



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 induction type relay. Develop the torque equation for this type of relay.  
  
b) Write down the principles of differential protection.

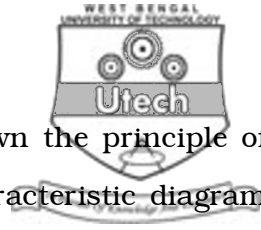
3 + 4 + 3 + 4

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

2 + 12

30012 ( M.Tech )

[ Turn over



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  $30^\circ$ . 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- $\phi$  line.
- c) Discuss the type of faults that are likely to occur in a 3- $\phi$  induction motor. Distinguish between short circuit overload and earth fault protection of motor. 5 + 5 + 4
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