

Seventh Semester B.E. Degree Examination, June/July 2025

Power System Protection

Time: 3 hrs.

Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

- 1 a. Explain the need for protective schemes and essential qualities of protection. (10 Marks)
- b. Explain primary and back up protection. Also explain briefly the classification of protective relays. (10 Marks)

OR

- 2 a. Draw a neat sketch of an induction cup relay and discuss its operating principle. (10 Marks)
- b. Compare static relays with electro mechanical relays. (10 Marks)

Module-2

- 3 a. Explain directional over current relay with a neat sketch. (10 Marks)
- b. Explain the protection of parallel feeders and ring mains. (10 Marks)

OR

- 4 a. Explain the effect of arc resistance on the performance of distance relays. (10 Marks)
- b. Two relays R_1 and R_2 are connected in two sections of a feeder as shown in Fig.Q.4(b) CT's are of ratio 1000/5A. The plug setting of R_1 is 100% and R_2 is 125%. The operating time characteristics are given in the table below. The time multiplier setting of the relay R_1 is 0.3. The time grading scheme has a determinative time margin of 0.5S between the relays. A 3ph short circuit at F results in a fault current of 5000 A. Find the actual operating times of R_1 and R_2 . What is the time multiplier setting (TMS) of R_2 ? (10 Marks)

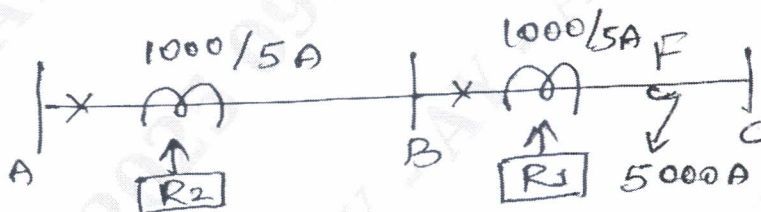


Fig.Q.4(b)

PSM	2	4	5	8	10	20
Operating time in seconds	10	5	4	3	2.8	2.4

Module-3

- 5 a. Explain the term 'Pilot' with reference to power line protection. What are the different types of pilots? Discuss their field of applications. (10 Marks)
- b. Explain carrier current protection. For what voltage range it is used for protection of transmission line. (10 Marks)

OR

- 6 a. Explain the working of Buchholz relay with a neat sketch. (10 Marks)
 b. An 11 KV, 100 MVA alternator is grounded through a resistance of 5Ω . The CTS have a ratio 1000/5. The relay is set to operate when there is an out of balance current of 1A. What percentage of the generator winding will be protected by the percentage differential of protection? (10 Marks)

Module-4

- 7 a. Derive an expression for restriking voltage and RRRV in terms of system voltage, inductance and capacitance. What are the measures to be taken to reduce them? (10 Marks)
 b. In a 220 KV system, the reactance and capacitance up to the location of the circuit breaker is 8Ω and $0.025 \mu\text{F}$, respectively. A resistance of 600 ohms is connected across the contacts of circuit breaker. Determine the following:
 i) Natural frequency of oscillation.
 ii) Damped frequency of oscillation.
 iii) Critical value of resistance which will give no transient oscillation.
 iv) The value of resistance which will give damped frequency of oscillation, one-fourth of the natural frequency oscillation. (10 Marks)

OR

- 8 a. With a neat sketch explain the construction and working of puffer type SF_6 C.B. (10 Marks)
 b. What are the different types of air blast circuit breakers? Discuss their operating principle and area of applications, which type is less affected by current chopping. (10 Marks)

Module-5

- 9 a. Describe with a neat sketch the working of HRC fuse, what are its advantages and disadvantages. (10 Marks)
 b. Discuss in detail causes for overvoltages in a power system. (10 Marks)

OR

- 10 a. Explain the working of klydonograph and magnetic links. (10 Marks)
 b. Explain the following:
 i) Minimum fusing current
 ii) Rated current
 iii) Fusing factor
 iv) Prospective current
 v) Cut off current. (10 Marks)
