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Question Paper Code : 90529

B.E./B.Tech. DEGREE EXAMINATIONS, NOVEMBER/DECEMBER 2022.

Seventh Semester

Electrical and Electronics Engineering

EE 8702 — POWER SYSTEM OPERATION AND CONTROL

(Regulations 2017)

Time : Three hours

Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. List out the requirements of good power system.
2. Write the significance of load curves.
3. Define frequency bias tie-line control.
4. Enumerate the co-ordination between LFC and economic dispatch.
5. Name the devices adopted for reactive power generation.
6. Define the term 'stability compensation'.
7. Draw the input and output characteristics of thermal plant.
8. List the thermal constraints of UC problem.
9. Write the significance of energy control centers.
10. Draw the state transition diagram.

PART B — (5 × 13 = 65 marks)

11. (a) (i) Discuss the power scenario in Indian grid and the role of national and regional load dispatching centers. (7)
- (ii) Write short notes on P-V and Q-F control loops. (6)

Or

- (b) With relevant block diagram explain the basics of speed governing mechanisms, modeling and speed characteristics in detail.
12. (a) Explain the static and dynamic analysis of controlled and uncontrolled cases of single area system.

Or

- (b) Explain the static and dynamic analysis of two area system.
13. (a) Draw the block diagram representation of AVR loop and explain the function of each component.

Or

- (b) With neat diagrams explain the various methods of voltage control.
14. (a) Explain the optimal operation of thermal units with and without transmission losses.

Or

- (b) (i) Draw the flowchart for priority list method. (7)
- (ii) Discuss the special aspects of short term and long term hydrothermal problems. (6)

15. (a) Explain the hardware configuration and functions of SCADA.

Or

- (b) Write the algorithm for state estimation problem using weighted least square method.

PART C — (1 × 15 = 15 marks)

16. (a) A 50 Hz, 4-pole turbo generator is rated 500 MVA, 22 kV and has an inertia constant (H) of 7.5. Assume that the generator is synchronized with a large power system and has a zero accelerating power while delivering a power of 450 MW. Suddenly its input power is changed to 475 MW. Find the speed of the generator in rpm at the end of a period of 10 cycles. The rotational losses are assumed to be zero.

Or

- (b) In a three plant system the cost functions are given by

$$F_1 = 400 + 6.8P_1 + 0.002P_1^2,$$

$$F_2 = 300 + 6.7P_2 + 0.003P_2^2$$

$$F_3 = 100 + 7.2P_3 + 0.005P_3^2$$

While the transmission loss is expressed as

$$P_t = 0.00002P_1^2 + 0.00006P_2^2 + 0.0001P_3^2$$

Assume total load to be 750W, Find the economic dispatch schedule.