CBCS SCHEME

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15EE81

Eighth Semester B.E. Degree Examination, Dec.2019/Jan.2020
Power System Operation and Control

Time: 3 hrs. Max. Marks: 80

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

Module-1

1 a. With a neat diagram describe the major components of SCADA system. **(08 Marks)**

b. Explain the spinning reserve and thermal constraints in unit commitment. **(04 Marks)**

c. Discuss on different emergency control action initiated in a power system to prevent degradation of system. **(04 Marks)**

OR

2 a. With a flow chart explain the priority list method of unit commitment. **(08 Marks)**

b. What are the different states in which power system operates? Explain. **(08 Marks)**

Module-2

3 a. Deduce an expression for gradient vector in hydrothermal scheduling based on discrete time interval. **(08 Marks)**

b. Two generators rated 200 MW and 400 MW are operating in parallel. The droop characteristics of their governor are 4% and 5% respectively from no load to full load. The speed set points are such that the generators operate at 50Hz when sharing the full load of 600 MW in proportion to their ratings:

(i) If load reduces to 400 MW, who is the load shared, at what frequency will system operate.

(ii) If speed changer are reset so that load of 400 MW is shared at 50 Hz in proportion to their rating what is the no load frequency now? **(08 Marks)**

OR

4 a. Deduce an expression for hydro power generation and thermal power generation in lambda-gamma technique of hydro thermal scheduling. **(09 Marks)**

b. Two machines operate in parallel to supply a load of 400 MW. The capacities of the machines are 200 MW and 500 MW. Each has a droop characteristic of 4%. Their governors are adjusted so that frequency is 100% on full load. Calculate the load supplied by each unit and the frequency at this load. The system is a 50 Hz system. **(07 Marks)**

Module-3

5 a. Two areas A_1 and A_2 are interconnected by a Tie line T_{12}. Derive an expression for frequency change and Tie line power flow when the load in Area 1 changes. **(08 Marks)**

b. Two areas 1 and 2 are interconnected. The capacity of area 1 is 1500 MW and area 2 is 500 MW. The incremental regulation and damping torque coefficient for each area on its own base are 0.2 pu and 0.9 pu respectively. Find the steady state frequency and change in steady-state the line power, for an increase of 60 MW in area 1. Nominal frequency is 50 Hz. **(08 Marks)**

OR

6 a. Prove that by adding a feedback of proportional integral controller to ALFC, the steady state frequency deviation is zero. **(08 Marks)**

b. A control area has following data, total generation capacity = 2000 MW, normal load = 1500 MW, H = 4.8s, D = 1.2%, f = 50 Hz, R = 2.5 Hz/pu MW.

(i) Determine primary ALFC parameter

(ii) For increase of 0.02 pu unload, find frequency drop without governor control

(iii) With governor control. **(08 Marks)**

Module-4

7 a. Highlight the event of tie line oscillation in inter connected power system by deriving necessary equation. **(08 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. Total system reactance is 0.5 Ω/phase. Calculate the:

(i) Receiving end current

(ii) Regulation

(iii) Sending end voltage

(iv) Short circuit capacity of the system

Assume system to be loss less. **(08 Marks)**

OR

8 a. Prove that voltage at receiving end is dependent on reactive power in power system. **(08 Marks)**

b. Two control area of capacity 1500 MW and 10000 MW are interconnected through the 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 steady state frequency deviation and change in the line power. **(08 Marks)**

Module-5

9 a. With an example, explain how security constrained optional power flow is implemented. **(05 Marks)**

b. Explain system adequacy and system security in reliability analysis of power system. **(04 Marks)**

c. Discuss on major issues of state estimation. **(07 Marks)**

OR

10 a. With a flow chart explain contingency analysis for generator outage. **(08 Marks)**

b. Obtain an expression for state estimator problem by weighted least square technique in DC state estimation. **(08 Marks)**

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