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Question Paper Code : 21409

B.E./B.Tech. DEGREE EXAMINATION, MAY/JUNE 2013.

Seventh Semester

Electrical and Electronics Engineering

EE 2401/EE 71 — POWER SYSTEM OPERATION AND CONTROL

(Regulation 2008)

Time : Three hours

Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. What is the need of voltage regulation in power system?
2. What is the effect of load factor on the cost of generation?
3. What is the function of load frequency control on a power system?
4. Define speed droop.
5. Show that voltage control and reactive power control are interrelated.
6. Give the functions of AVR.
7. Draw incremental fuel cost curve.
8. What is meant by spinning reserve?
9. What is meant by state estimation?
10. What are the functions of SCADA?

PART B — (5 × 16 = 80 marks)

11. (a) (i) What is meant by chronological load curve? Give the information obtained from load curves. (3 + 5)
(ii) Explain the advantages and different types of computer control system. (8)

Or

- (b) Describe briefly about plant level and system level control. (16)

12. (a) (i) Develop a schematic of speed governing system and explain its operation. (8)
- (ii) Two generators rated 200 MW and 400 MW are operating in parallel. The droop characteristics of their governors are 4% and 5% respectively from no load to full load. Assume that the generators are operating at 50 Hz at no load, how would a load of 600 MW be shared between them? What will be the system frequency at this load? Assume free governor operation. (8)

Or

- (b) Draw the block diagram of uncontrolled two area load frequency control system and explain the salient features under static conditions. (16)

13. (a) (i) Name the generators and consumers of reactive power in a power system. (8)
- (ii) What are static Var systems? State the advantages of SVS. (8)

Or

- (b) Explain the following methods of voltage control

- (i) Tap changing transformers (4)
- (ii) Shunt reactors (3)
- (iii) Synchronous phase modifiers (3)
- (iv) Shunt capacitors (3)
- (v) Series capacitors. (3)

14. (a) (i) With help of flow chart explain economic dispatch by λ Iteration method without loss. (8)

- (ii) The fuel cost of two units are given by

$$F_1 = F_1(P_{G1}) = 1.5 + 20 P_{G1} + 0.1 P_{G1}^2 \text{ Rs/hr}$$

$$F_2 = F_2(P_{G2}) = 1.9 + 30 P_{G2} + 0.1 P_{G2}^2 \text{ Rs/hr}$$

If the total demand on the generator is 200 MW. Find the Economic load scheduling of the two units. (4)

- (iii) What is the significance of equality and inequality constraints in the formulation of optimum dispatch problem? (4)

Or

(b) (i) What is a unit commitment problem? Discuss the constraints that are to be accounted in unit commitment problem. (6)

(ii) Obtain the priority list of unit commitment using full load average production cost for the given data :

$$\text{Heat rate of unit 1 } H_1 = 510 + 7.2 P_{G1} + 0.00142 P_{G1}^2 \text{ MW}\backslash\text{hr}$$

$$\text{Heat rate of unit 2 } H_2 = 310 + 7.85 P_{G2} + 0.00194 P_{G2}^2 \text{ MW}\backslash\text{hr}$$

$$\text{Heat rate of unit 3 } H_3 = 78 + 7.97 P_{G3} + 0.00482 P_{G3}^2 \text{ MW}\backslash\text{hr}$$

Unit	Mm (MW)	Max (MW)	Fuel cost (K)
1	150	600	1.1
2	100	400	1.0
3	50	200	1.2

$$P_D = 500 \text{ MW.} \quad (10)$$

15. (a) (i) What is EMS? What are its major functions in power system operation and Control? (6)

(ii) Explain the major functions of system security control. (10)

Or

(b) Draw the state transition diagram of a power system. Explain the state transition that may occur due to system disturbance and also different control actions that can be taken to improve the security level of the system. (16)