CBCS SCHEME

USN | | | | | | | | | | 15EE81

Eighth Semester B.E. Degree Examination, June/July 2023
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. Explain the operating states of power system, with a neat diagram showing the transition between the states. **(08 Marks)**

b. Explain the algorithm of priority list method of unit commitment. **(08 Marks)**

OR

2 a. With a neat diagram explain the general configuration and major components of SCADA system. **(08 Marks)**

b. Explain the various constraints to be considered in unit commitment. **(08 Marks)**

Module-2

3 a. Explain the short-term hydrothermal scheduling using γ-λ iterations. **(08 Marks)**

b. Explain with diagrams : i) Steam turbine governing system ii) Electronic hydraulic governing system. **(08 Marks)**

OR

4 a. What are the assumptions and operational constraints in general algorithm for hydrothermal scheduling? **(06 Marks)**

b. What are the functions of automatic generation control? **(06 Marks)**

c. Why the Cross-Coupling between ALFC and AVR loops is negligible? **(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. Derive the tie-line power oscillations equation for a two area system with valid assumptions (08 Marks)

b. Briefly explain the components of power system that can generate and/or absorb reactive power. (04 Marks)

c. Explain the method of Voltage control by shunt reactors (04 Marks)

OR

8 a. Explain with relevant diagrams, the dependence of voltage on reactive power. (08 Marks)

b. In the power system shown in Fig.Q.8(b), the line voltage at bus-X falls by 2kV for a particular load. Calculate the reactive power injection required to bring back the voltage to the original value. All pu values are on a 500MVA base.

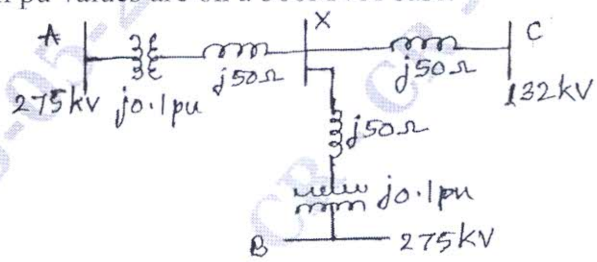

Fig. Q8(b)

(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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