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10EE82

**Eighth Semester B.E. Degree Examination, Dec.2016/Jan.2017**  
**Power System Operation and Control**

Time: 3 hrs.

Max. Marks:100

**Note: Answer FIVE full questions, selecting  
at least TWO questions from each part.**

**PART – A**

- 1 a. What is a SCADA system? Draw and explain the functional block diagram of the dual computer configuration for control and monitoring of power system. (10 Marks)  
b. Derive the expression for tie-line power and frequency deviation for two area system. (06 Marks)  
c. Two areas A and B interconnected by tie-line. The generating capacity of area A is 25,000 MW and its regulating characteristic is 2.5% of capacity per 0.1 Hz. Area B has a generating capacity 5000 MW and its regulating characteristic is 1.5% of capacity per 0.1 Hz. Find each areas share of a 800 MW disturbance (load increase) occurring in area B and resulting tie-line flow. (04 Marks)
- 2 a. What is the function of AVR? Explain with suitable block diagram, the mathematical modeling of AVR. (10 Marks)  
b. What is load frequency control? Obtain and explain the transfer function model of load frequency control for an isolated power system. (10 Marks)
- 3 a. Write notes on basic generator control loops and cross coupling between control loops. (05 Marks)  
b. Determine the primary ALFC loop parameters for control area having the following data:  
Total rated area capacity  $P_r = 2000$  MW  
Inertia constant 5.05, Frequency  $f_0 = 60$ Hz, Normal operating load  $P_D = 1000$  MW (05 Marks)  
c. A single area consists of two generators with following parameters:  
Generator – 1 = 1200 MVA,  $R = 6\%$  (on machine base)  
Generator – 2 = 1000 MVA,  $R = 4\%$  (on machine base)  
The units are sharing 1800 MW at nominal frequency of 50 Hz. Unit 1 supplies 1000 MW and unit 2 supplies 800 MW. The load is now increased by 200 MW. Choose a common base of 2000 MVA.  
Find (i) Steady state frequency and generation of each unit if  $D = 0$   
(ii) Repeat (i) if  $D = 1.5$ . (10 Marks)
- 4 a. Explain different sources of reactive power generation and absorption of reactive power in a power system. (08 Marks)  
b. Derive the equations to get the relation between voltage, power and reactive power at a node. (06 Marks)  
c. Explain voltage instability and voltage collapse. (06 Marks)

**PART – B**

- 5 a. Explain the problem of unit commitment. What are the constraints in solving the unit commitment problem? Explain each of it. (10 Marks)  
b. With the help of flow chart, explain the dynamic programming method in unit commitment problem. (10 Marks)
- 6 a. What is meant by power system security? Explain major functions involved in system security. Explain the factors affecting system security. (10 Marks)  
b. With the help of flow chart, explain the contingency selection procedure. (10 Marks)
- 7 a. Explain energy management system. (10 Marks)  
b. Explain the least square estimation method used in power system state estimation. (10 Marks)
- 8 a. Derive the steady-state reliability expression and general reliability expression. (10 Marks)  
b. With the help of flow chart, explain loss and load probability for planning of generating capacity. (10 Marks)

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