Reg. No. : | | | | | | | | | | | | |

Question Paper Code : 31265

M.E./M.Tech. DEGREE EXAMINATIONS, NOVEMBER/DECEMBER 2022.

First Semester

Power Systems Engineering

PS 4102 – POWER SYSTEM OPERATION AND CONTROL

(Regulations 2021)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Define Diversity factor.
2. Differentiate load curve and load duration curve.
3. List out the main functions of speed governor.
4. Illustrate the advantages of state variable model
5. Compare long-range and short-range hydrothermal scheduling problems.
6. Define hydro thermal co-ordination.
7. List out the constraints in unit commitment problem.
8. Differentiate unit commitment and economic dispatch.
9. Write the need for power system security.
10. Validate the role of contingency analysis in power system security.

PART B — (5 × 13 = 65 marks)

11. (a) (i) Explain the significance of various types of reserves. (6)

(ii) A generating station has the following daily load curve cycle:

Time (Hours)	0-6	6-10	10-12	12-16	16-20	20-24
Load (MW)	10	15	30	20	25	35

Draw the load curve and calculate (i) maximum demand (ii) units generated per day (iii) average load and (iv) load factor. (7)

Or

(b) (i) Explain the growth of power sector in India. (6)

(ii) Discuss the need for load forecasting and the role of load forecasting techniques in power system operation. (7)

12. (a) With neat diagrams explain the modeling of Load Frequency Control (LFC) of single area system. (13)

Or

(b) Draw the block diagram of uncontrolled two area load frequency control system and describe the salient features under static condition. (13)

13. (a) Explain the concepts of hydro thermal scheduling with pumped hydro plant. (13)

Or

(b) Describe the procedure for short term hydrothermal scheduling using linear programming. (13)

14. (a) With the help of a flow chart, explain forward dynamic programming solution method of unit commitment problem. (13)

Or

(b) Derive the condition for economic dispatch of thermal units in a power system using Lambda iteration method neglecting transmission line losses. (13)

15. (a) Explain the algorithm for interior point solver. Discuss its merits and demerits compared to Newton Raphson power flow method. (13)

Or

(b) (i) Discuss the importance of security assessment in power system operation. (6)

(ii) Elaborate the control actions to be taken for power system security enhancement. (7)

PART C — (1 × 15 = 15 marks)

16. (a) Obtain the priority list of unit commitment using full load average production cost for the given data for the load level of 900MW

$F1=392.7+5.544P_1+0.001093P\ P_1^2$

$F2=217+5.495P_2+0.001358P_2^2$

$F1=65.5+6.695P_3+0.004049P_3^2$

P_1, P_2, P_3 are in MW. Generation limit are:$150<=P_1<=600$MW; $100<=P_2<=350$MW. $50<=P_3<=250$MW Obtain the optimum unit commitment table. (15)

Or

(b) The data of a single area power system with linear load-frequency characteristics are as follows:

Rated Capacity = 2000 MW System Load = 1000 MW Inertia Constant = 5 sec Speed regulation = 0.03 pu Load damping factor = 1 pu Nominal Frequency = 50 Hz Governor Time constant = 0 sec Turbine time constant =0 sec. For a sudden change in load of 20 MW, determine the steady state frequency deviation and the change in generation in MW and reduction in original load in MW. (15)