

B 350

B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2005

Sixth Semester

Electrical and Electronics Engineering

EE 338 — PROTECTION AND SWITCHGEAR

Time : Three hours

Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Mention the various parameters used for discriminating fault location in a power system.
2. What are the different inverse time characteristics of overcurrent relays and mention how the characteristics can be achieved in practice for an electromagnetic relay.
3. Draw a protection scheme to detect a turn-turn fault in a winding of an alternator.
4. A three phase 500k VA, 11/0.4kV transformer is connected in Delta/Star. The protection transformer on the LV side have turns ratio of 500/5. What will be the CT ratio on the HV side if the transformer?
5. What is the effect of current asymmetry on the instantaneous values of recovery voltage?
6. Mention the different methods of high resistance arc interruption.
7. What are the main design problems in HVDC circuit breakers?
8. Enumerate the chief requirements of the contact material for vacuum circuit breaker.
9. Draw the v-i characteristics of Z_n O lightning arrester.
10. Mention the different sources of over voltages in power system.

11. (i) Explain in detail the theory of circuit interruption in circuit breaker. (10)
 (ii) Write short notes on the selections of circuit breakers. (6)
12. (a) Explain the principle of operation of (i) Circulating current differential protection and (ii) Balanced voltage differential protection and compare them. (8+6+2)

Or

- (b) (i) What are the different types of phase comparators? (2)
 (ii) Describe any three circuits of coincidence type of phase comparator. (14)
13. (a) (i) Explain restricted earth-fault protection for generators? (8)
 (ii) A 500 k VA, 6.6KV Star connected alternator has a synchronous reactance of 1.0 Ohm per phase and negligible resistance. The differential relay operates if the out-of-balance current through it exceeds 30% of the normal full-load current of the alternator. The star point of the alternator is earthed through a resistance of 5 ohms, what percent of the stator winding is left unprotected? Show that the effect of the alternator reactance can be neglected. (8)

Or

- (b) (i) Explain carrier system of protection with a suitable block diagram. (8)
 (ii) Explain the phase comparison method of carrier current protection. (8)
14. (a) (i) Explain the role of oil in arc quenching in oil circuit breakers. (4)
 (ii) Compare the bulk oil and minimum oil circuit breakers based on rating, constructional detail, principle of operation and limitations. (12)

Or

- (b) (i) Give the properties of SF₆ gas that make it more useful for circuit breaking. (6)
 (ii) Explain the principle of operation of an SF₆ breaker with neat sketches. (10)
15. (a) Discuss in detail the different methods of protection against over voltages.

Or

- (b) Draw the schematic block diagram of a microprocessor based impedance relay and explain the operation using a flow chart. (10+6)