CBCS SCHEME

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18EE72

# Seventh Semester B.E. Degree Examination, June/July 2023
## 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. Discuss various zones of protection for a modern power system. **(06 Marks)**

b. List and explain the essential qualities of a protective relay. **(06 Marks)**

c. Write short notes on :
(i) Current Transformer (CT)
(ii) Potential Transformer (PT) **(08 Marks)**

**OR**

2 a. Derive an expression for torque produced by an induction relay. **(06 Marks)**

b. Discuss how an amplitude comparator can be converted to phase comparator and vice-versa. **(06 Marks)**

c. State the merits and demerits of static relays and discuss the operating principle of a rectifier bridge phase comparator. **(08 Marks)**

### Module-2

3 a. With a neat sketch, explain the construction and working principle of induction disc type reverse power relay. **(08 Marks)**

b. Discuss a protective scheme for ring main feeders. **(06 Marks)**

c. With a neat block diagram, explain the static inverse time over current relay. **(06 Marks)**

**OR**

4 a. With a neat sketch, explain the principle of operation, torque equation, and operating characteristics of impedance relay. Also, write the disadvantages of impedance relay. **(10 Marks)**

b. With a neat connection diagram, explain the working of directional earth fault relay. **(06 Marks)**

c. Explain the MHO Relay characteristics in the R-X diagram. **(04 Marks)**

### Module-3

5 a. With a neat sketch, discuss the phase comparison scheme of carrier current protection. **(07 Marks)**

b. With schematic diagram, explain balanced (opposed) voltage differential protection. **(07 Marks)**

c. With a neat diagram, explain the working of Buchholz Relay. **(06 Marks)**

**OR**

6 a. With a neat diagram, explain percentage differential protection of star-delta connected transformer. **(08 Marks)**

b. Explain the protection of a generator against:
(i) Loss of excitation
(ii) Stator inter turn fault **(08 Marks)**

c. With a neat sketch, explain differential scheme for bus zone protection. **(04 Marks)**

## Module-4

7 a. Discuss the recovery rate theory and energy balance theory of arc interruption in AC circuit breaker. **(06 Marks)**

b. With a neat sketch and waveform, explain the interruption of capacitive current. **(06 Marks)**

c. Derive an expression for restriking voltage and rate of rise of restriking voltage. **(08 Marks)**

**OR**

8 a. With a neat sketch, explain the working of axial blast circuit breaker. **(07 Marks)**

b. State the advantages and disadvantages of $SF_6$ circuit breaker. **(05 Marks)**

c. Explain the procedure adopted in unit test and synthetic testing of circuit breaker. **(08 Marks)**

## Module-5

9 a. With a neat diagram, explain the HRC fuse and list its advantages and disadvantages. **(06 Marks)**

b. With a neat sketch, explain the phenomenon of lighting. **(06 Marks)**

c. Write short notes on: (i) Klydonograph (ii) Protective angle **(08 Marks)**

**OR**

10 a. With a neat diagram , explain : (i) Rod-gap arrester (ii) Expulsion Arrester **(10 Marks)**

b. Write short notes on:

(i) Insulation coordination

(ii) Gas Insulated Substation (GIS) **(10 Marks)**

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