

# 17508

**11920**

**3 Hours / 100 Marks**

Seat No.

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- Instructions* – (1) All Questions are *Compulsory*.
- (2) Answer each next main Question on a new page.
- (3) Illustrate your answers with neat sketches wherever necessary.
- (4) Figures to the right indicate full marks.
- (5) Mobile Phone, Pager and any other Electronic Communication devices are not permissible in Examination Hall.

**Marks**

1. a) **Attempt any THREE of the following:** **12**
- (i) State any two advantages of current limiting reactor, using single line diagram show the placement of reactor in power system.
- (ii) State functions with their symbols:
- 1) Circuit Breaker
  - 2) Lightning arrester
  - 3) Earthing switch
  - 4) Current transformer
- (iii) Describe the difference between definite characteristics and inverse characteristics of relays.
- (iv) State Basic Insulation Level (BIL). Explain its significance w.r.t. insulation co-ordination of power system.

P.T.O.

**b) Attempt any ONE of the following: 6**

- (i) A3 phase transmission line operating at 10kV and having a resistance of 1 ohm and reactance of 4 ohm is connected to the generating station bus bars through 5 MVA step-up transformer having a reactance of 5%. The bus-bars are supplied by a 10 MVA alternator having 10% reactance. Calculate the short circuit kVA fed to symmetrical fault between phases if it occurs
- 1) at the load end of transmission line,
  - 2) at the high voltage terminals of the transformer.
- (ii) A3 Phase 66/11 kV star-delta connected transformer is protected by Merz-Price protection scheme. The CT's on the LT side have a ratio of 400/5 A. Find the ratios of the CT's on the HT side. Also draw a neat connection diagram of the complete scheme.

**2. Attempt any FOUR of the following: 16**

- a) With a neat sketch, explain the construction and working of HRC fuse.
- b) Differentiate between isolator and circuit breaker (any four point).
- c) State the precautions while using C.T. with justification.
- d) With the neat sketch describe protection scheme of an alternator against inter-turn faults.
- e) State the meaning of the term resistance earthing. List its any three advantages.
- f) State different causes of over voltages in an electrical power system.

**3. Attempt any FOUR of the following: 16**

- a) Define the following terms
  - (i) Arc voltage
  - (ii) Recovery voltage
  - (iii) Restriking voltage
  - (iv) RRRV

- b) Justify the statement 'ELCB is must for a residential installation'
- c) Describe microprocessor based relay with the help of block diagram.
- d) Explain negative phase sequence protection of alternator.
- e) State three protective devices used for the protection of alternator against:
  - (i) Overvoltage
  - (ii) Overspeed
  - (iii) Motoring
  - (iv) Rotor over heating

**4. a) Attempt any THREE of the following: 12**

- (i) State four advantages of SF<sub>6</sub> Circuit breaker over other types of CB's.
- (ii) Draw and explain basic relay circuit.
- (iii) Describe Fault bus protection of busbars, with neat labeled diagram.
- (iv) State any four types of lightning arresters with their particular application.

**b) Attempt any ONE of the following: 6**

- (i) Enlist the faults and normal abnormalities observed in induction motor. Explain working of single phase preventer with diagram.
- (ii) State and explain with diagram the principle of distance protection. What are the advantages of distance protection over other types of protection of feeders.

**5. Attempt any FOUR of the following:****16**

- a) State the criteria to select MCCB and circuit breaker rating for motor.
- b) Explain arc formation process and state the various methods of arc extinction.
- c) Classify electromagnetic attraction armature relays with only basic constructional diagrams
- d) Explain the operation of static overcurrent relay with block diagram and time current characteristics.
- e) State and explain quality requirements of relay with any four points.
- f) State the significance of directional relay. State the type of relay as a directional relay with its working.

**6. Attempt any FOUR of the following:****16**

- a) Determine the time of operation of a 1 A, 3 seconds overcurrent relay having Plug setting of 125% and Time multiplier of 0.6. The supplying CT is rated 400:1 Amp and fault current is 4000 Amp. The relay characteristics as per given below:

PSM	1.3	2	4	8	10	20
Time of operation in Sec	30	10	5	3.3	3	2.2

- b) Draw neat labelled circuit diagram with proper current direction of differential protection used for protection of alternator.
- c) State the protections provided by buchholz relay with constructional diagram. State the position of placement.
- d) Describe “restricted earth fault protection” of a star connected, neutral earthed side of power transformer.
- e) Explain the principle of time graded protection used for protection of feeders using IDMT overcurrent relay.