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10EE82

**Eighth Semester B.E. Degree Examination, Jan./Feb. 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. Derive the expression for tie line power and frequency deviation for a two area system. (10 Marks)
- b. What is Area Control Error (ACE)? Briefly explain. (06 Marks)
- c. Two areas are interconnected as shown in Fig.Q1(c). The generating capacity of area A is 36,000 MW and its regulating characteristic is 1.5% of capacity per 0.1 Hz. Area D has a generating capacity of 4000 MW and its regulating characteristic is 1% of capacity per 0.1 Hz. Find each area's share of +400– MW disturbance (load increase) occurring in area D and the resulting tie-line flow.

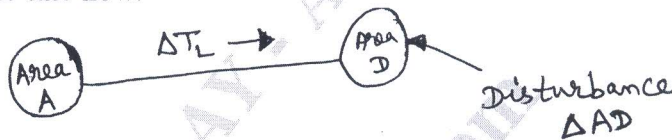


Fig.Q1(c)

(04 Marks)

- 2 a. With relevant graphs, explain parallel operation of generators for the following cases: (10 Marks)
- (i) Generator with infinite bus
- (ii) Two generators with different capacity and regulation (06 Marks)
- b. With a neat figure, explain the automatic voltage regulator. (06 Marks)
- c. Determine the primary ALFC loop parameters for a control area having the following data: (04 Marks)
- Total rated area capacity  $P_r = 2000$  MW
- Normal operating load  $P_D^0 = 1000$  MW
- Inertia constant  $H = 5.0$  sec
- Regulation,  $R = 2.40$  Hz/per MW (all area generators)
- 3 a. Explain with relevant diagrams, tie line bias control of a two area system. (10 Marks)
- b. Two generators are supplying power to a system. Their ratings are 50 and 500 MW respectively. The frequency is 60 Hz and each generator is half-loaded. The system load increases by 110 MW and as a result the frequency drops to 59.5 Hz. What must the individual regulations be if the two generators should increase their turbine powers in proportion to their ratings? (06 Marks)
- c. Distinguish AVR and ALFC control loops of a generator. (04 Marks)
- 4 a. Explain generation and absorption of reactive power in electrical power system. (06 Marks)
- b. What is series compensation? Explain the advantages of series compensation. (06 Marks)
- c. Briefly explain voltage instability and voltage collapse. (08 Marks)

**PART – B**

- 5 a. Explain the problem of unit commitment. What are the constraints in solving the unit commitment problem? (10 Marks)
- b. With the help of flow chart, explain the dynamic programming method in unit commitment. (10 Marks)

- 6 a. Define the following terms:
- (i) Optimal dispatch
  - (ii) Post contingency
  - (iii) Secure dispatch
  - (iv) Secure post-contingency
- b. With the block diagram, explain the 1P1Q contingency selection procedure. (04 Marks)
- c. Describe the fast decoupled load flow method. (08 Marks)
- 7 a. Explain the objective and Process of Power System State Estimation (PSSE). (08 Marks)
- b. Explain how Least Square Estimation (LSE) method is used in PSSE. (10 Marks)
- 8 a. Briefly explain Loss of Load Probability (LOLP) and frequency and duration of a state. (10 Marks)
- b. With the usual notations, derive the expression for derivation of reliability index. (08 Marks)
- c. Write short notes on recursive relation. (04 Marks)

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