CLASS: BE   SEMESTER : VII/ADD
BRANCH: EEE   SESSION : MO/19

SUBJECT: EE7203 SWITCHGEAR AND PROTECTION

TIME: 3:00 HOURS   FULL MARKS: 60
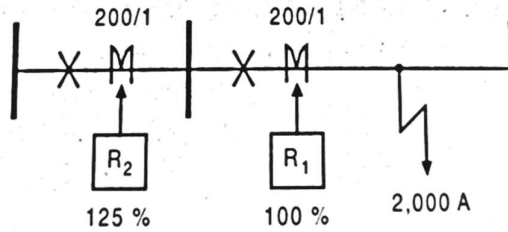
INSTRUCTIONS:
1. The question paper contains 7 questions each of 12 marks and total 84 marks.
2. Candidates may attempt any 5 questions maximum of 60 marks.
3. The missing data, if any, may be assumed suitably.
4. Before attempting the question paper, be sure that you have got the correct question paper.
5. Tables/Data hand book/Graph paper etc. to be supplied to the candidates in the examination hall.

Q.1(a)   Analyze the significance of operation of circuit breaker in power system protection.   [2]
Q.1(b)   Analyze resistance switching of circuit breaker and identify the resistance value to obtain the condition   [4]
         of no-transient oscillations.
Q.1(c)   In a system of 132 kV, the circuit phase to ground capacitance is 0.02 μF and the circuit inductance   [6]
         is 5 H. The circuit breaker interrupts a magnetizing current of 5 A (peak). Find: (i) The voltage across
         the circuit breaker contacts after the current interruption (ii) The value of the resistance to be used
         across the contacts to suppress restriking voltage.

Q.2(a)   Classify the circuit breaker based on their voltage range and breaking capacity?   [2]
Q.2(b)   Determine the rating of circuit breakers.   [4]
Q.2(c)   What are the different types of air blast circuit breakers? Discuss their operating principle and area of   [6]
         application.

Q.3(a)   Determine the significance of percentage differential protection scheme in protection of substation   [2]
         equipments.
Q.3(b)   Explain with neat diagram the percentage differential protection for a star connected generator with   [4]
         only four leads brought out.
Q.3(c)   A 3-phase, 2 pole, 11 kV, 10,000 kVA alternator has neutral earthed through a resistance of 7 Ohms.   [6]
         The machine has current balance protection which operates upon out of balance current exceeds 20
         % of full load. Determine % of winding protected against earth fault.

Q.4(a)   What is the significance of oil pressure relief valve in transformers?   [2]
Q.4(b)   What is magnetic inrush current in transformer? How can the transformer be protected?   [4]
Q.4(c)   Describe with the help of a neat diagram the connection of differential protection of a transformer.   [6]
         A 3-phase 33/6.6 kV, star/delta connected transformer is protected by differential protection system.
         The CT's on LV side have ratio of 300/5. Show that the CT's on HT side will have a ratio 60: $5\sqrt{3}$.

Q.5(a)   What is field suppression?   [2]
Q.5(b)   What are the abnormal operating conditions and causes of failure in induction motor?   [4]
Q.5(c)   Draw and explain the flowchart for relay operation for HL2 (Transmission line) protection.   [6]

Q.6(a)   Differentiate between electromechanical and numeric relay?   [2]
Q.6(b)   Determine the function of CT and PT in protection of power system.   [4]
Q.6(c)   Design the control logic for pre-acceleration of zone II in a distance relay protection at one end to   [6]
         synchronize with zone I protection at the other end in case of internal fault condition near the zone I
         of the transmission line..

Q.7(a)   Determine the time of operation of an IDMT relay of rating 5A and having setting of 125% and TMS =   [2]
         0.5. The relay is connected through a CT of 400/5 A. The fault current is 4000 A. The operating time
         for PSM of 8 is 3.2 Seconds.
Q.7(b)   Obtain the torque equation for operation of electromechanical relays.   [4]

Q.7(c) For the Fig. 1. Given below let fault current =2000 A; relay 1 is set on 100%; CT ratio = 200/1; relay 2 **[6]** is set on 125%. For discrimination the gradient margin between the relay is 0.5 second. Determine the time of operation of the two relays assuming that both relays have the characteristic as shown in the table and the relay no. 1 has a time multiplier setting = 0.2.

Plug setting multiplier	2	3.6	5	8	10	15	20
Time in seconds for a time multiplier of 1	10	6	3.9	3.15	2.8	2.2	2.1

Also determine the time setting multiplier of relay no. 2.