



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 load 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

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

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

- (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  $(25+j66)\Omega$ . 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 required 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.