Roll No. | | | | | | | | | | |

B.E / B.Tech (Full Time) DEGREE END SEMESTER EXAMINATIONS, APRIL / MAY 2013

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

VI Semester

EE9353 Power System operation and Control

(Regulation R2008)

Time: 3 Hours | Answer ALL Questions | Max. Marks 100

PART-A (10 x 2 = 20 Marks)

1. What are the different components of a speed governing system?
2. What is 'Control Area' with respect to load frequency control?
3. What are the differences between installed and spinning reserve?
4. What are the salient features of a SCADA system?
5. In a 100 MW generator, if the frequency drops by 0.1 Hz but the turbine power must remain unchanged, by how much should the reference setting be changed?
6. What is EMS?
7. Define ACE.
8. Differentiate Plant level and system level controls.
9. What is Base point and participation factor?
10. What are the various reactive power sources and sinks?

Part – B (5 x 16 = 80 marks)

11. Draw the transfer function block diagram for a two area system along with the tie line provided with governor control.

12. a) i) Explain the static performance of a speed governor explaining all the three cases. (10)

ii) A diesel station supplies the following loads to various customers namely,Industrial load -1000 KW, Commercial Load – 750 KW, Domestic Load – 500 Kw and Domestic light – 500 KW.If the maximum demand on the station is 2500 KW and the number of Kwhr generated per year is $45*10^5$.Determine the diversity factor and Annual Load factor. (6)

OR

b) i) Perform the Static and dynamic analysis of Automatic Voltage Regulator. (8)

ii) A generating station has the following daily loads: (8)

Hours	Load (KW)
0-6	4500
6-8	3500
8-12	7500
12-14	2000
14-18	8000
18-20	2500
20-24	5000

13. a) Derive the open loop transfer function for Automatic Voltage Regulator with a block diagram.

OR

b) Explain in detail the various methods of Voltage Control.

14. a) Four units to be committed to serve 1 hr load pattern. Find the optimum unit commitment. Use forward dynamic programming method, assume that unit 2 and 3 are in operation at the start of the period. Fuel cost of each unit is 2.15 Rs/Mbtu.

UNIT	Max (MW)	Min (Mw)	Inc heat rate (Btu/KW hr)	No load cost (Rs/hr)	Start Up cost (Rs)	Inc Cost (Rs/MW hr)
1	80	25	10 440	213	350	20.88
2	250	60	9000	585.62	400	18
3	300	75	8730	684.74	-	17.46
4	60	20	11900	252	0	23.8

Load pattern

Hour	1
Load(MW)	520

OR

b) i) A power plant has two units with the following cost characteristics:

$$F_1 = 0.05\, P_{G1}^2 + 20.5\, P_{G1} + 300 \text{ Rs/hr.}$$

$$F_2 = 0.06\, P_{G2}^2 + 21.5\, P_{G2} + 600 \text{ Rs/hr.}$$

$$40 \text{ MW} \le P_{Gi} \le 120 \text{ MW};\ i = 1,2.$$

P_G's are the generating powers in MW. Find the optimal schedule for a load of 150 MW. (8)

ii) Explain the steps involved in the Lambda iteration method to solve an economic dispatch problem. (8)

15. a) Draw a block diagram to show the hardware components of Master station of SCADA system and explain the application of SCADA in monitoring and control of power system.

OR

b) Explain the different states of the power system and the various control actions taken under every state to maintain or bring back the system to normal operating mode.