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06EE62

Sixth Semester B.E. Degree Examination, May/June 2010
Switchgear and Protection

Time: 3 hrs. Max. Marks:100

Note: ***Answer any FIVE full questions, selecting at least TWO questions from each part.***

PART – A

1 a. Explain the cut – off characteristics and time-current characteristics of a fuse. **(06 Marks)**

b. With a neat sketch, explain the construction and working of a high voltage liquid type fuse. **(06 Marks)**

c. Discuss the recovery rate theory and energy balance theory of arc interruption in a.c. circuit breaker. **(08 Marks)**

2 a. Explain the phenomenon of current chopping in a circuit breaker. **(06 Marks)**

b. What is resistance switching? Derive the expression for critical resistance interms of system inductance and capacitance, which gives no transient oscillation. **(08 Marks)**

c. In a 132 kV system, reactance and capacitance up to the location of the circuit breaker are 5 Ω and 0.02 μF respectively. A resistance of 500 Ω is connected across the circuit breaker. Determine : i) Natural frequency of oscillation ; ii) Damped frequency of oscillation and iii) Critical value of resistance. **(06 Marks)**

3 a. With a neat figure, explain the construction and working of an axial flow air – blast circuit breaker. **(08 Marks)**

b. Discuss, resistance switching in air – blast circuit breaker. **(06 Marks)**

c. Explain the following terms with respect to SF_6 gas i) Electronegativity and ii) Arc time constant. **(06 Marks)**

4 a. With a neat figure, explain the construction of an outdoor minimum – oil circuit – breaker. **(06 Marks)**

b. Discuss, direct testing of a circuit breaker. **(08 Marks)**

c. With a circuit diagram and waveform, explain synthetic testing an HV circuit breaker. **(06 Marks)**

PART – B

5 a. What is a protective relay? Discuss the basic requirements of protective relaying. **(08 Marks)**

b. Explain concept of zones of protection used in protection of large power systems. **(06 Marks)**

c. Differentiate between IDMT overcurrent relay and extremely inverse – time overcurrent relay characteristics. **(06 Marks)**

6 a. Explain the construction and working of a Buchholz relay. **(06 Marks)**

b. Determine the actual time of operation of a 5 ampere, 3 second over current relay having a current setting of 125% and a time setting multiplier of 0.6 connected to supply circuit through a 400/5 current transformer when the circuit carries a fault current of 4000 A. Time of operation is 3.5 seconds for the estimated value of PSM. **(06 Marks)**

c. Explain stepped time-distance characteristics of three distance relaying units used for I, II and III zones of protection. **(08 Marks)**

7 a. With the basic circuit diagram, explain harmonic restraint relay protection for a transformer. **(10 Marks)**

b. Describe the loss of excitation protection in a generator and its characteristics. **(10 Marks)**

8 Write short notes on :

a. Microprocessor based overcurrent relay

b. Vacuum circuit breaker

c. Restricted earth – fault protection in a transformer

d. Fuse and fuse materials. **(20 Marks)**

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