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Question Paper Code : 50546

B.E./B.Tech. DEGREE EXAMINATIONS, APRIL/MAY 2023.

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. Define load curves and give the types.

2. Write the necessary conditions for two synchronous generators sharing the load in parallel operation.

3. Give the advantages of the AVR loop over ALFC.

4. Draw the block diagram representation of two area systems.

5. List the sources of reactive power and its controlling methods.

6. When is feedback stability compensation used?

7. Differentiate the economic load dispatch and optimal power flow.

8. What are the objectives of hydrothermal scheduling?

9. Give the functions of the control center.

10. What is weighted least square estimation?

PART B — (5 × 13 = 65 marks)

11. (a) Explain the necessity of voltage and frequency regulation in the power system.

Or

(b) What are the components of the speed governor system of an alternator? Derive mathematical model of the speed governor system with aid of a block diagram.

12. (a) Draw the transfer function block diagram for a single area system provided with static analysis of an uncontrolled case and controlled case.

Or

(b) Explain with a neat block diagram the integration of economic dispatch with toad frequency control.

13. (a) (i) Demonstrate in brief the brushless excitation system. (7)

(ii) Point out the relations between voltage, power, and reactive power at a node for applications in power system control. (6)

Or

(b) Explain the operation of TCR and TSC with necessary V-I characteristics.

14. (a) What is meant by unit commitment? and briefly explain the constraints on unit commitment.

Or

(b) Consider two units of a plant that have fuel costs of

$F_1 = 0.2P_1^2 + 40P_1 + 120\,Rs./h$

$F_2 = 0.25P_2^2 + 30P_2 + 150\,Rs./h$

(i) Determine the economic operating schedule and the corresponding cost of generation for the demand of 180 MW. (7)

(ii) If the load is equally shared by both units, determine the savings obtained loading the units optimally. (6)

15. (a) Briefly discuss the energy control centers and their functions.

Or

(b) Describe the various functions of SCADA in the control of power systems.

PART C — (1 × 15 = 15 marks)

16. (a) A 132 kV line is fed through an 11/132 kV transformer from a constant 11 kV supply. At the load end of the line, the voltage is reduced by another transformer of a nominal ratio: 132/11kV. The total impedance of the line and transformers at 132kV is (25+j66)V. Both transformers are equipped with tap-changing facilities which are arranged so that the product of the two off-nominal settings is unity. If the load on the system is 100 MW at 0.9 p.f. lagging. Calculate the settings of the tap-changers requited to maintain the voltage of the load bus bar at 11 kV Use a base of 100 MVA.

Or

(b) Analyze the economic dispatch of thermal units considering with and without transmission losses.