Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

B. E. - SEMESTER – VII • EXAMINATION – WINTER 2012

Subject code: 170903 **Date: 01/01/2013**

Subject Name: Power System Protection

Time: 10.30 am - 01.00 pm **Total Marks: 70**

Instructions:

1. Attempt any five questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.

Q.1 (a) Discuss time and current grading schemes of overcurrent protection. Why is a combination of the above two schemes preferred? **07**

(b) Define the terms 'Plug Setting Multiplier' and 'Time Multiplier Setting' used in context of an IDMT relay. **07**

An IDMT type overcurrent relay is used to protect a feeder through a 500/1 A CT. The relay has a plug setting of 125% and TMS=0.3 . Find the time of operation of the said relay if a fault current of 5000 A flows through the feeder. Make use of the following characteristic:

PSM	2	3	5	8	10	15
Time for TMS=1	10	6	4.5	3.2	3	2.5

Q.2 (a) Explain, what are the basic requirements of a protective system. **07**

(b) Discuss the working principle of an induction relay and also derive an expression for the torque produced by it. **07**

OR

(b) Discuss the block schematic diagram of interface for a reactance type numerical relay. **07**

Q.3 (a) Explain in detail the time-distance characteristics of three impedance relaying units used for the I, II and III zone of protection. **07**

(b) Define the following: **07**

Reach, Overreach, Underreach, Fault Clearing time,
CT ratio error, CT phase angle error, Unit protection.

OR

Q.3 (a) Discuss a protective scheme for the protection of parallel feeders and ring main system. **07**

(b) Draw and explain the circuit connections of three MHO units used at a particular location for the three zones of protection. **07**

Q.4 (a) What are the limitations found in the simple differential protection of a transformer? How are they overcome? **07**

(b) Why should protective relays be put to rigorous testing before being put to use. What are the stability tests carried out on the relays. **07**

OR

Q.4 (a) With a neat sketch, discuss the differential scheme for bus-zone protection. **07**

Q.4 (b) What is magnetizing inrush current? What measures are taken to distinguish between the fault current and the magnetizing inrush current? Discuss the protective scheme which protects the transformer against faults but does not operate in case of magnetizing inrush current. **07**

Q.5 (a) Explain the principle of carrier aided directional comparison relaying for an internal fault and an external fault. **07**

(b) What are the effects of single phasing on an induction motor? What protection is used to detect single phasing? **07**

OR

Q.5 (a) What is meant by loss of excitation in a generator? What protection is used against it? **07**

(b) Compare the time-current characteristics of IDMT, very-inverse and extremely inverse overcurrent relays. Discuss their areas of applications. **07**

****