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15EE72

Seventh Semester B.E. Degree Examination, Jan./Feb. 2021 Power System Protection

Time: 3 hrs.

Max. Marks: 80

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

Module-1

- 1 a. Explain the nature is causes of faults. Discuss the consequences of faults on a power system. (08 Marks)
- b. Discuss how an amplitude comparator can be converted to a phase comparator. (08 Marks)

OR

- 2 a. Compare numerical relay with an electromechanical relay. (05 Marks)
- b. Explain various methods of backup protection. (05 Marks)
- c. Briefly explain the essential qualities of a protective relay. (06 Marks)

Module-2

- 3 a. An earth fault develops at point F on the feeder shown in Fig Q3(a) and the fault current is 16000A. The IDMT relays at points A & B are fed via 800/5 A CTs. The relay at B has a plug setting of 125% and Time Multiplier Setting (TMS) of 0.2. The circuit breakers take 0.20s to clear the fault, and the relay error in each case is 0.15s for a plug setting of 200% on the relay A, determine the minimum TMS on that relay for it not to operate before the circuit breaker at B has cleared the fault. Assume the operating time at PSM of 10 for a TMS of 1 = 3.0s. (08 Marks)

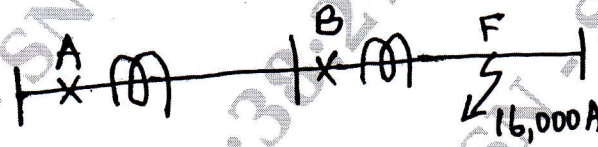


Fig Q3(a)

- b. What is an impedance relay? Explain its operating principle, torque equation and operating characteristics for impedance relay. (08 Marks)

OR

- 4 a. Describe the operating principle of reverse power or directional relay with neat diagram. (08 Marks)
- b. Explain Angle impedance relay with neat diagram. (08 Marks)

Module-3

- 5 a. Describe the balanced voltage (or opposed voltage) differential protection scheme. (08 Marks)
- b. With a neat sketch, discuss the differential scheme for bus zone protection. (08 Marks)

OR

- 6 a. Describe with a neat sketch, the percentage differential protection of a modern alternator. (08 Marks)
- b. Define the term pilot, with reference to power line protection list the difference types of wire pilot protection schemes and explain any one of the scheme. (08 Marks)

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
2. Any revealing of identification, appeal to evaluator and /or equations written eg. 42+8 = 50, will be treated as malpractice.

Module-4

- 7 a. With a neat sketch, explain the recover rate theory and energy balance theory of arc interruption in a circuit breaker. (08 Marks)
- b. For a 132KV system, the reactance and capacitance up to the location of the circuit breaker is 3Ω and $0.015\mu\text{F}$, respectively. Calculate the following :
- The frequency to transient oscillation
 - The maximum value of restriking voltage across the contacts of the circuit breaker
 - The maximum value of RRRV. (08 Marks)

OR

- 8 a. With a neat sketch, explain the direct testing of circuit breaker. (05 Marks)
- b. List the classification of circuit breaker. (05 Marks)
- c. What are the merits and demerits of SF_6 circuit breaker? (06 Marks)

Module-5

- 9 a. What do you mean by discrimination? Discuss discrimination between i) two fuses ii) a fuse and an over current relay. (08 Marks)
- b. Describe the protection of stations and substations against direct lightning strokes. (08 Marks)

OR

- 10 a. What is GIS? What are the various component of a GIS? Briefly, describe their functions. (08 Marks)
- b. Write short notes on :
- Klydonograph
 - Rod gap. (08 Marks)
