14115

3 Hours/100 Marks

Seat No.

Instructions : (1) **All** questions are **compulsory**.
(2) **Illustrate** your answers with neat sketches **wherever** necessary.
(3) Figures to the **right** indicate **full** marks.
(4) **Assume** suitable data, if **necessary**.
(5) **Use** of Non-programmable Electronic Pocket Calculator is **permissible**.
(6) Mobile Phone, Pager and any other Electronic Communication devices are **not** permissible in Examination Hall.

MARKS

1. A) Attempt **any three** of the following : **(3×4=12)**

   a) State any four abnormal conditions which can develop in power system and state its effect on power system.

   b) State the necessity of current limiting reactors in power system and classify the reactors on the basis of their location.

   c) State various causes of over voltages in an electrical power system.

   d) What are fundamental requirements of protective relaying ? What qualities relay must posses for satisfactory functioning.

   B) Attempt **any one** of the following : **(1×6=6)**

   a) Two 11 KV, 3 phase, 3000 KVA generators having reactance of 15% operates in parallel. The generator supply power to a transmission line through a 6000 KVA transformer of ratio 11/22 KV and having leakage reactance of 5%. Calculate fault current and faults KVA on H.T. side of a transformer.

   b) A 3 phase transformer of 220/11000 volts is connected in star/delta is protected by Merz price circulating current scheme. The protective transformer on 220 volt side have a current ratio of 600/S. What should be the ratio on 11000 volt side. Draw a neat diagram and indicate given values at appropriate places.

P.T.O.

MARKS

2. Attempt **any four** of the following : (4×4=16)

   a) Compare HRC Fuse and circuit brakers as an interrupting devices.

   b) State the sequence of operation of isolator, circuit breaker and earthing switches :
      i) while closing the circuit
      ii) while opening the circuit.

   c) Describe the construction and principle of operation of a typical lighting arrestor.

   d) State necessity of neutral earthing and list the different methods.

   e) Define the following terms related to relay :
      i) Relay time
      ii) Pick up
      iii) Reset
      iv) Fault clearing time.

   f) State the abnormalities and faults in alternator with necessary protection.

3. Attempt **any four** of the following : (4×4=16)

   a) Describe current zero method for arc extinction in circuit breaker operation.

   b) What is ELCB ? Describe its working.

   c) The current rating of an overcurrent relay is 5 Amp. Current setting is at 200%. Tsm = 0.4, CT ratio= 400/S. Fault current = 4000 Amp. Determine the operating time of the relay. Use the following table operating at various PSM at TMS = 1.

PSM	2	4	8	20
Relay time in Sec.	10	5	3	2.4

   d) State the common faults occurs in power transformer. Suggests the protection for these faults.

   e) What are the difficulties in differential protection scheme used for transformer ?

MARKS

4. A) Attempt **any three** of the following : (3×4=12)

   a) Draw a diagram of differential protection scheme for a star connected alternator and explain its working.

   b) Define the term insulation co-ordination. Draw the volt-time curve of an apparatus used in power system.

   c) Define following terms related to C.B. :

      i) Rated normal current

      ii) Rated breaking current

      iii) Short time rating

      iv) Symmetrical breaking current.

   d) Which are most commonly used schemes for bus bar protection ? Explain any one scheme in detail.

   B) Attempt **any one** of the following : (1×6=6)

   a) What type of motor protection is used for high capacity induction motors ? Describe the function of different relays used.

   b) What are advantages of distance protection over other type of protection of feeder ? Explain distance protection of transmission line.

5. Attempt **any four** of the following : (4×4=16)

   a) State any eight properties of SF_6 gas which is suitable for arc quenching.

   b) Describe the working principle, construction and advantages of vacuume circuit breaker with neat diagram.

   c) Describe with the help of neat diagram the construction and operation of Induction type over current relay.

   d) Explain how the plug setting and time setting can be done in induction relay.

   e) State advantages and disadvantages of static relays over electromagnetic relays.

   f) State salient features of microprocessor based protection relay. Draw block diagram of microprocessor based overcurrent relay.

6. Attempt **any four** of the following : **(4×4=16)**

   a) Draw neat labelled diagram of Buchholz relay.

   b) State the specifications of CT and PT as a protective transformer.

   c) How negative phase sequence current are set up in an alternator ? Draw protective scheme for same.

   d) Describe restricted earth fault-protection scheme for 3 phase Delta/Star transformer with neat diagram.

   e) What are the requirements of transmission line protection ?

_____