

Reg. No. : 30402105050

P 1201

B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2007.

Seventh Semester

Electrical and Electronics Engineering

EE 431 — POWER SYSTEM CONTROL

Time : Three hours

Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. What is the need for voltage constancy in a power system?
2. How system loads are classified?
3. Define control area.
4. What do you understand by Steady State instabilities?
5. Name any two modern excitation system.
6. What is a synchronous condenser?
7. State the functions of energy control center.
8. Draw state transition diagram.
9. Write the coordination equations taking the effect of losses into account.
10. What is meant by economic dispatch control?

PART B — (5 × 16 = 80 marks)

11. (a) (i) Draw the P-f and Q-V control channels of a synchronous generator and explain how voltage and frequency are maintained constant. (10)
(ii) Write a brief note on cross coupling between control channels. (6)

Or

- (b) What are the recent trends in real time control of power system? (16)

12. (a) Obtain the mathematical model for the following components in the power system from the first principles :

- (i) Speed governing system of a hydro turbine.
- (ii) Boiler model for dynamic studies.
- (iii) Turbine generator.

Or

(b) Two identical 60 MW synchronous generators operate in parallel. The governor settings on the machines are such that they have 4% and 3% droops (no load to full load percentage speed drop). Determine (i) the load taken by each machine for a total load of 100 MW (ii) the percentage adjustment in the no load speed to be made by the speeder motor if the machines are to share the load equally.

13. (a) Draw the block diagram of the exciter control system and derive the transfer function of each block. How stability compensation is provided in the system?

Or

(b) Discuss analytically the various methods of MVAR control used in large power systems.

14. (a) Draw the block diagram to show the hardware configuration necessary for carrying out SCADA and power system analysis applications in an energy control centre.

Or

(b) What are the different operating states of a power system from security point of view? Explain.

15. (a) Derive the coordination equation for economic scheduling taking the effect of losses into account.

Or

(b) The incremental production cost of two plants are given by

$$\frac{dF_1}{dP_1} = 0.08P_1 + 16 \text{ Rs/MWhr}$$

$$\frac{dF_2}{dP_2} = 0.08P_2 + 12 \text{ Rs/MWhr}$$

$$Bmn = \begin{bmatrix} 0.01 & -0.005 \\ -0.005 & 0.024 \end{bmatrix}$$

For the incremental cost of received power of Rs. 20/MWhr find the economic schedule for the two plants.