CBCS SCHEME

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17EE81

Eighth Semester B.E. Degree Examination, June/July 2023
Power System Operation and Control

Time: 3 hrs. Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
2. Any revealing of identification, appeal to evaluator and /or equations written eg, 42+8 = 50, will be treated as malpractice.

Module-1

1 a. What are the objectives of power system control? Explain major control systems implemented in a power system. **(10 Marks)**

b. Explain the various constraints to be considered in unit commitment. **(10 Marks)**

OR

2 a. With a neat diagram, describe the major components of SCADA system. **(10 Marks)**

b. Draw the flow chart for the priority list method of unit commitment and explain. **(10 Marks)**

Module-2

3 a. Draw the flowchart for the γ - λ iterative technique for hydrothermal scheduling and explain. **(10 Marks)**

b. With a neat diagram, describe the Basic Generator Control loops. **(10 Marks)**

OR

4 a. Explain the following terms used in AGC:
(i) Control Area (ii) Frequency
(iii) Time deviations (iv) Unit Control Errors **(10 Marks)**

b. Draw the block diagram of steam turbine governing system and explain functions of the major components. **(10 Marks)**

Module-3

5 a. Derive the transfer function for the complete ALFC Model. **(10 Marks)**

b. Consider an isolated generator of 500 MVA, M = 8 pu MW/pu freq/s on the machine base. The unit is supplying a load of 400 MVA. The load changes by 1.5% for a 1% change in frequency. Draw the block diagram for the equivalent generator load system. For an increase of 10 MVA in the load, determine the steady-state frequency deviation. **(10 Marks)**

OR

6 a. Derive the state model of an isolated AGC system. **(10 Marks)**

b. Two control areas are connected via a tie line with the following characteristics.
Area 1 : $R_1 = 1\%$ $D_1 = 0.8$, base MVA : 500
Area 2: $R_1 = 2\%$ $D_2 = 1.0$, base MVA : 500
A load change of 100 MW occurs in Area 1. Find the new steady state frequency, change in the line flow and change in generation of each area if nominal frequency is 50 Hz. **(10 Marks)**

Module-4

7 a. Discuss on related issues in AGC implementation. **(10 Marks)**

b. Two control area of capacity 1500 MW and 10,000 MW are interconnected through the tie line. The parameters of each area on its own capacity are R = 1 Hz/pu MW and D = 0.02 pu MW/Hz. There is an increase of 200 MW in load of area 2. Determine the steady state frequency deviation and change in the line power. **(10 Marks)**

OR

8 a. Explain the different methods of voltage control by reactive power injection. **(10 Marks)**

b. At a 3ϕ, 11 KV bus, a load drawing (2 + j1) MVA is connected. The 11 KV bus is supplied from a radial line. The total system reactance is 0.5 Ω/phase. Calculate:

(i) The receiving end current
(ii) The regulation
(iii) The sending end voltage
(iv) The short-circuit capacity of system

Assume the system to be lossless. **(10 Marks)**

Module-5

9 a. With a flow chart, explain contingency analysis for generator outage. **(10 Marks)**

b. Discuss on major issues of state estimation. **(10 Marks)**

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OR

10 a. With a neat flow chart, explain contingency analysis for line outage, using line outage distribution factors. **(10 Marks)**

b. Obtain an expression for state estimator problem by weighted least square technique in DC state estimation. **(10 Marks)**

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