

K 1200

B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2004.

Seventh Semester

Electrical and Electronics Engineering

EE 431 — POWER SYSTEMS CONTROL

Time : Three hours

Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. What is the need for voltage regulation in power systems?
2. State whether changes in AVR loop will be reflected in ALFC loop.
3. State the basic role of ALFC.
4. What is meant by a control area?
5. List the various components in AVR loop.
6. What is an Synchronous condenser?
7. Distinguish between reliability and security of power system.
8. List the various controls to ensure secured operation of a power system.
9. List the factors that affects the power system security.
10. Explain the term incremental operating cost of a power system.

PART B — (5 × 16 = 80 marks)

11. Consider an inductive load of type $Z = R + jx$
 - (i) By how many percent will the real load drop if the voltage is reduced by 5 percent?
 - (ii) How would a 2 percent drop in frequency affects the real load, if the load is assumed to have a power factor of 0.8. (8+8)

12. (a) (i) Using a simplified functional diagram explain the operating features of a speed governing system.
- (ii) Explain the static and dynamic response of ALFC control loop. (8+8)

Or

- (b) (i) Develop a linear mathematical model of two area system.
- (ii) Explain the tie line bias control of two area system. (8+8)
13. (a) (i) Develop a mathematical model of an excitor system and brief on its control action.
- (ii) Explain the static and dynamic performance of AVR loop. (8+8)

Or

- (b) (i) Explain the different types of static VAR compensators with a phasor diagram.
- (ii) Discuss the effect of compensation on the maximum power transfer in a transmission line. (8+8)
14. (a) (i) Explain the tasks of energy control center and its interaction with individual power plants.
- (ii) Explain the different functions that are performed by SCADA systems. (8+8)

Or

- (b) (i) Classify and distinguish between the various operating states of power system.
- (ii) Explain briefly how the system states are continuously monitored and controlled. (8+8)
15. (a) (i) In a system of 'n' generating units show that all individual controllable generator must operate at equal incremental production cost, for optimum despatch.
- (ii) Discuss the significance of equality and inequality constraints in the formulation of optimum despatch problem. (8+8)

Or

- (b) (i) Develop an iterative algorithm for solving the optimum despatch equation of an 'n' bus power system taking into account the effects of system losses.
- (ii) A generating station has two units A and B. The incremental operating cost of the two units are as follows.

$$\text{Unit A : } \lambda_1 = 0.1P_1 + 20 \text{ Rs/MWhr}$$

$$\text{Unit B : } \lambda_2 = 0.12P_2 + 16 \text{ Rs/MWhr.}$$

Where P_1 = load on Unit A in MW

P_2 = load on Unit B in MW.

Calculate the load distribution based on economic loading of two generating stations for a total load of 180 MW. (8+8)