

ONE TIME EXIT SCHEME

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10EE73

Seventh Semester B.E. Degree Examination, April 2018 High Voltage Engineering

Time: 3 hrs.

Max. Marks:100

Note: Answer any FIVE full questions, selecting at least TWO questions from each part.

PART – A

- 1 a. Explain the effect of high voltage used in transmission on :
 - i) Volume of conductor required
 - ii) Line efficiency
 - iii) Line voltage drop. (07 Marks)
- b. Discuss the need of generating high voltage in the laboratory. (06 Marks)
- c. Mention the important applications of high voltage. (07 Marks)
- 2 a. Derive an expression for the growth of current in a gaseous dielectric under uniform field condition assuming Townsend's first and second ionization co-efficient. (08 Marks)
- b. A steady current of $600\mu\text{A}$ flows through the plane electrodes separated by a distance of 0.5cm when a voltage of 10 KV is applied. Determine Townsend's first ionization co-efficient if a current of $60\mu\text{A}$ flows when the distance of separation is reduced to 0.1cm and the field is kept constant at the previous value. (06 Marks)
- c. Explain the suspended particle theory of breakdown in liquid. (06 Marks)
- 3 a. The following observations were made in an experiment for determination of dielectric strength of transformer oil. Determine the power law equation : (06 Marks)

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|------------------|----|-----|-----|-----|
| Gap spacing | 4 | 6 | 8 | 10 |
| Bd. Voltage (KV) | 88 | 135 | 165 | 212 |

- b. How does the 'Internal discharge' phenomena lead to breakdown in solid dielectric? (07 Marks)
- c. Explain electro thermal break down of solid dielectric. (07 Marks)
- 4 a. With the help of a neat sketch, explain how cascade transformer generate high AC voltages. (06 Marks)
- b. Describe with neat sketch the working of Cockcroft – Wotton voltage multiplier circuit. (08 Marks)
- c. Derive expressions for ripple in cascaded voltage multiplier circuits. (06 Marks)

PART – B

- 5 a. With the help of the neat diagram explain how lightning impulse voltage can be developed in the laboratory by Marx circuit. (08 Marks)
- b. A 12 – stage impulse generator has $0.126\mu\text{F}$ capacitors. The wave – front and wave – tail resistance connected are 800 ohms and 5000 ohms respectively. If the load capacitor is 1000 pF, find the front and tail times of the impulse wave produced. (06 Marks)
- c. Explain with a neat circuit diagram, the tripping of an impulse generator with a three electrode gap method. (06 Marks)

- 6 a. Explain the principle and construction of an electrostatic voltmeter for the measurement of high voltages. (08 Marks)
- b. Explain the working principle of series capacitor peak voltmeter based on Chubb – Frotscu method. (06 Marks)
- c. A generating voltmeter has to be designed so that it can have a range from 20 to 200 KV DC. if indicating meter reads a minimum current of $2\mu\text{A}$ and maximum current of $25\mu\text{A}$ what should the capacitance of the generating voltmeter be? (06 Marks)
- 7 a. With the help of a diagram of Schering bridge explain how capacitance and $\tan \delta$ can be measured. (05 Marks)
- b. What is meant by partial discharge? Explain how it is measured using straight method and balance method. (10 Marks)
- c. Discuss the factors affecting the discharge detection. (05 Marks)
- 8 Write a short note on :
- a. Testing of circuit breaker and isolators
- b. Factors influencing the spark over voltages of sphere gaps
- c. Trigatron gap
- d. Paschen's law. (20 Marks)

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