

CBCS SCHEME

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15EE81

Eighth Semester B.E. Degree Examination, July/August 2021 Power System Operation and Control

Time: 3 hrs.

Max. Marks: 80

Note: Answer any FIVE full questions.

- 1 a. What are the different operating states of power system? Explain the transition that can take place from one state to another state, with a block diagram. (08 Marks)
b. What is SCADA? Explain the components of SCADA with a general SCADA configuration. (08 Marks)
- 2 a. List the seven key concepts proposed by NERC. Explain any two. (08 Marks)
b. What is a unit commitment problem? Draw and explain the flow chart for forward dynamic programming method. (08 Marks)
- 3 a. Explain the algorithm for hydrothermal scheduling using discrete time interval method. (10 Marks)
b. Explain the basic control loop of a generator with a schematic diagram. (06 Marks)
- 4 a. Draw the block diagram of steam turbine governing system and explain the functions of various components. (08 Marks)
b. Explain the following terms :
 - i) Control Area
 - ii) Tie – line
 - iii) Area Control Error (ACE). (08 Marks)
- 5 a. Obtain the transfer function for the complete ALFC system. (08 Marks)
b. A control area has the following data :
Total generation capacity = 2000MW, Normal load = 1500MW, $H = 4.8s$, $D = 1.2\%$, $f = 50Hz$, $R = 2.5Hz/pu MW$.
 - i) Determine the primary ALFC parameters
 - ii) For an increase of $0.02pu$ in the load, find the frequency drop without and with governor control. (08 Marks)
- 6 a. Obtain the block diagram representation of a two area system, with primary control. (08 Marks)
b. Obtain the state space model of a single area system. (08 Marks)
- 7 a. Explain tie line oscillations in a 2-area system. (10 Marks)
b. Explain briefly the components of a power system that can generate and /or absorb reactive power. (06 Marks)

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.

- 8 a. Show that the real power flow between nodes is proportional to the transmission angle ' δ ' and reactive power flow is proportional to the scalar voltage difference between the two nodes. (08 Marks)
- b. Explain the method of voltage control by reactive power injection. (08 Marks)
- 9 a. Explain the Security Constrained Optimal Power Flow (SCOPF) function of power system security with an example. (08 Marks)
- b. Explain contingency analysis using a flow chart. (08 Marks)
- 10 a. What is state estimation in power system? Discuss need and importance of state estimation. (06 Marks)
- b. Explain the Weighted Least Square Estimation (WLSE) method of power system state estimation. (10 Marks)

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