Name : ……………………………………………………

Roll No. : …………………………………………….

Invigilator's Signature : …………………………………….

CS/M.Tech (EE)/SEM-2/EDPM-203/2013
2013
POWER SYSTEM PROTECTION

*Time Allotted* : 3 Hours   *Full Marks* : 70

The figures in the margin indicate full marks.

Candidates are required to give their answers in their own words as far as practicable.

GROUP – A

1. Answer any *seven* of the following :   7 × 2 = 14

   a) What is unit type protection ?

   b) What is meant by time graded protection ?

   c) Why secondary side of CT's is not opened in operating condition ?

   d) Why it is not necessary to provide protection for turn-to-turn fault in turbo generator ?

   e) What is composite error of CT ?

   f) What is CT Burden ?

30688 (M.Tech)   [Turn over
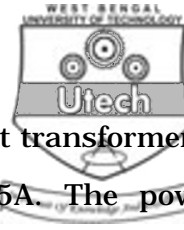
g) The rated secondary current of a current transformer is 5A. The plug setting of a relay is 2.5A. The power consumption of the relay at the 2.5A plug setting is 2VA. Calculate the effective VA burden on the current transformer.

h) What are the application of *dc* relays ?

i) What is stalling ?

j) Distinguish between through fault internal fault.

GROUP – B
Answer any *four* of the following.   4 × 14 = 56

2. a) Describe the principle of impedance type distance relay and explain its characteristic on V-I and R-X planes.

b) Obtain the expression of average rate of frequency change over a frequency interval [f1, f2], in terms of average power factor rating [p], relative load excess factor [L] and inertia constant [H] in order to determine the load shedding relay settings.   (5 + 4) + 5

3. a) A generator is provided with restricted earth fault protection. The ratings are 11 kV, 5000 kVA. The percentage of winding protected against phase to ground fault is 80%. The relay setting such that it trips for 25% out of balance. Calculate the resistance to be added in neutral to ground condition.

b) Describe bus zone protection by directional interlock.

c) Desribe the protection scheme of a low voltage (below 1000 V) 3-phase induction motor.   4 + 5 + 5

4. a) Describe the transient behaviour of CT's.

b) Describe High impedance differential protection based on voltage drop in case of busbar protection.

c) Discuss the special problem faced in protecting a series capacitor compensated transmission line.   5 + 5 + 4

5. a) Draw the schematic diagram of the carrier current protection scheme of lines. Also explain its working principle.

b) Discuss why second harmonic component of magnetizing inrush current is specifically chosen as the restraining quantity to achieve stability under magnetizing inrush condition.   (4 + 6) + 4

6. a) Describe vectorialy the Merz-Price differential protection scheme used for protection of delta-star transformer.

b) A 3 phase, 33/11 kV star-delta transformer is protected by Merz-Price system. The CT's on low voltage side have a ratio of 400/5A. Find the ratio of the CT's on the high voltage side.

c) What is the cause of overfluxing in a transformer ?

          7 + 3 + 4
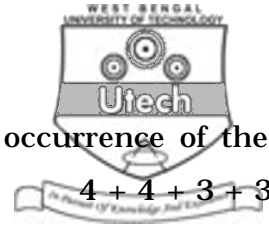
7. Briefly discuss the protection against the occurrence of the following with reference to a generator : 4 + 4 + 3 + 3

   a) Under frequency operation

   b) Loss of excitation

   c) Negative phase sequence or unbalanced loading

   d) Stator turn-to-turn fault.

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