CBCS SCHEME

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17EE81

Eighth Semester B.E. Degree Examination, June/July 2024
Power System Operation and Control

Time: 3 hrs. Max. Marks: 100

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

Module-1

1 a. Mention the objectives of power system control? Explain. **(06 Marks)**

b. What are the major components of the energy management centers and explain. **(07 Marks)**

c. With diagram, describe the major components of SCADA system. **(07 Marks)**

OR

2 a. Mention the essential preventive and emergency control measures required to maintain power system in the normal state. **(07 Marks)**

b. Explain the common communication channels used for SCADA in power systems. **(06 Marks)**

c. Explain the details constraints used in unit commitment. **(07 Marks)**

Module-2

3 a. Explain discrete time interval method of hydro thermal scheduling. **(12 Marks)**

b. With block diagram, explain the two major control loops of generator. **(08 Marks)**

OR

4 a. With block diagram, explain the conventional speed governor operation. **(06 Marks)**

b. Explain the following terms used in AGC :
i) Control area ii) Frequency bias iii) load – frequency error. **(06 Marks)**

c. A two plant system has the following characteristics

$F_T = 20P_{GT} + 0.04 P_{GT}^2$ Rs/hr

$Q = 7.5P_{GH} + 0.04 P_{GT}^2$ mt^3/sec

$\gamma = 4.1 \times 10^{-4}$ Rs/mt^3, $\lambda = 70$ Rs/mWhr

$B_{HH} = 0.0025 mW^{-1}$.

Determine the generation of each plant, the load on the system and the losses. **(08 Marks)**

Module-3

5 a. With relevant equations, derive mathematical model of generator for ALFC. **(10 Marks)**

b. Prove that the adding a feedback of PI controller to ALFC loop, the steady state frequency deviation in zero. **(10 Marks)**

OR

6 a. For two area system i.e area A_1 and are A_2 with primary loop, derive an expression for frequency deviation and tie-time power flow when the load in area A_1 area changes. **(12 Marks)**

b. Two generating areas have capacities of 500 and 1000mW respectively. They are interconnected by a short time. The percentage speed regulating from no-load to full-load of the two stations are 3% and 4% respectively. If the load an each station is 250mW, find the power generation of each station and the tie-time power. The system frequency is 50Hz. **(08 Marks)**

Module-4

7 a. Derive the state space model for an isolated AGC system. **(12 Marks)**

b. Derive the equation that voltage at receiving end is dependent on reactive power in power system. **(08 Marks)**

OR

8 a. Explain the different issue arises in implementation of AGC. **(06 Marks)**

b. Explain how voltage control is achieved by using booster and phase shifting transformers. **(06 Marks)**

c. A 440V, 3-phase distribution feeder has a load of 75kW drawing a current of 130A. A capacitor rating 45KvAr is connected across the load. Determine the

i) Power factor and reactive load before compensation

ii) Power factor after compensation. **(08 Marks)**

Module-5

9 a. Derive the following :

i) Reliability

ii) System adequacy

iii) System security **(06 Marks)**

b. Discuss the factors affecting power system security. **(07 Marks)**

c. Explain the formulation and state estimate using linear least squares estimation. Also explain the condition for deferability in least squares estimation. **(07 Marks)**

OR

10 a. Explain the calculation of network linear sensitivity factors. **(07 Marks)**

b. With the help of flow chart, explain 1PIQ contingency selection procedure. **(07 Marks)**

c. Discuss the issues of state estimation. **(06 Marks)**

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