Name : ....

Roll No. : ....

Invigilator's Signature : ....

CS/M.Tech(EE-NEW)/SEM-2/EDPM-203/2011
2011
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.

Answer any *five* questions.   5 × 14 = 70

1. a) Derive the time behaviour of the core flux linkages and the secondary current of current transformer.   8

   b) Consider the case of a purely resistive burden of 0·5 ohm being supplied by a current transformer with a core loss resistance of 100 Ω, and a magnetizing inductance of 0·005 H. Let the premary current with a steady state value of 100 A be fully offset. Let the primary fault circuit time constant be 0·1 second. Find the expression for flux linkage of the core and the secondary current.   6

30322 (M.Tech)   [Turn over
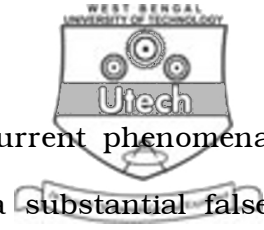
2. Discuss specially in relation to inrush current phenomena under different conditions that causes a substantial false differential current to trip a percentage differential relay.   14

3. a) Explain the principle of operation of an induction type directional overcurrent relay.   6

   b) Explain with circuit and phasor diagram, how the disadvantages in operation of the relay due to insufficient torque at the time of fault can be overcome. 8

4. a) Discuss the negative sequence protection of alternator against unbalanced current.   6

   b) Discuss the schemes which aer used for a generator :

      i)   Rotor earth fault protection

      ii) Winding turn to turn fault protection

      iii) Restricted earth fault protection.   3 + 2 + 3

5. Show that in a three-phase distance relay, regardless of the type of fault involved, relay will measure the positive sequence impedance to the fault.   14

6. a) Discuss the principle of protection of a multiterminal lines. 4

b) Discuss how the disadvantages of relay operation with zero voltage fault can be overcome. 4

c) Assuming relay characteristic angle as 45° for a mho relay, determine the zone setting of the relay for a given line impedance $Z_L = 2 + j5\Omega$ primary (to be protected).

Line impedance of the next line section = $3 + j\ 7.5\ \Omega$. Given CT ratio 400/1 and PT ratio 33000/110V. 6

7. Discuss the principle of operation of high impedance differential protection used for bus bar. What are its main disadvantages ? What is the main advantage of using linear coupler c.t.s. for bus protection. 9 + 3 + 2

8. Write short notes on the following : 5 + 5 + 4

a) Stepped distance protection

b) Underfrequency operation of generator

c) Loss of excitation of synchronous generator.

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