

# CBCS SCHEME

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18EE72

Learning Resource Centre

Aharya Institute of Technology Seventh Semester B.E. Degree Examination, Feb./Mar.2022

## 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. With a neat diagram, explain zones of protection in a power system. (06 Marks)  
b. Discuss the essential qualities of a protective relay. (08 Marks)  
c. Explain various methods of back up protection. (06 Marks)

OR

- 2 a. Define the following terms :  
(i) Relay  
(ii) Operating force  
(iii) Pick up level  
(iv) Reset  
(v) Current setting (10 Marks)  
b. Write a short note on Automatic reclosure. (05 Marks)  
c. Write the advantage and disadvantages of the static relay. (05 Marks)

### Module-2

- 3 a. What is an impedance relay? Explain its operating principle, torque equation and operating characteristics of impedance relay. (08 Marks)  
b. Explain the operating principle of reverse power or directional relay with neat diagram. (06 Marks)  
c. Why IDMT relays are widely used for over current protection? (06 Marks)

OR

- 4 a. Discuss a protection scheme for parallel feeder. (06 Marks)  
b. Distinguish between earth fault relay and an over current relay. (06 Marks)  
c. Write and explain 3 stepped distance protection of transmission line. (08 Marks)

### Module-3

- 5 a. Define the term pilot with reference to power line protection. List the different types of wire pilot protection scheme and explain any one of the scheme. (08 Marks)  
b. Explain balanced (opposed) voltage differential protection. (06 Marks)  
c. The neutral point of a 11 KV an alternator is earthed through a resistance of 12  $\Omega$  the relay is said to operate when there is out of balance of a 0.8 A. The CT's have a ratio of 2000/5. What percentage of the winding is protected against earth fault? What must be the minimum value of earthing resistance required to give 90% of protection to earth phase. (06 Marks)

OR

- 6 a. With a neat sketch explain the working of frame leakage protection used for bus-zone protection. (08 Marks)  
b. With neat diagram, explain construction and operation of Burholz relay. (12 Marks)

**Module-4**

- 7 a. With a neat sketch, explain the recovery rate theory and energy balance theory of arc interruption in a circuit breaker. (10 Marks)
- b. Explain the terms: restriking voltage, recovery voltage and RRRV. Derive expression for restriking voltage and RRRV in terms of system voltage, inductance and capacitance. (10 Marks)

**OR**

- 8 a. What are the different types of air blast circuit breaker? Discuss their operating principle and area of application. (08 Marks)
- b. With a neat sketch, explain the direct testing of circuit breaker. (06 Marks)
- c. What are the merits and demerits of SF<sub>6</sub> circuit breaker? (06 Marks)

**Module-5**

- 9 a. Define the following terms:  
(i) Fuse  
(ii) Fuse element  
(iii) Rated current  
(iv) Minimum fusing current  
(v) Fusing factor. (06 Marks)
- b. Describe the construction and operation of the HRC cartridge fuse with indicator. Write applications of the HRC fuse. (08 Marks)
- c. Write discrimination between fuse and over-current protective devices. (06 Marks)

**OR**

- 10 a. Write note on Klydonograph and magnetic link. (08 Marks)
- b. What is a Gas Insulated Substation? Discuss its advantages and disadvantages as compared to conventional air insulated substation. (08 Marks)
- c. Write short note on Arcing horn with diagram. (04 Marks)

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