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Question Paper Code : 60583

B.E./B.Tech. DEGREE EXAMINATIONS, APRIL/MAY 2026.

Seventh Semester

Electrical and Electronics Engineering

EE8702 — POWER SYSTEM OPERATION AND CONTROL

(Regulations 2017)

Time : Three hours

Maximum : 100 marks

Answer ALL questions.

PART A — ($10 \times 2 = 20$ marks)

1. List the main functions of Regional Load Dispatch Centers.
2. Mention the significance of load curves in generation scheduling.
3. Distinguish between load frequency control and economic dispatch control.
4. Highlight the purpose of tie-line modeling.
5. Enlist the effects of reactive power flow on voltage profile.
6. Justify why a brushless excitation system is preferred in modern generating stations over conventional excitation systems.
7. Define: Incremental fuel cost.
8. Write the objectives of economic operation of power system.
9. State the need for computer control of power systems.
10. Identify the hierarchical levels used in EMS.

PART B — ($5 \times 13 = 65$ marks)

11. (a) Compare and contrast the real power-frequency control loop and the reactive power-voltage control loop based on various controlling parameters, and explain their operation with neat block diagrams.

Or

- (b) (i) Analyze the governor speed-droop characteristics and elucidate the basic principles of load sharing between two synchronous machines operating in parallel. (7)
- (ii) Summarize the different methods of load forecasting and their importance in modern power systems. (6)
- 12. (a) (i) A power utility wants to reduce fuel cost while maintaining frequency within limits. Explain how economic dispatch can be integrated with LFC. (7)
- (ii) Differentiate the single area and two-area Load Frequency Control systems in terms of operation, stability and performance. (6)

Or

- (b) Two areas of a power system network are interconnected by a tie line, whose capacity is 250 MW, operating at a power angle of 45° . If each area has a capacity of 2,000 MW and the equal speed-regulation co-efficiency of 3 Hz/p.u. MW, determine the frequency of oscillation of the power for a step change in load. Assume that both areas have the same inertia constants of $H = 4$ s. If a step-load change of 100 MW occurs in one of the areas, determine the change in tie-line power.
- 13. (a) Describe the operation of an Automatic Voltage Regulator (AVR) loop with a suitable block diagram and explain how it maintains generator terminal voltage under varying load conditions.

Or

- (b) Examine the different methods of reactive power injection used for voltage control in transmission systems and evaluate their effectiveness under various operating conditions.
- 14. (a) The fuel cost functions of two generating units are given by:

$$F_1 = 0.2 P_1^2 + 40 P_1 + 120 \text{ Rs/hr}$$

$$F_2 = 0.25 P_2^2 + 30 P_2 + 150 \text{ Rs/hr}$$

Determine the most economical operating schedule and the corresponding generation cost for a total load demand of 180 MW, neglecting transmission losses. Assume that the minimum and maximum limits of each unit are 25 MW and 100 MW respectively. Also determine the cost saving achieved when compared with equal load sharing between the two units.

Or

- (b) (i) Discuss in detail the various constraints involved in the unit commitment problem and write their significance in the scheduling of generating units. (7)
- (ii) During a dry season, hydro power availability is reduced. Explain how thermal units are scheduled to meet the load demand economically. (6)

15. (a) Elaborate the various functions of energy control centre in power system operation.

Or

- (b) (i) A utility company plans to modernize its grid monitoring system by replacing conventional measurements with PMUs. Evaluate the benefits of PMU installation in terms of speed, accuracy and reliability. (7)
- (ii) Illustrate the state transition diagram of a power system and Identify the different operating states according to system security level. (6)

PART C — (1 × 15 = 15 marks)

16. (a) Develop the state variable model of a two area system and state the advantages of the model.

Or

- (b) Analyze the impact of SCADA communication failure during a cyclone on power system monitoring and discuss the methods used to improve communication reliability with suitable example.

10. The first of the two main parts of the report is devoted to a general survey of the situation in the country.

11. The second part of the report is devoted to a detailed study of the various aspects of the situation in the country. This part is divided into three main sections: (a) the economic situation, (b) the social situation, and (c) the political situation.

CHAPTER II - THE ECONOMIC SITUATION

12. The economic situation in the country is characterized by a high degree of unemployment and a low level of industrial production.

13. The main causes of the economic situation are the lack of investment capital, the low level of technological development, and the inefficient management of the economy.