Name : .....

Roll No. : .....

Invigilator's Signature : .....

CS/B.Tech(EE)/SEM-6/EE-602/2012

2012

POWER SYSTEM - II

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.

GROUP – A
(Multiple Choice Type Questions)

1. Choose the correct alternatives for any *ten* of the following : 10 × 1 = 10

i) Economiser is used to heat
   a) air b) feed water
   c) steam d) flue gas.

ii) A Buchholz relay is actuated by
   a) oil b) gas
   c) current d) voltage.

iii) The arc voltage in a circuit breaker is
   a) in phase with the arc current
   b) lagging the arc current by 90°
   c) leading the arc current by 90°
   d) in phase opposition of the arc current.

iv) Making capacity of a circuit breaker is
   a) 1·55 times the symmetrical breaking current
   b) 2·55 times the symmetrical breaking current
   c) 2·55 times the asymmetrical breaking current
   d) 2·55 times the peak symmetrical current.

v) Bus admittance matrix is a

a) full matrix b) sparse matrix

c) diagonal matrix d) rectangular matrix.

vi) x_0, x_1 and x_2 are the zero, positive and negative sequence reactances of a synchronous generator. then

a) $x_0 = x_1 = x_2$ b) $x_0 > x_1 > x_2$

c) $x_1 > x_2 > x_0$ d) $x_1 < x_2 > x_0$.

vii) Nuclear power plants are suitable as

a) peak load plants

b) base load plants

c) plants with variable outputs

d) plants with rapidly fluctuating loads.

viii) Equal area criterion is useful for the determination of

a) steady state stability

b) transient stability of two machine power system

c) transient stability of multi-machine power system

d) both steady state and transient stability of multi-machine power system.

ix) At slack bus, which of the following combinations of variables is specified ?

a) voltage magnitude, phase angle

b) active power, reactive power

c) active power, voltage magnitude

d) reactive power, voltage magnitude.

x) Which of the following quantities can never have a zero sequence component ?

a) phase voltages

b) Line voltages

c) Line currents of three phase four wire distribution system

d) Line currents in case of line to ground faults.

xi) Which of the following circuit breakers is not suitable for autoreclosing purpose ?
   a) Airblast circuit breaker
   b) Oil circuit breaker
   c) SF_6 circuit breaker
   d) Vacuum circuit breaker.

xii) Which of the following relays has the best reflectivity ?
   a) Over current relay b) Different relay
   c) Impedance relay d) Mho relay.

GROUP – B
(Short Answer Type Questions)

Answer any *three* of the following. 3 × 5 = 15

2. What are the applications of load flow analysis ? Why power system buses are classified into different types for load flow analysis ? 2 + 3

3. Derive relation between the sequence current in case of a single line to ground fault at the terminal of an initially unloaded synchronous generater and draw the corresponding sequence diagram. 3 + 2

4. Derive the swing equation for synchronous generator.

5. Discuss the role of air preheater, reheater and electro-static specipitators in a thermal power plant.

6. What is current chopping in circuit breaker ? Why current chapping is a problem in airblast circuit breaker, but not in oil circuit breaker ? 2 + 3

GROUP – C
(Long Answer Type Questions)

Answer any *three* of the following. 3 × 15 = 45

7. a) Derive necessary equations for the load flow solution using Gaus-Seidel method. 3

   b) Discuss the load flow solution algorithm using Gaus-Seidel method with the help of a flow chart. 6

   c) Obtain decoupled load flow equations from Newton-Raphason load flow equations. Mention the necessary assumptions. 6

8. a) Define 'recovery voltage', 'rate of rise of restriking voltage' and 'active recovery voltage'. Derive expression for the restriking voltage in terms of active recovery voltage. 3 + 6

   b) Write a short note on the rating of circuit breaker. 6

9. a) Differentiate between state and transient stability. 3

   b) Explain equal area criterion as applied to power system stability. 6

   c) A synchronous generator is delivering 0·5 P.U. power to infinite bus, the steady state stability limit of the generator being 1·0 P.U. The input power of the generator is suddenly increased to 0·85 P.U. Determine, whether the generator can maintain transient stability or not. 6

10. a) Discuss the principle of operation of distance relay. 3

    b) Describe the construction and operating principle of induction disc type relay. 7

    c) Explain the role of plug setting and time setting in over current relay. 5

11. a) Write short notes on any one of the following : 8

    i) Main components of a hydel power station and their functions.

    ii) Working of a thermal power station.

    b) A 500 MVA, 11 kV, 3 phase alternator was subjected to different types of faults. The fault currents are as given below : 7

    Three phase fault — 2000 A

    Line to line fault — 2600 A

    Line to ground fault — 4200 A

    The generator neutral is solidly grounded. Find the values of the sequence reactances of the alternator. Assume that generator has negligible winding resistance.