

Roll No.:.....

National Institute of Technology, Delhi

Name of the Examination: B. Tech.

Branch : Electrical & Electronics Engg.

Semester : 6th

Title of the Course : Switchgear and Protection

Course Code : EEL 352

Time: 3 Hours

Maximum Marks: 50

- Note : 1. Do not write anything on the question paper except Roll number
2. Assume any data suitably if found missing

Section A: Answer all 10 multiple choice questions. Each question carries 01 mark. [10×1=10]

- A1.** The least expensive protection for over-current in low-voltage system is
(a) rewirable fuse (b) isolator (c) circuit breaker (d) air break switch
- A2.** Sparking occurs on switching-off the load due to circuit high
(a) resistance (b) capacitance (c) inductance (d) skin effect
- A3.** The recovery voltage will be maximum for power factor of
(a) zero (b) 0.5 (c) 0.707 (d) unity
- A4.** In a circuit breaker the currents that exists at the instant of contact separation is called the _____ current.
(a) restriking (b) breaking (c) arc (d) recovery
- A5.** Resistance switching is normally employed in
(a) all breakers (b) bulk oil breakers
(c) minimum oil breakers (d) air blast circuit breakers
- A6.** Which of the following circuit breakers has the lowest operating voltage?
(a) Air break (b) bulk oil (c) minimum oil (d) vacuum
- A7.** If the time of operation of a relay for unity TMS is 10s, the time of operation for 0.4 TMS will be
(a) 4s (b) 25s (c) 10s (d) none of these
- A8.** If the fault current is 2000A, the relay setting is 50% and CT ratio is 400/5, the plug setting multiplier will be
(a) 25 (b) 15 (c) 50 (d) 10
- A9.** The impedance relaying scheme is used for the protection of
(a) transformer (b) bus bar
(c) synchronous generator (d) transmission line

- A10. The relay best suited for phase fault relaying for medium transmission lines is
(a) mho relay (b) reactance relay (c) impedance relay (d) none of these

Section B: Answer any 4 questions. Each question carries 5 marks. [4×5=20]

- B1. Explain the various methods of arc extinction in a circuit breaker.
- B2. discuss the time graded over current protection for radial feeders, parallel feeders and ring main system.
- B3. Explain the working of induction type negative phase sequence relay with the help of schematic diagram.
- B4. Explain the combined leakage and overload protection of alternators.
- B5. A star-connected, 3-phase, 10 MVA, 6.6 kV alternator is protected by Merz-Price circulating-current principle using 1000/5 amperes current transformers. The star point of the alternator is earthed through a resistance of 7.5Ω . If the minimum operating current for the relay is 0.5 A, calculate the percentage of each phase of the stator winding which is unprotected against earth-faults when the machine is operating at normal voltage.

Section C: Answer any 2 questions. Each question carries 10 marks. [2×10=20]

- C1. Explain the construction, working, advantages, disadvantages and applications of SF6 circuit breakers.
- C2. Derive the equation for actual transformation ratio & phase angle error of CT with the help of neat phasor diagram. Also explain the measures to be taken in the design of CT to decrease various errors.
- C3. (a) Explain the construction and working of Buchholz relay [5]
(b) A 3-phase transformer having line voltage ratio of 0.4 kV/11 kV is connected in star-delta and protective transformers on the 400 kV side have a current ratio of 500/5. What must be the ratio of the protective transformers on the 11 kV side? [5]