

GBCS SCHEME

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21EE71

Seventh Semester B.E./B.Tech. Degree Examination, Dec.2025/Jan.2026 High Voltage and Power System Protection

Time: 3 hrs.

Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

- 1 a. Write any four advantages, limitations and applications of high voltage engineering. (08 Marks)
- b. Define Townsend's first ionization coefficient and derive an expression for the current in the air gap that in $I = I_0 e^{\alpha d}$ (06 Marks)
- c. In an experiment in a certain gas it was found that the steady state current is 5.5×10^{-8} A at 8 KV at a distance of 0.4 cm between the plane electrodes keeping the field constant and reducing the distance to 0.1 cm results in a current of 5.5×10^{-9} A. Calculate Townsend's primary ionization coefficient α . (06 Marks)

OR

- 2 a. Explain Bubbles theory and suspended particles theory and breakdown in liquid dielectrics. (10 Marks)
- b. Explain the following breakdown mechanism in solid dielectrics :
i. Thermal breakdown
ii. Electromechanical breakdown. (10 Marks)

Module-2

- 3 a. Write a neat sketch explain the working of 4 stage Cockcroft Walton DC generator. (10 Marks)
- b. With the help of neat sketch explain the construction and working principle of generating voltmeter. (10 Marks)

OR

- 4 a. With a neat sketch explain the Marx circuit arrangement for multistage impulse generator. (10 Marks)
- b. Explain in brief the method of discharge detection using straight detector. (10 Marks)

Module-3

- 5 a. Discuss the essential qualities of a protective relay. (08 Marks)
- b. Explain various methods of back up protection. (06 Marks)
- c. Write a note on protection of parallel feeder. (06 Marks)

OR

- 6 a. Draw the schematic diagram of a numerical relay and briefly describe the functions of its various components. (08 Marks)
- b. Write the merits and demerits of static relay. (06 Marks)
- c. Differentiate between earth fault and an over current relay. (06 Marks)

Module-4

- 7 a. What is an impedance relay? Explain its operating principle, torque equation and operating characteristics of impedance relay. (10 Marks)
- b. Define the term pilot with reference to power line protection. List the different types of wire pilot protection scheme and explain circulating current protection. (10 Marks)

OR

- 8 a. Explain balanced (opposed) voltage differential protection. (06 Marks)
- b. With a neat sketch explain the working of frame leakage protection used for Bus-Zone protection. (06 Marks)
- c. With a neat diagram, explain construction and operation of Buchholz relay. (08 Marks)

Module-5

- 9 a. With a neat sketch, explain the construction and working of non-puffer type SF₆ circuit breaker. (08 Marks)
- b. With a neat sketch, explain the phenomenon of lightning. (06 Marks)
- c. Explain the phenomenon of current chopping with neat waveform. (06 Marks)

OR

- 10 a. With a neat sketch, explain the synthetic testing of circuit breaker. (08 Marks)
- b. With a neat diagram, explain the construction and working of Klydonograph. (06 Marks)
- c. What are the causes of over voltages arising on a power system? (Any 6). (06 Marks)

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