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Sixth Semester B.E. Degree Examination, June/July 08
Switch Gear and Protection

Time: 3 hrs.

Max. Marks:100

Note : Answer any FIVE full questions.

- 1 a. Define :
 i) Fuse ii) Rated current of the fuse ii) Fusing current iv) Fusing factor of the fuse. (08 Marks)
 b. With neat sketch, explain the HRC fuse and list its advantages and disadvantages. (08 Marks)
 c. Define circuit breaker. How they are classified? (04 Marks)
- 2 a. Explain recovery rate theory related to current zero method of arc interruption. (06 Marks)
 b. Derive an expression for restriking voltage and rate of rise of restriking voltage of circuit breaker. (07 Marks)
 c. For a 132 kV system, the reactance and capacitance upto the location of the circuit breaker is 3Ω and $0.015 \mu\text{F}$ respectively. Calculate the following
 i) The frequency of transient oscillation
 ii) Maximum value of restriking voltage across the contacts of the circuit breaker and
 iii) Maximum value of rate of rise of restriking voltage. (07 Marks)
- 3 a. By analyzing the resistance switching of circuit breaker, derive an expression for critical resistance. (08 Marks)
 b. Explain how arc can be extinguished in the circuit breaker. (04 Marks)
 c. In a 220 kV system, the reactance and capacitance upto the location of circuit breaker is 8Ω and $0.025 \mu\text{F}$ respectively. A resistance of 600Ω is connected across the contacts of the circuit breaker. Determine the :
 i) Natural frequency of oscillation.
 ii) Damped frequency of oscillation.
 iii) Critical value of resistance, which will give no transient oscillation.
 iv) The value of resistance which will give damped frequency of oscillation, one-fourth of the natural frequency of oscillation. (08 Marks)
- 4 a. With a neat sketch explain the operating principle of axial air blast circuit breaker. (06 Marks)
 b. Sketch and explain the working principle of sulphur hexa fluoride circuit breaker. (06 Marks)
 c. Explain the procedure adopted in unit test and synthetic testing of circuit breaker. (08 Marks)
- 5 a. Explain making capacity, breaking capacity and short time rating of the circuit breaker. (06 Marks)
 b. Define relay. Explain the fundamental requirements of relay. (06 Marks)
 c. Define the following relay terminologies :
 i) Operating force
 ii) Pick-up level
 iii) Reset level
 iv) Burden. (08 Marks)

- 6 a. Explain with neat sketch the construction and operation of induction type non-directional over current relay. (07 Marks)
 b. Explain with neat sketch the impedance type distance relay. (06 Marks)
 c.

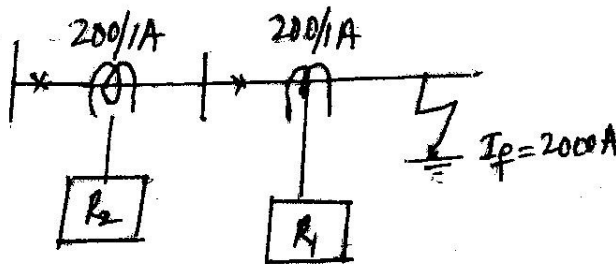


Fig.6(c)

Table

PSM	2	3.6	5	8	10	15	20
Time in Sec.	10	6	3.9	3.15	2.8	2.2	2.1

With reference to Fig.6(c) and tabular column the fault current is 2000A, for discrimination time grading margin between the relays is 0.5 sec, the plug setting multiplier of relay R_1 is 100%, the plug setting multiplier of relay R_2 is 125% and time multiplier setting of relay R_1 is 0.2. Determine the time of operation of the two relays.

(07 Marks)

- 7 a. With the help of neat sketch explain the working of Buchholz relay used for transformer protection. (10 Marks)
 b. Discuss the protection of an alternator against stator winding faults, field failure and rotor faults. (10 Marks)
- 8 Write short notes on :
 a. Primary and backup protection
 b. Current chopping
 c. Vacuum circuit breaker
 d. Negative sequence relay. (20 Marks)
