

GANPAT UNIVERSITY
B.TECH. SEM-VII (ELECTRICAL ENGINEERING)
REGULAR EXAMINATION NOV-DEC 2015
2EE702:-PROTECTION & SWITCHGEAR

Time: 3 Hours

Total Marks:-70

- Instructions:** - 1. Attempt all questions.
 2. Make suitable assumptions wherever necessary.
 3. Answer to two sections must be written in separate answer books.
 4. Figures to the right indicate full marks.

SECTION-I

- Que.-1** (A) Explain properties of materials used as fuse element. [03]
 (B) With reference to fuse, define (i) Fusing factor (ii) Prospective current (iii) Pre arcing time [03]
 (C) Why is it difficult to interrupt dc current than ac current? Explain HVDC circuit breaker. [06]

OR

- Que.-1** (A) Explain the construction, working and application of HRC fuse with tripping device. Also state advantages of HRC fuse. [06]
 (B) Explain the properties of SF₆ gas which make it suitable as arc quenching medium in circuit breaker. [06]

- Que.-2** (A) Discuss current chopping phenomenon. [05]
 (B) In a 220 kV system, the reactance and capacitance up to the location of circuit breaker is 8 Ω and 0.025 μF respectively. A resistance of 600 Ω is connected across the contacts of the circuit breaker. Determine (i) Frequency of damped oscillation (ii) The value of critical resistance (iii) The value of resistance for 1576 Hz damped frequency of oscillations. [06]

OR

- Que.-2** (A) Explain synthetic testing of circuit breaker. [05]
 (B) Classify oil circuit breakers. [03]
 (C) With reference to circuit breaker, define (i) Symmetrical breaking capacity (ii) Making capacity (ii) Rated current [03]

- Que.-3** Attempt any two: [12]
 (A) Explain the construction and operation of directional power relay.
 (B) Explain the working of differential relay with clear schematic diagram and current equations.
 (C) What essential qualities does a protection scheme should have? Explain each of them briefly.

SECTION-II

- Que.-4** (A) Define (i) Reach (ii) Unit protection (iii) Primary protection [03]
 (B) Derive the equation for torque developed in an induction relay. [03]
 (C) Discuss the stator inter-turn protection scheme for alternator. [06]

OR

- Que.-4** (A) Explain the construction and operation of gas actuated relay used to provide protection to transformer. [06]
 (B) 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 earthing resistor if 85% of the stator winding is protected against earth faults. Assume an earth fault setting of 20%. Neglect the impedance of alternator winding.

- Que.-5** (A) The current rating of an over-current relay is 5 A. The relay has a plug setting of 150% and TMS of 0.4. The CT ratio is 400/5. Determine the operating time of the relay for a fault current of 6000 A. At TMS =1, the operating time at various PSM are given as: [05]

PSM	2	4	5	8	10	20
Operating Time (sec)	10	5	4	3	2.8	2.4

- (B) Draw and explain differential current protection of bus zone. What are its limitations? How can they be overcome? [06]

OR

- Que.-5** (A) Discuss three stepped distance protection of transmission line using impedance relays. [05]
 (B) Explain the effect of arc resistance and power swing on the performance of impedance, mho and reactance relays. [06]

Que.-6 Attempt any two:

- (A) Discuss merits and demerits of numerical relays.
 (B) With neat schematic diagram, explain phase comparison carrier current protection.
 (C) Explain carrier aided direct transfer tripping (under reaching) scheme.

END OF PAPER