

|  |  |  |  |  |  |  |  |  |  |
|--|--|--|--|--|--|--|--|--|--|
|  |  |  |  |  |  |  |  |  |  |
|--|--|--|--|--|--|--|--|--|--|



## P.E.S. College of Engineering, Mandya - 571 401

(An Autonomous Institution affiliated to VTU, Belgaum)

**Eighth Semester, B.E. - Electrical and Electronics Engineering**

**Semester End Examination; June/July - 2015**

**Power System Operation and Control**

Time: 3 hrs

Max. Marks: 100

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

### PART - A

1. a. What is the SCADA? Explain its role in power system operation and control. 7
- b. Discuss the parallel operation of two generators having different, capacity and regulation characteristics. 7
- c. Generators  $G_1$  and  $G_2$  are operating at 1P.U. frequency (60 Hz). The rating of unit 1 is 337 MW and has 0.03-P.U. droop built into its governor. Unit 2 is rated at 420 MW and has 0.05-P.U. droop. Find sharing of  $G_1$  and  $G_2$  and actual frequency for 0.1P.U.(10%) increase in load demand. The system is operating at 1 P.U. frequency (60 Hz) 6
2. a. With neat schematic representation, explain basic generator control loops. 7
- b. Draw and explain the ALFC with supplementary control system for a 2 area system. 7
- c. Determine the primary ALFC loop parameters for a control area having the following data with the assumption that the load frequency dependency and linear. Total rated area capacity  $P_r = 2000$  MW, Normal operating load  $P_D^0 = 1000$  MW, Inertia constant  $H = 5$  seconds, Regulation  $R = 2040$  Hz/PU MW. 6
3. a. Discuss in brief about the methods of voltage control. 7
- b. Derive the relation between voltage, power and reactive power at node. 7
- c. Discuss in brief about generation and absorption of reactive power. 6
4. Write short notes on the following :
  - (i) Area control error
  - (ii) Primary ALFC loop 20
  - (iii) AVR loop
  - (iv) Sub synchronous resonance.

### PART - B

5. a. Briefly explain the various constraints used in unit commitment analysis. 7
- b. Explain unit commitment analysis using suitable flow chart by dynamic programming method. 7
- c. Construct a priority list and write commitment rule for three units whose data are given below: 6

| Unit | Full load Average Production cost<br>Rs/MWh | P <sub>G</sub> MW (Min) | P <sub>G</sub> MW (Max) |
|------|---|-------------------------|-------------------------|
| 1    | 9.79  | 150                     | 600                     |
| 2    | 9.48  | 100                     | 400                     |
| 3    | 11.188                                      | 50                      | 200                     |

- 6 a. What is meant by power system security? Discuss on the various factors that affect the power system security. 10
- b. What is contingency ranking? How are the critical cases identified, ranked and filtered during contingency analysis? 10
- 7 a. What is state estimation? Explain its role in the operation and control of power systems. 10
- b. Discuss in brief on the maximum likelihood concepts of state estimation. 10
8. Write short notes on the following :
- (i) Spinning reserve
  - (ii) Major functions of power system security 20
  - (iii) State estimation in power systems
  - (iv) Typical results of state estimation on an AC network.

\* \* \* \* \*