22524

3 Hours / 70 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.   **Attempt any FIVE of the following :**   **10**

a)   State the need of current limiting reactors in power system.

b)   Define normal and abnormal conditions in electrical system.

c)   Define the following terms :

i)   Arc voltage

ii)   Recovery voltage

d)   Draw time - current characteristics of IDMT relay.

e)   List any four protection scheme used for alternator.

f)   State any two requirements of transmission line protection.

g)   State the difference between short circuit and overload.

Marks

2. **Attempt any THREE of the following :** **12**

a) What are the causes of faults in power system ? State any four harmful effects of faults.

b) With the help of neat diagram explain arc extinction phenomenon for high resistance current interruption.

c) State following four basic relay terminologies –

    i) Relay time

    ii) Fault clearing time

    iii) Pick up

    iv) Reset

d) Draw and explain microprocessor based transformer protection.

3. **Attempt any THREE of the following :** **12**

a) A 10 MVA, 6.6 KV, 3-phase star connected alternator having a reactance of 20% is connected through a 5 MVA, 6.6 KV/33 KV transformer of 10% reactance to a transmission line having a resistance and reactance per conductor of $0.2\,\Omega$ and $1\,\Omega$ respectively. Fifty kilometer along the line, a short circuit occurs between the three conductor. Find the current fed by the fault by the alternator.

b) "ELCB is must for a residential installation." Justify the statement.

c) With the help of suitable diagram explain working of thermal relay.

d) A star connected 3-phase 10 MVA, 6.6 KV alternator is protected by circulating current protection. The star point being earthed via a resistance r. Estimate the value of earth resistor if 85% of the stator winding is protected against earth fault. Assume earth fault setting of 20%. Neglect the impedance of the alternator winding.

Marks

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

    a) Compare Isolator and Circuit Breaker on the basis of –

        i)   Function

        ii)   Arc quenching media

        iii) Types

        iv)   Application

    b) With a neat sketch, explain the operation of voltage balanced differential relay.

    c) What is Buchholz relay ? Which equipment is protected by it ? State it's any two limitations.

    d) Explain with sketch protection of 3-phase induction motor during single phasing.

    e) Describe differential protection of Bus-bar with neat labelled diagram.

5.   **Attempt any TWO of the following :**   **12**

    a) Explain construction and working of SF6 gas circuit breaker with neat diagram.

    b) Explain any six quality requirements for better protective relaying.

    c) A 3-phase 66/11 KV, star-delta connected transformer is protected by Merz-price protection scheme. The CT's on the 11 KV side have a ratio of 420/SA. Find the ratio's of the CT's on the 66 KV side. Also draw a neat connection diagram of the complete scheme and indicate the given values at appropriate places.

Marks

6. **Attempt any <u>TWO</u> of the following :** **12**

    a) Explain working of H.R.C. fuse with neat diagram. Also state their two application.

    b) Explain working of induction type directional over-current Relay.

    c) Explain how 'Pilot Wire protection is given to transmission line.

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