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18EE72

Seventh Semester B.E. Degree Examination, Jan./Feb. 2023
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 various zones of protection of a power system with the help of schematic diagram. **(06 Marks)**
   b. Explain various methods of backup protection. **(06 Marks)**
   c. Derive an expression for torque produced by an induction relay. **(08 Marks)**

OR

2. a. Give the comparison of electromagnetic relays and Numerical relays. **(05 Marks)**
   b. Explain the operation of induction cup type relay with the help of neat diagram. **(07 Marks)**
   c. Explain the various time – current characteristics of over current relays. **(08 Marks)**

Module-2

3. a. Give notes on protection of parallel feeders. **(05 Marks)**
   b. Explain the working of static impedance relay using Amplitude and phase comparator with the help of relevant diagram. **(08 Marks)**
   c. Explain the working of directional Earth fault Relay with the help of neat diagram. **(07 Marks)**

OR

4. a. Fig Q4(a), show distance protection for a section of power system. The I zone setting at A and B is 150Ω.
   i) What will be impedance seen by the relay at A for a fault at F_1? Will the relay at A operate before the circuit breaker at B has tripped?
   ii) Will the relay at B trip for a fault at F_1 before the circuit breaker at A has tripped?
   iii) If the circuit breaker C_2 fails for a fault at F_2, will the fault be cleared by relays at A and B?
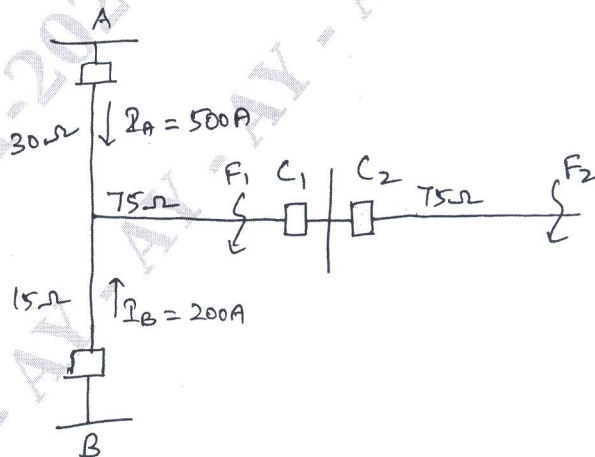   iv) How will the fault at F_2 be cleared?

Fig Q4(a)   **(08 Marks)**

b. Write a notes on Reach of a Distance Relays. **(04 Marks)**

c. Explain in detail with the help of block diagram
   i) Static definite time overcurrent Relay
   ii) Static Inverse – time overcurrent relay **(08 Marks)**

Module-3

5 a. What are the different operating schemes used in wire pilot protection? Explain in detail about circulating current scheme and opposed voltage scheme. **(08 Marks)**

   b. Explain the working of Buchholz's relay with the help of neat diagram. **(05 Marks)**

   c. An 11kV, 100MVA alternator is grounded through a resistance of 5Ω. The C.T.S 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 scheme of protection? **(07 Marks)**

OR

6 a. Write a note on :
   i) Stator – overheating protection of Generators.
   ii) Protection of Transformer against magnetizing inrush current. **(08 Marks)**

   b. Explain the working of biased (or) percentage differential relay with the help of neat schematic diagram and Derive its operating condition. **(08 Marks)**

   c. Give notes on Frame leakage protection. **(04 Marks)**

Module-4

7 a. Define: i) Restriking voltage   ii) Recovery voltage.
   Derive the expression for Restriking voltage and Rate of Rise of Ristriking Voltage (RRRV). **(10 Marks)**

   b. With the help of neat diagram, explain the working of cross – blast and Axial-blast circuit breakers. **(10 Marks)**

OR

8 a. Write notes on :
   i) Recovery rate theory
   ii) Energy balance theory of arc interruption in a circuit breaker. **(10 Marks)**

   b. With a neat circuit diagram, explain the synthetic testing of a circuit breaker. **(06 Marks)**

   c. Describe the current chopping phenomenon in a circuit breaker. **(04 Marks)**

Module-5

9 a. What are the components of CRS? Briefly describe their functions. **(08 Marks)**

   b. Explain the construction and working of HRC cartridge fuse. **(06 Marks)**

   c. With a neat diagram, explain the construction and working of 'klydonograph'. **(06 Marks)**

OR

10 a. Explain the lighting phenomena with the help of relevant diagrams. **(08 Marks)**

   b. With the help of neat diagram, explain the working of Rod gap and Arcing horn to protect against Travelling waves. **(08 Marks)**

   c. Define : i) Fuse   ii) Fusing factor. **(04 Marks)**

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