B.E (ELECTRICAL AND ELECTRONICS ENGINEERING)

COLLEGE OF ENGINNERING, ANNA UNIVERSITY CHENNAI - 25

EE9353 POWER SYSTEM OPERATION AND CONTROL - APRIL/MAY 2012

MAX TIME: 3Hrs MAX MARKS: 100

ANSWER ALL QUESTIONS

PART A (10*2=20)

1. Define load factor.
2. What is the need for maintaining the voltage and frequency for a power system?
3. What are the various features of SCADA system?
4. Frequency regulation is better in a two area interconnected system than a single area system against step load variation. Justify this statement.
5. What is 'Area Frequency Response Co-efficient' with reference to load frequency control? What does it signify?
6. Give the static performance characteristics of a speed governor.
7. What are the various constraints of the Unit Commitment problem?
8. What is participation factor with respect to economic load dispatch?
9. What is Area Control Error?
10. What is the need for Load forecasting?

PART B (5*16=80)

11. (i) Explain in detail Plant level and System level controls. (8)

(ii) A diesel station supplies the following loads to various consumers:

Industrial consumer	= 1200 KW
Commercial load	= 750 KW
Domestic load	= 600 KW
Domestic light	= 500 KW

If the maximum demand on the station is 2500 KW and the number of kwh generated per year is 45×10^5, determine the diversity factor and annual load factor. (8)

12.a) (i) Explain the cross coupling between Control loops. (8)

(ii) Explain the AVR loop with a block diagram. (8)

(OR)

12 b)Derive the transfer function of the Automatic load frequency control with the secondary loop control and perform the static analysis. (16)

13 a) (i) Explain in detail the various reactive power sources and sinks. (8)

(ii) Compare Static and Dynamic Voltage support (8)

(OR)

13 b) Explain how reactive power management and control is critical for maintaining overall system stability and hence explain the Voltage collapse phenomenon? (16)

14 a) The fuel-cost functions for three thermal plants in Rs/hr are given by

$$F1 = 0.004\,P^2_{g1} + 5.5\,P_{g1} + 500$$

$$F_2 = 0.006\,P^2_{g2} + 5.5\,P_{g2} + 400$$

$$F_3 = 0.009\,P^2_{g3} + 5.8\,P_{g3} + 200$$

where P_{g1}, P_{g2}, and P_{g3} are in MW.

Find the optimal dispatch and the total cost when the total load is 975 MW with the following generator limits:

$$100\ MW \le P_{g1} \le 450\ MW$$

$$100\ MW \le P_{g2} \le 350\ MW$$

$$100\ MW \le P_{g3} \le 225\ MW$$ (16)

(OR)

14 b) Explain the Forward Dynamic Programming solution for Unit Commitment problem with a flowchart (16)

15 a) (i) What is EMS? What are its major functions in power system operation and control? (8)

(ii) Explain the hardware configuration of Master Station and Remote Terminal Unit. (8)

(OR)

15 b) Explain the state transition diagram showing the various state transitions and control strategies. (16)