SWITCHGEAR AND PROTECTION

Time Allowed: 3 Hours

Full Marks: 60

Answer to Question No. 1 of Group A must be written in the main answer script. In Question No. 1, out of 2 marks for each MCQ, 1 marks is allotted for right answer and 1 marks is allotted for correct explanation of the answer. However, no marks will be given for wrong explanation of the answer of each MCQ type question.
Answer any Five (05) Questions from Group-B.

GROUP-A

1. Choose the correct answer from the given alternatives and explain your answer (any ten):   2×10=20

   i.   Most of the faults on overhead systems are _____ faults. (a) L-L (b) L-G (c) L-L-L (d) L-L-L-G

   ii. If the % reactance upto fault point is 20%, the short circuit current will be ----times of full load current. a) 20; b) 5; c)120; d) 1.8 .

   iii. The secondary winding of current Transformer never kept _____ during live condition.(a) Open (b) Short (c) Loaded (d) None of above.

   iv. SF6 circuit beaker is superior than oil circuit breaker due to the fact that (a) low thermal stability; (b) good insulating property; (c) good arc quenching property; (d) both b and c.

   v.   Induction relays are used with....... quantities. (a) ac (b) dc (ç) ac and dc (d) None of these.

   vi. The minimum relay coil current at which the relay operates is called (a) pick up value (b) reset value (c) relay time (d) None of this.

   vii. Earth fault protection relay has ____ current setting than over current relay. (a) more; (b) less; (c) same; (d) none of this.

   viii. What should be the value of fusing factor? Equal to zero (b) Equal to one (c) Less than one (d) More than one .

   ix. When a fault occurs in a high voltage transmission line, _____ and the supply being interrupted. (a) circuit breaker operates the relay (b) relay operates the circuit breaker (c) relay operates, then successively the isolator and the circuit breaker operates (d) isolator operates ,then successively the relay and the circuit breaker operates.

   x.   A 300/5 CT is connected with a induction type over current relay. The current setting of the relay coil is 1.25. The pick up value of the relay is a) 6.25 A; b) 5 A; c) 1.25A; d) 4.

   xi. Maximum fault occurs in (a) Transformer (b) Switch gear (c) Generator (d) overhead lines

   xii. Buchholz relay is used for: (a) Protection of a transformer against all internal faults (b) Protection of a transformer against external faults (c) Protection of a transformer against both internal and external fault (d) Protection of induction motors

   xiii. Assuming the same peak value, a $\frac{1}{50}$ µs surge _____ harmful than $\frac{3}{50}$ µs surge. a) more; b) less; c) about same; d) none of the above.

   xiv. The operating characteristic of a distance relay in the R-X plane is circle passing through origin. It represents operating characteristic of a (a) reactance relay (b) directional impedance relay (c) impedance relay (d) mho relay.

   xv. What is the difference between an overload and a short circuit? (a)An overload involves gradual current increase, while a short circuit is a sudden surge; (b) An overload occurs in faulty equipment, while a short circuit happens outside equipment; (c) An overload causes overheating, while a short circuit results in sparking; (d) All of the above.

GROUP-B
Answer any Five (05) questions.

2. (a) What is current limiting reactor?
(b) Two 11 kV, 36, 3000 kVA generators having sub transient reactance of 15% operate in parallel. Generators supply power to the transmission line through 6000 KVA transformer of ratio 11/22 kV and with a leakage reactance of 5%. Find fault current and fault MVA for 3-phase fault on:
(i) H.T side   (ii) L.T. side of transformer   2+6

3. (a) In asymmetrical fault calculation by symmetrical component method derive the value of $(1+a+a^2)$.
(b) Define and explain the following terms as applied to circuit breakers: i) Restriking voltage;
(ii) recovery voltage.   4+4

4. (a) Explain in brief working of ELCB.
(b) What is an isolator? Where it is used? Give the classification of isolators.   4+1+1+2

5. (a) Explain the construction and working of SF6 circuit breaker.
(b) What are the disadvantages of SF6 circuit breaker?   6+2

6. (a) Explain the working principal of induction type relay.
(b) What are the essential properties required for protective relay?   5+3

7. Explain the terms: (i) Current setting, (ii) Plug setting multiplier (iii) Time setting multiplier (iv) Relay timing.   2+2+2+2

8. (a) Explain the operating principal of percentage bias differential Relay.
(b) How impedance relay is used in protection of transmission?   6+2

9. (a) A 3-Ø transformer of 220/11000 line volts is connected in star/ delta. The protective transformer on 220V side has a current ratio of 600/5. What should be the CT ratio on 11,000 V side? Also draw necessary schematic diagram for the same.
(b) Discuss the important faults in alternator.   5+3

10. (a) Explain basic difference between surge arrester and surge absorber.   [2]
(b) Write short notes on i) Rod gap type Arrester, ii) Valve type Arrester.   3+3