CBCS SCHEME

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15EE81

Eighth Semester B.E. Degree Examination, Feb./Mar. 2022
Power System Operation and Control

Time: 3 hrs. Max. Marks: 80

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. 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)**

OR

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. Explain algorithm for Hydro thermal scheduling using Discrete Time Interval method. **(10 Marks)**
b. Draw flow chart for 8-λ interactions. **(06 Marks)**

OR

4 a. What are the functions of AGC? **(04 Marks)**
b. Draw the block diagram of steam turbine governing system and explain the functions of the various components. **(08 Marks)**
c. What are the two modes of governor operation and explain? **(04 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

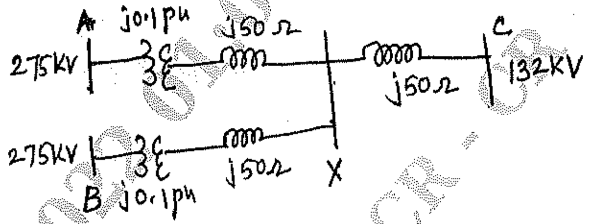
6 a. Prove that by adding a feedback of proportional integral controller to ALFC, the steady state frequency deviation is zero. **(08 Marks)**
b. A control area has following data, total generation capacity = 2000 MW, normal load = 1500 MW, H = 4.8s, D = 1.2%, f = 50 Hz, R = 2.5 Hz/pu MW.
i) Determine 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. Explain the different methods of voltage control by reactive power injection. **(08 Marks)**

b. Three generating stations are connected to a common bus bar and as shown in Fig.Q7(b). For a particular system load the line voltage at bus x falls by 5 KV. Calculate the reactive power injection required to bring back the voltage to the original value. All pu values are on a base of 500 MVA. **(08 Marks)**

Fig. Q7(b)



OR

8 a. Explain voltage control using; tap changing transformers, Booster transformers and phase shifting transformers. **(08 Marks)**

b. A 415 V, 50 Hz 3ϕ system delivers 500 KW at 0.8 p.f. lag. Shunt capacitors are installed to improve the p.f. to 0.92. Determine the value of capacitors needed if the capacitor bank is star connected. **(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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