6701 : HIGH VOLTAGE ENGINEERING
(Regulations 2013)

Time : Three Hours | Maximum : 100 Marks

Answer ALL questions

PART – A (10×2=20 Marks)

1. What are the causes for power frequency over voltage in power system ?
2. What is isokeraunic level ?
3. What are electronegative gases ? Give example.
4. What are pure liquid dielectrics ?
5. What are the advantages of Vande-Graff generator ?
6. Draw the standard impulse waveform.
7. What are the advantages of CVT measurement in HVAC ?
8. What type of measuring devices preferred for measurement of high frequency impulse current ?
9. Define disruptive discharge voltage.
10. What is meant by insulation coordination ?

23/11/18 FN

Reg. No. :

Question Paper Code : 20466

B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2018.

Seventh Semester

Electrical and Electronics Engineering

EE 6701 – HIGH VOLTAGE ENGINEERING

(Regulations 2013)

(Common to : PTEE 6701 – High Voltage Engineering for B.E. (Part – Time) Fifth Semester – Electrical and Electronics Engineering – Regulations – 2014)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. What are the causes of over voltages in power system?
2. List the sources of switching over voltage in power system.
3. What are electronegative gases?
4. Write the Paschen's Law.
5. Give the expression for effective inductance of distributed inductors in impulse current generator.
6. What are the specifications for standard impulse voltage?
7. What is Rogowski coil? Give its limitations.
8. How is stray effect reduced in resistive shunt type of measurement?
9. What is the difference between type and routine test?
10. State the importance of insulation coordination in power system.

PART B — (5 × 13 = 65 marks)

11. (a) (i) Explain the technique of modeling the lightning. (8)

(ii) Discuss in detail the characteristics of switching surges with necessary waveforms. (5)

Or

(b) Explain in detail the protection of power system equipments using protective devices.

12. (a) Explain in detail the breakdown mechanism in non-uniform fields and phenomenon of corona.

Or

(b) Explain about the breakdown mechanisms in solid dielectrics with neat sketches.

13. (a) What is the principle behind the electrostatic energy conversion methods? Explain the construction and operation of Vandegraff generator with neat diagrams.

Or

(b) (i) Write a brief note on resonant transformer. (8)

(ii) How is impulse current generated using capacitor bank? Explain it in detail. (5)

14. (a) With a neat diagram explain the sphere gap arrangement method of high voltage measurement in detail and give the factors influencing the measurement.

Or

(b) Tabulate and explain the methods used for the measurement of high voltages and high currents.

15. (a) Explain in detail the power frequency and impulse voltage test need to be conducted on bushings with necessary diagrams.

Or

(b) Discuss in detail the dielectric power factor test and partial discharge test procedures for high voltage cables.

PART C — (1 × 15 = 15 marks)

16. (a) What are the tests need to be conducted on isolators and circuit breakers? Explain them in detail.

Or

(b) Explain in detail the origin and characteristics of switching surges and explain the causes of over voltage due to switching surges in EHV and UHV system with a suitable Illustration.

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25/11/19/FN

Reg. No. :

Question Paper Code : 91499

B.E./B.Tech. DEGREE EXAMINATIONS, NOVEMBER/DECEMBER 2019

Seventh Semester

Electrical and Electronics Engineering

EE6701 – HIGH VOLTAGE ENGINEERING

(Regulations 2013)

(Common to PTEE6701 – High Voltage Engineering for B.E. (Part-Time) – Fifth Semester – Electrical and Electronics Engineering Regulations – 2014)

Time : Three Hours | Maximum : 100 Marks

Answer ALL questions

PART – A **(10×2=20 Marks)**

1. Classify the lightning stroke.
2. What are the factors to be considered for the effective protection of transmission line using ground wire ?
3. State Paschen's law.
4. How does long-term breakdown occur in a composite dielectric ?
5. Why is controlled tripping necessary in a multistage impulse generator ?
6. What are the advantages of cascaded transformer over two winding transformer for generating high AC voltages ?
7. Give the requirements of an Oscilloscope used for impulse and high frequency high voltage measurements.
8. What are the different types of resistive shunts used for impulse current measurements ?
9. Write the standard atmospheric conditions for HV testing as per Indian standard.
10. What are volt-time curves ?

PART – B (5×13=65 Marks)

11. a) i) What are the causes for switching and power frequency over voltages ? How are they controlled in power systems ? (7)

ii) List out the problems caused by corona discharges. (6)

(OR)

b) i) Consider an overhead transmission line is connected to a cable. Obtain the expression of reflection and refractions of travelling waves at the junction. (7)

ii) What is tower-footing resistance ? Discuss the two methods to reduce this resistance. (6)

12. a) Derive the expression of current growth equation in a uniform field due to Townsend's first and second ionization process and thereby deduce the condition for breakdown of gaseous dielectrics.

(OR)

b) i) Explain the intrinsic breakdown mechanism in solid dielectrics. (7)

ii) Explain how breakdown occurs due to internal discharges in a solid dielectric ? (6)

13. a) i) Explain the working principle of Cockroft-Walton voltage multiplier circuit under no-load and loaded conditions. (7)

ii) Derive an expression for total voltage drop and total ripple voltage of n-stage voltage multiplier circuit and hence deduce the condition for optimum number of stages. (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) Explain the principle of operation of resonant transformer for generating high alternating voltages. (6)

14. a) i) Describe the working principle and operation of Generating Voltmeter for measuring high DC voltages. (7)

ii) With phasor diagram, explain how a tuned Capacitance Voltage Transformer can be used for high alternating voltage measurements in power system. (6)

(OR)

b) With an equivalent circuit and its step response, discuss how are resistance, capacitance and mixed R-C potential dividers used for impulse voltage measurements. Explain the arrangement used to minimize the errors in each case.

15. a) i) With a neat circuit diagram, explain the procedure of synthetic testing of circuit breakers. Also give its advantageous over other testing methods for short circuit test. (7)

ii) Discuss the arrangement, procedure and specification of water for conducting impulse voltage wet withstand test on insulator. (6)

(OR)

b) i) Discuss the arrangement and detailed procedure for impulse voltage testing of power transformer. (7)

ii) Explain the procedure adopted for detection and location of fault in a transformer during impulse testing. (6)

PART – C (1×15=15 Marks)

16. a) Consider a long transmission line is energized by a unit step voltage 1.0 V at the sending end and is terminated through a resistance R. Construct the Bewley Lattice diagram and obtain the value of voltage at the receiving end after a long time. Also draw the voltage-time and current time curves at the receiving end. Take reflection coefficient at receiving end is 0.4.

(OR)

b) What do you mean by insulation coordination ? With suitable illustrations, explain how insulation level is chosen for various equipments in a 400/230 KV substation.

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