USN | | | | | | | | | | |

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)**

* * * * *