



Course/Branch : B.Tech/EEE/EE
 Subject Name : Power System protection
 Subject Code : KEE-077

Semester : V
 Max. Marks : 100
 Time : 180 min

CO-1: Describe the relays and different protective schemes.
 CO-2: Explain Relay types and its application.
 CO-3: Describe types of faults and protection scheme for major components of power system.
 CO-4: Describe the circuit breaker operation, testing and types.
 CO-5: Explain the electronic relay, microprocessor and computer-based protection schemes.

Section – A # 20 Marks (Short Answer Type Questions)

Attempt ALL the questions. Each Question is of 2 marks (10 x 2 = 20 marks)

Q. No.	COx	Question Description # Attempt ALL the questions. Each Question is of 2 marks
1	a	CO1 Define the term 'Protection Scheme' (K1)
	b	CO1 Define Automatic Reclosing in the context of power system protection. (K2)
	c	CO2 List the key characteristics of over current relays (K1)
	d	CO2 Define the distance protection relay (K2)
	e	CO3 What are the methods used for rotor protection in alternators? (K2)
	f	CO3 What is power line carrier protection, and how is it used (K2)
	g	CO4 List the key ratings of circuit breakers. (K1)
	h	CO4 What are the constructional features of Bulk Oil circuit breakers (K2)
	i	CO5 Explain the primary function of static relays. (K2)
	j	CO5 Describe a basic logic circuit used in protection schemes (K2)

Section – B # 30 Marks (Long / Medium Answer Type Questions)

Attempt ALL the questions. Each Question is of 6 marks (5 x 6 = 30 marks)

Q.2(CO-1): Elaborate on the evolution of protective relays and how it has impacted power system reliability. (K2)

OR

Describe the working principles of over current relays and their role in power system protection. (K3)

Q.3 (CO-2): Describe the principle of differential relays and how they are used to detect faults in power systems. (K3)

OR

Discuss the construction and working of static distance relays, including their application in protection schemes. (K3)

Q.4 (CO-3): Write the universal torque equation and using it plot the characteristics of an impedance relay and MHO relay on the R-X plane. Discuss the range setting of three impedance relays placed at a particular location. Discuss why zone 1 is not set for the protection of 100% of the line (K4)

OR

Explain carrier current protection scheme with the help of block diagrams and neat schematics. Discuss how directional comparison can be used to protect the feeder from both ends. (K4)

Q.5 (CO-4): Discuss the operating principle of SF6 circuit breaker. What are its advantages over other types of circuit breakers? For what voltage range is it recommended. (K4)

OR

Describe the construction, operation, and benefits of Vacuum circuit breakers in power systems. (K4)

Q.6 (CO-5): Explain the concept of reliability in protection schemes and the factors that influence it. (K3)

OR

Draw the schematic diagram of a microprocessor-based overcurrent relay and explain its working. Also develop the program flowchart for the relay. (K4)

Section – C # 50 Marks (Medium / Long Answer Type Questions)

Attempt ALL the questions. Each Question is of 10 marks.

Q.7 (CO-1): Attempt any TWO question. Each question is of 5 marks.

- a. What is the significance of Current Transformer (CT) in power system protection systems. Explain how a protection CT differ from a measurement CT (K3)
- b. Compare and contrast different classifications of Protective schemes, providing detailed examples for each.(K3)
- c. Describe in detail the concept of 'Zones of Protection' and its significance in electrical protection systems.(K3)

Q.8 (CO-2): Attempt any TWO question. Each question is of 5 marks.

- a. Discuss the time and current grading schemes used to provide selectivity in overcurrent protection? What are their limitation (K2)
- b. Discuss the application of directional overcurrent relay in the protection of parallel feeders and ring main systems with suitable examples (K3)
- c. What is the drawback of using overcurrent protection in the protection of transmission lines? Develop the trip law of the impedance relay and draw its characteristics on the R-X plane. What type of directional property does an impedance relay exhibit (K4)

Q.9 (CO-3): Attempt any TWO question. Each question is of 5marks.

- a. A star connected, 3Φ , 10 MVA, 6.6 kV alternator has a per phase reactance of 10%. It is protected by Merz-Price circulating current principle which is set to operate for fault currents not less than 175 A. Calculate the value of earthing resistance to be provided in order to ensure that only 10% of the alternator winding remains unprotected (K4)
- b. Describe the role of relays in detecting and isolating faults in power systems (K3)
- c. Explain how differential protection works in transformers and why it is essential. (K2)

Q.10 (CO-4): Attempt any TWO question. Each question is of 5 marks.

- a. Describe the working principle of Air Blast circuit breakers (K3)
- b. Discuss resistance switching and its application in improving circuit breaker performance (K2)
- c. Discuss short line interruption, including the factors that influence its occurrence and methods to manage it.(K3)

Q.11 (CO-5): Attempt any TWO question. Each question is of 5 marks.

- a. Describe the methods used to enhance the security of microprocessor-based protection schemes (K3)
- b. Explain how training circuits are integrated into static relays and their role in system reliability (K2)
- c. Describe the various types of level detectors used in protection circuits and their operating principles (K3)

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