CBCS SCHEME

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15EE81

Eighth Semester B.E. Degree Examination, June/July 2024
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. Briefly describe the major components of a SCADA system. **(08 Marks)**

b. What are the various transducers used in power system SCADA? **(04 Marks)**

c. Discuss the various options available for communication in SCADA. **(04 Marks)**

2 a. Draw the flowchart for the priority list method of unit commitment and explain. **(08 Marks)**

b. Draw and explain the flowchart for the forward dynamic programming algorithm. **(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)**

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. Derive the transfer function for the complete ALFC block. **(08 Marks)**

b. Two generators rated 1000 MW and 500 MW are operating on parallel with a droop of 5% and 4% respectively. The frequency in 1 PU, 50 HZ at no-load. How is a load of 800 MW shared between them? At what frequency? **(08 Marks)**

OR

6 a. Draw the block diagram of a two area system with primary control loop. **(08 Marks)**

b. The data of a two area system are as follows,
Area 1: $PG_1 = 1000$ MW, $R_1 = 0.015$, $D_1 = 0$
Area 2: $PG_2 = 10000$ MW, $R_2 = 0.0015$, $D_2 = 0$
An increase of 10 MW takes place in area1. Determine the change in frequency, ACE and the appropriate control action. **(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 a neat flow chart, explain contingency analysis for generation outage using generation shift sensitivity factors. **(08 Marks)**

b. Explain the formulation and state estimate using linear least square estimation. Also explain the condition for observability in least square estimates. **(08 Marks)**

OR

10 a. With a neat flow chart, explain contingency analysis for line outage, using line outage distribution factors. **(08 Marks)**

b. Explain 1P1Q method for contingency Ranking. Also explain contingency processing using AC load flow analysis with a flow chart. **(08 Marks)**

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