



B.E DEGREE EXAMINATIONS: MAY 2017

(Regulation 2014)

Sixth Semester

ELECTRICAL AND ELECTRONICS ENGINEERING

U14EETE44: High Voltage Engineering

COURSE OUTCOMES

- CO1:** Identify various causes of over voltages, currents and their effects on power system.
CO2: Interpret principles of generation and measurement of high voltages and high currents in any electrical apparatus.
CO3: Know the breakdown of insulators and apply various testing methods to test the High Voltage components.

Time: Three Hours

Maximum Marks: 100

Answer all the Questions:-

PART A (10 x 1 = 10 Marks)

1. Matching type item with multiple choice code

CO3 [K₁]

Group A	Group B
i) High frequency resonant transformer	a) Impulse generation
ii) Series RLC circuit under over damped conditions	b) Tesla coil
iii) Multistage impulse generator	c) Van de Graff Generator
iv) Electrostatic machine	d) Marx circuit

a) i-b, ii-a,iii-d,iv-c

b) i-b, ii-a,iii-c,iv-d

c) i-a, ii-b,iii-d,iv-c

d) i-b, ii-d,iii-a,iv-c

2. Material that is used in surge arresters for EHV and UHV power systems is

CO1 K1

a) Silicon carbide

b) Zinc oxide

c) Aluminium oxide

d) Metal oxides

3. Which of the following statement about corona is incorrect?

CO2 [K₁]

(A) Corona gives rise to radio interference

(B) Corona results in loss of power in transmission

(C) Corona discharge can be observed as red luminescence

(D) Corona is always accompanied by a hissing noise.

a) (C) only

b) (A) & (B)

c) (B) & (C)

d) (B) & (D)

4. Breakdown due to internal discharges develops CO1 [K₁]
- a) in milliseconds b) in few seconds
 c) over a long duration of several days d) all the above.
5. Parallel resonant transformer test system is used when CO2 [K₁]
- a) Large test voltages are needed b) Stable output voltage with high rate of rise of voltage is needed
 c) Large current is needed d) When high frequency test voltage is needed.
6. Multi test kits used in high-voltage laboratories consist of which of the following? CO3 [K₁]
- i) ac voltage test units ii) dc voltage test units
 iii) impulse voltage test units iv) impulse current test units
- a) i, ii and iii b) i only
 c) ii and iii only d) iii only
7. The type of measuring device preferred for measurement of impulse currents of short duration is CO3 [K₁]
- a) Park's tubular shunt b) Current transformer
 c) Hall generator d) Faraday ammeter
8. The main factors that affect the sparkover voltage of sphere gap are CO3 [K₁]
- a) Humidity and waveform b) Nearby earthed objects and atmospheric conditions
 c) Diameter of the sphere d) Gap spacing, diameter and waveform.
9. Assertion (A): The switching over voltages increase with increased system voltage. CO1 [K₁]
 Reason (R) : The switching over voltages depends on the normal voltage of the system.
- a) both A and R are individually true but R is not the correct explanation of A b) both A and R are individually true and R is the correct explanation of A
 c) A is true but R is false d) A is false but R is true
10. Fault location in an HV cable is done by CO3 [K₁]
- a) Voltage withstand test b) Partial discharge scanning tests
 c) Life tests d) Impulse testing

PART B (10 x 2 = 20 Marks)

(Answer not more than 40 words)

11. What is meant by Townsend's discharge? Explain its main features. CO1 [K₁]
12. Differentiate switching surge from lightning impulse. CO1 [K₁]
13. What are the causes of switching and power frequency overvoltages? CO1 [K₁]

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|-----|---|-----|-------------------|
| 14. | State Paschen's law. Write the expression. | CO2 | [K ₁] |
| 15. | What are the advantages of high frequency transformers? | CO2 | [K ₁] |
| 16. | What is an impulse voltage? Draw its waveform. | CO2 | [K ₁] |
| 17. | What are the elements which cause different errors in measurements? | CO2 | [K ₂] |
| 18. | A resistance divider of 1400 KV (impulse) has a high-voltage arm of 16 kilo-ohms and a low-voltage arm consisting 16 members of 250 ohms, 2 watt resistors in parallel. The divider is connected to a CRO through a cable of surge impedance 75 ohms and is terminated at the other end through a 75 ohm resistor. Calculate the exact divider ratio. | CO3 | [K ₂] |
| 19. | List out any four tests on cables. | CO3 | [K ₁] |
| 20. | What is impulse withstand voltage test. | CO3 | [K ₁] |

Answer any FIVE Questions:-
PART C (5 x 14 = 70 Marks)
(Answer not more than 300 words)

Q.No. 21 is Compulsory

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|-----|--|-----|-------------------|
| 21. | Explain with neat diagram the working of Voltage doubler circuit.
Design a peak reading voltmeter along with a suitable micro-ammeter such that it will be able to read voltages upto 100 KV (peak). The capacitance potential divider available is of the ratio 1000: 1. | CO3 | [K ₂] |
| 22. | Explain with neat diagram the streamer theory of breakdown in gases. | CO2 | [K ₁] |
| 23. | Explain with neat diagram the voltage doubler circuit for generating high DC voltage. | CO2 | [K ₁] |
| 24. | Explain about peak reading voltmeters for impulse voltages. | CO3 | [K ₁] |
| 25. | Explain the different methods of testing of bushings. | CO3 | [K ₁] |
| 26. | Explain the different theories of charge formation in clouds. | CO1 | [K ₁] |
| 27. | Explain any three methods for measuring impulse currents. | CO3 | [K ₁] |
