



Reg. No. : .....

Name : .....

**Sixth Semester B.Tech. Degree Examination, May 2013****(2008 Scheme)****Branch : Electrical and Electronics****08.605 : POWER SYSTEM ENGINEERING – II**

Time : 3 Hours

Max. Marks : 100

**Instruction :** Answer **all** questions from Part – **A** and **any one** full question from **each** Module in Part – **B**.

**PART – A**

1. Justify the statement 'For an alternator, a single line to ground fault is more severe than a three phase fault'.
2. The neutral grounding impedance  $Z_n$  appears as  $3 Z_n$  in the zero sequence network. Why ?
3. Draw zero sequence network of a two-winding transformer for (a) Star-star with star point grounded (b) Delta-star (c) Ungrounded star-delta (d) Delta-delta connections.
4. Explain the requirements of a protective relay.
5. With reference to a circuit breaker, define (a) Breaking capacity (b) Making capacity (c) Symmetrical breaking current (d) Assymetrical breaking current.
6. With a neat sketch explain the working of HRC fuse.
7. What are the drawbacks in differential current protection ?
8. Explain the high impedance relay scheme for bus bar protection.
9. Distinguish between primary protection and back-up protection.
10. How is protection against magnetic inrush current provided in a transformer ?

**(10×4=40 Marks)**

## PART – B

## Module – I

11. a) Discuss the principle of symmetrical components. Derive necessary equations to convert
- a) phase quantities into symmetrical component.
  - b) symmetrical components into phase quantities. 10
- b) The line currents in a 3-phase supply are  $I_a = (12 + j 24)$  A,  $I_b = (16 - j 2)$  A and  $I_c = (-4 - j 6)$  A. The phase sequence is abc, calculate the sequence components of currents of all phases. 10
12. a) Deduce the conditions for a single line to ground fault. Draw the sequence network for the above fault. 10
- b) A power station contains 3 similar, 3 phase, 50 Hz alternators each of 200 MVA, 11 kV and 0.9 pu reactance. Each machine is connected to a  $11/132$  KV transformer of 200 MVA and 0.09 pu reactance. The transformer secondaries feed a common 132 KV bus from which a short line takes off. Each phase of the line has a resistance of 0.5 ohm and an inductance of 8 mH. Find the fault MVA for a 3-phase fault the far end of the line. 10

## Module – II

13. a) What is universal torque equation ? Using this equation, derive the characteristics of (a) Impedance relay (b) Reactance relay (c) Mho relay. Sketch the characteristics and indicate clearly the zones of operation and non-operation. 10
- b) Compare time graded system, current graded system and time-current graded system of over current protection. Draw sketches to illustrate the same. 10
14. a) With a neat sketch, explain the construction and operation of vacuum circuit breaker or  $SF_6$  circuit breaker. 10
- b) With relevant circuits discuss the procedure of testing a circuit breaker. 10



**Module – III**

15. a) With a neat sketch, explain the Merz prize differential scheme of protection for a power transformer. 10
- b) What are the important faults on an alternator ? Explain any two stator faults and rotor fault. 10
16. a) With the help of a block diagram and flow chart explain the operation of any one microprocessor based relay. 10
- b) Write notes on : 10
- i) Amplitude comparator.
  - ii) Phase comparator.
  - iii) Buchholz relay.
-