B.E./B.Tech (Full Time) DEGREE END SEMESTER EXAMINATIONS, APRIL/MAY 2012

ELECTRICAL AND ELECTRONICS ENGINEERING

SEMESTER VII – (REGULATIONS 2004)

EE473 – PROTECTION AND SWITCHGEAR

Time:3 hrs Max Marks:100

Answer ALL Questions

Part A – (10×2=20)

1. How is method of symmetrical components used in analysis of unbalanced system?
2. Mention the importance of power system earthing?
3. Write down universal relay torque equation
4. Define the term, pick up value
5. Mention the uses of CTs and PTs in power system
6. What is the use of negative sequence current protection scheme in alternator?
7. What is meant by RRRV?
8. Write down the two methods of extinguishing the arc.
9. State the functions of oil in bulk oil circuit breaker.
10. What is meant by arc splitters?

Part B – (5×16=80)

11. (i) What is meant by symmetrical fault? How does it occur? (4)

(ii) A three phase transmission line operating at 10 kV and having a resistance of 1 Ω and reactance of 4 Ω is connected to the generating station bus-bars through a 5 MVA step-up transformer having a reactance of 6%. The bus-bars are supplied by a 10 MVA alternator having 12% reactance. Calculate the short circuit kVA fed to symmetrical fault between phases if it occurs at the high voltage terminals of the transformer and load end of transmission line. (12)

12. a. Derive operating characteristics of an impedance relay and mho relay. Explain how direction features are provided. Compare them. (16)

OR

b.(i) Draw and explain the block diagram of static relays and also state their merits and demerits. (8)

(ii)Explain construction and working principles of induction type directional power relay with suitable diagram. (8)

13. a.(i) Describe the inter-turn protection arrangement for multi-turn generator with diagram. (8)

(ii) A three phase 15 MVA, 11kV star connected alternator is protected by the current balancing system of protection. If the ratio of the CTs is 1200/5, the minimum operating current of the relay is 0.7A and the neutral point earthing resistance is 5.5 Ω, calculate the percentage of each phase of stator winding which is unprotected against earth faults when the machine is operating at normal voltage. (8)

OR

b.(i) Describe the Merz-Price circulating current system for protection of transformers. (8)

(ii) A three phase, 66/11kV star-delta connected transformer is protected by Merz-Price system. The C.Ts on low voltage side have a ratio of 420/5 A. Find the ratio of C.Ts on high voltage side. (8)

14.a. (i) Derive the expression for resistance, which is to be inserted across the circuit breaker contacts during current chopping. (12)

(ii) Describe current chopping. (4)

OR

b. (i) Discuss how arc is initiated and sustained in a circuit breaker when the circuit breaker contacts break. (12)

(ii) Give the differences between fuse and circuit breaker. (4)

15.a.Describe with a neat diagram, the construction, principle of operation and applications of SF_6 circuit breakers. (16)

OR

b. Discuss the construction and operating principle of vacuum circuit breaker with suitable diagram. Write down its applications also. (16)