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10EE82

Eighth Semester B.E. Degree Examination, Dec.2017/Jan.2018
Power System Operation & Control

Time: 3 hrs. Max. Marks:100

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

PART – A

1 a. Discuss different states of power system with neat sketch. **(05 Marks)**

b. Derive an expression for Tie-Line power and frequency deviation for two area system. **(05 Marks)**

c. Two synchronous Generators are initially supplying a common load at 1.0 p.u and frequency of 50 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 each unit share of 10% increase in load demand. Also find new-value of Line frequency. Assume free governor action. **(10 Marks)**

2 a. For two generators operating in parallel deduce,

$$R_{system} = \frac{1}{\frac{P_1 rate}{R_1} + \frac{P_2 rate}{R_2}} \text{ 1 /MW}$$

Where R_1 and R_2 are droop characteristics of Generator 1 and Generator 2. **(08 Marks)**

b. With a neat block diagram, explain (i) Load model (ii) Generator model. **(06 Marks)**

c. Explain (i) Automatic generator control (ii) Area control error. **(06 Marks)**

3 a. With a block diagram, list the functions of, (i) AVR (ii) ALFC loops. **(05 Marks)**

b. Determine the primary ALFC loop parameters for control area having the following data:
(i) Rated capacity of area = 2000 MW (ii) Frequency = 50 Hz
(iii) Inertia constant = 5.0 (iv) Operating load (P_D) = 1000 MW **(05 Marks)**

c. A single area consist 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 system load is increased by 200 MW. Find (i) Steady state frequency and generation of each unit if D = 0. (ii) Repeat (i) if D = 1.5
Assume a base of 2000 MVA. **(10 Marks)**

4 a. Explain different sources of reactive power generation and absorption of reactive power in a power system. **(05 Marks)**

b. Deduce a equation relating voltage, power and reactive power at node. **(05 Marks)**

c. A 220 KV, line has tap changing transformer at both ends. The transformer at sending end has a nominal ratio of 11/220 KV and that at receiving end 220/11 KV. The line impedance is $20 + j60\Omega$ and the load at the receiving end is 100 MVA , 0.8 γ.f (lag). If the product of two off-nominal tap setting is 1, find the tap-setting to give 11 KV at load Bus. **(10 Marks)**

PART – B

5 a. Explain in detail constraints in unit commitment problems. **(10 Marks)**

b. With a neat flow-chart, explain forward dynamic programming method of solving u.c. problem. **(10 Marks)**

6 a. What is meant by power system security? Explain major functions involved in system security. What are the factors affecting system security? **(10 Marks)**

b. With the help of flow-chart, explain contingency analysis. **(10 Marks)**

7 a. Explain 'Energy Management System'. **(10 Marks)**

b. Derive the steady-state reliability expression and general reliability expression. **(10 Marks)**

8 Write short notes on : (any four)

a. u.c. problem.

b. Least square estimation.

c. Spinning reserve.

d. B-coefficients.

e. Network sensitivity factors. **(20 Marks)**

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