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10EE82

**Eighth Semester B.E. Degree Examination, Dec.2018/Jan.2019**  
**Power System Operation and Control**

Time: 3 hrs.

Max. Marks:100

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

**PART – A**

- 1 a. What is energy control center? Explain the functions of energy control center. (06 Marks)
- b. With block diagram, explain the digital computer configuration of the SCADA system. (07 Marks)
- c. Explain the parallel operation of generator with infinite bus. (07 Marks)
- 2 a. What is automatic voltage regulator? Obtain the mathematical modeling of exciter. (07 Marks)
- b. Two areas are interconnected. The generating capacity of A is 36,000 MW and its regulating characteristic is 1.5% of capacity/0.1 Hz. Area-D has a generating capacity of 40,000MW and its regulating characteristic is 1.0% of capacity/0.1Hz. Find each areas share of a +400 MW disturbance occurring in D and the resulting tie line flow. (05 Marks)
- c. Explain the static performance of the Automatic Voltage Regulator (AVR) loop. (08 Marks)
- 3 a. What is Automatic Load Frequency Control (ALFC)? Obtain the mathematical modeling to close the ALFC loop. (06 Marks)
- b. With block diagram, explain the static response of two area system. (10 Marks)
- c. Determine the primary ALFC loop parameters for a control area having the following data:  
 Total rated area capacity  $P_r = 2000\text{MW}$   
 Normal operating load  $P_D^0 = 1000\text{MW}$   
 Inertia constant  $H = 5.0\text{sec}$   
 Regulation  $R = 2.4\text{Hz/pu MW}$   
 Frequency  $f = 60\text{ Hz}$   
 Take  $\partial P_D^0 = 10\text{MW}$  and  $\partial f = 0.6\text{ Hz}$ . (04 Marks)
- 4 a. Derive an expression to relate voltage, power and reactive power at a node. (06 Marks)
- b. Explain the method of voltage control by
  - i) Shunt capacitor and reactor
  - ii) Synchronous compensator. (07 Marks)
- c. With PV diagram, explain the phenomina of voltage collapse. (07 Marks)

**PART – B**

- 5 a. What is unit commitment? Explain the constraints in solving the unit commitment problem. (10 Marks)
- b. With the help of flow chart, explain the dynamic programming technique. (10 Marks)
- 6 a. What is system security? Explain the security constrained optimal power flow. (06 Marks)
- b. With the help of flow chart, explain the contingency analysis. (08 Marks)
- c. Explain the DC load flow technique for contingency analysis. (06 Marks)

- 7 a. What is state estimation? Explain the power system state estimation. (10 Marks)  
b. Explain the least square technique. (10 Marks)
- 8 a. Define reliability. Explain the mode of failures in a system. (05 Marks)  
b. Derive the following reliability expression: (08 Marks)  
i) Reliability index.  
ii) Steady state reliability expression.  
iii) General reliability expression. (07 Marks)  
c. With flow chart, explain the loss of load probability.

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