USN | | | | | | | | | | |

10EE82

Eighth Semester B.E. Degree Examination, June/July 2023
Power System Operation and Control

Time: 3 hrs. Max. Marks:100

Note: Answer any FIVE full questions, selecting at least TWO questions from each part.

PART – A

1 a. Write the various interfaces and equipment available to the operator at an energy control center. **(07 Marks)**

b. What is Area Control Error? **(03 Marks)**

c. With relevant graph, explain the parallel operation of generators for the following cases:
(i) Generator with infinite bus
(ii) Two generators with different capacity and regulation. **(10 Marks)**

2 a. With a neat figure, explain the AVR and ALFC loops of a synchronous generator. **(10 Marks)**

b. Classify the exciters. With a neat figure, explain a brushless AVR loop. **(10 Marks)**

3 a. With the help of a block diagram, explain the static response of primary ALFC loop. **(10 Marks)**

b. State the operating principles of pool operation. **(04 Marks)**

c. Determine the primary ALFC loop parameters for a control area having the following data:
Total rated area capacity $P_r = 2000$ MW
Normal operating load $P_D^o = 1000$ MW
Inertia constant, $H = 5.0$ s
Regulation, $R = 2.40$ Hz/pu MW
Frequency, $f^o = 60$ Hz. (All area generators)
Assume linear load frequency dependency. **(06 Marks)**

4 a. Explain voltage control by injecting reactive power using series capacitors and synchronous compensators. **(12 Marks)**

b. Explain absorption/generation of VAR with respect to:
(i) Synchronous generators
(ii) Overhead lines and transformers
(iii) Cables **(08 Marks)**

PART – B

5 a. Write a simple shut-down algorithm for a priority list method. **(06 Marks)**

b. Define unit commitment and discuss thermal unit constraints. **(10 Marks)**

c. State the assumptions made in the dynamic programming approach of unit commitment. **(04 Marks)**

6 a. Explain the three major functions involved in power system security analysis. **(10 Marks)**

b. With the help of a flow chart, explain the 1P1Q contingency selection procedure. **(10 Marks)**

7 a. Explain how Least Square Estimation (LSE) method is used in Power System State Estimation (PSSE). **(10 Marks)**

b. Explain:
(i) Detection of bad data
(ii) Identification of bad data in PSSE **(10 Marks)**

8 a. Explain how the reliability of N-unit system is measured. **(08 Marks)**

b. A power plant has the following generating units with the corresponding data shown in the Table 8(b). Prepare the capacity outage probability table and indicate the cumulative probabilities.

Unit Number	Capacitor in MW	Failure Rate/year	Repair Rate/year
1	50	1.0	24
2	100	0.2	9.8
3	150	1.2	38.8

Table 8(b) **(12 Marks)**

* * * * *