Name : .....

Roll No. : .....

Invigilator's Signature : .....

CS/M.Tech(EE)/SEM-2/PSM-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) What are the requirements of protective relaying ? Explain with sketches the construction of indication type relay. Develop the torque equation for this type of relay.

   b) Write down the principles of differential protection.

   3 + 4 + 3 + 4

2. What type of protective scheme is employed for the Bus-zone protection ? With neat sketches, discuss all the protective schemes. 2 + 12

3. a) What is impedance relay ? Write down the principle of impedance relay and explain its characteristic diagram and *R-X* diagram.

   b) Write down the effect of Power Surges (Power Swings) on the performance of distance relay and calculate the power swing analysis. 2 + 2 + 3 + 7

4. a) Write down the principles of directional over-current relay and explain with neat sketch.

   b) What is Auto-reclosing ? Discuss about the single shot Auto-reclosing in EHV transmission lines. 10 + 4

5. a) Discuss the types of generator faults.

   b) Draw the schematic diagram for protection against turn to turn fault on stator winding of a generator with voltage transformer connected in the circuit. Explain it.

   c) A generator is provided with restricted earth fault protection. The ratings are 11 kV, 5000 kVA. The percentage of winding protected against phase to earth fault is 80%. The relay setting is such that it trips for 25% of out of balance current. Calculate the ohmic value of resistance connected to neutral & ground.

   3 + 6 + 5

6. a) Explain with neat diagram the differential magnetic core balance protection system used for delta-star connected transformer.

   b) Discuss with sketch the earth fault protection of a star-star connected transformer.

   c) A 30 MVA, 11·5/69 kV star-delta power transformer is to be protected by differential protection. The H.V. side phase lags behind L.V. side by 30°. The continuous current carrying capacity of restraining coils should not exceed 5A. The C.T. ratio on 11·5 kV side is 3000/5. Find C.T. ratio on 69 kV side. 4 + 4 + 6

7. a) Explain with neat diagram, the carrier current transmission line protection.

   b) Explain with diagram the Merz-Price voltage protection scheme applied to a 3-ϕ line.

   c) Discuss the type of faults that are likely to occur in a 3-ϕ induction motor. Distinguish between short circuit overload and earth fault protection of motor. 5 + 5 + 4