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

Question Paper Code : 80581

B.E./B.Tech. DEGREE EXAMINATIONS, APRIL/MAY 2024.

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 the term load curve and load duration curve in power systems.
2. State the function of load dispatching centres.
3. Define control area in power systems.
4. Define the concept of tie-line bias control.
5. Sketch the V — I characteristics of SVC.
6. State the functions of AVR.
7. Define UC problem.
8. State the assumptions made in Economic Dispatch Problem.
9. State the functions of Energy Control Centres.
10. State the functions of PMU in electric power grid.

PART B — (5 × 13 = 65 marks)

11. (a) A generating station has the following daily load cycle:

Time (Hours) :	0-6	6-10	10-12	12-16	16-20	20-24
Load (MW):	40	50	60	50	70	40

Draw the Load Curve and Find (3)

(i) Maximum Demand (2)

(ii) Units generated per day (3)

(iii) Average Load and (3)

(iv) Load Factor. (2)

Or

(b) A generating station has a connected load of 43MW and a maximum demand of 20MW; the units generated being 61.5×10^6 per annum. Calculate

(i) the demand factor and (7)

(ii) load factor (6)

12. (a) Two interconnected Area-1 and Area-2 have the capacity of 2000MW and 500MW, respectively. The incremental regulation and damping torque coefficient for each area on its own base are 0.2 pu and 0.8 pu., respectively. Find the steady-state change in system frequency from a nominal frequency of 50Hz and the change in steady-state tie-line power following a 750 MW change in the load of Area-1.

Or

(b) Two power systems A and B are interconnected by a tie-line and have power frequency constants K_A and K_B MW/Hz. An increase in load of 500 MW on system A causes a power transfer of 300 MW from B to A. When the tie-line is open the frequency of system A is 49 Hz and of system B 50 Hz. Determine the values of K_A and K_B.

13. (a) Explain the Operation and Characteristics of STATCOM for Power Systems Control applications.

Or

(b) Explain the Operation and Characteristics of Static Var Compensator for Power Systems Control applications.

14. (a) Describe the Priority List method for Unit Commitment Problem.

Or

(b) Describe the Base point and Participation factor method for Economic Dispatch Problem.

15. (a) Draw the block diagram to show the hardware configuration of a SCADA for a power system operation and explain the application of SCADA for power system monitoring and control.

Or

(b) Explain the role of energy control centre in the modern power systems with a neat block diagram.

PART C — (1 × 15 = 15 marks)

16. (a) Explain the various operating states of power system. Also discuss the state transitions and control strategies using state transition diagram.

Or

(b) Determine the primary ALFC loop parameters for a control area having the following data.

Total rated area capacity $P_r = 2000$ MW

Normal operating Load $P_D^0 = 1000$ MW

Inertia constant (H) = 5.0 s

Regulation R = 2.40 Hz / pu MW (all area generators)

Assume that the load frequency dependency is "linear, meaning that the "old" load would increase one percent for one percent frequency increase.

(i) Find the static frequency drop for the 2 GW system following a one percent load increase, that is, ΔP_D = M = 20MW = 0.01 pu MW. (8)

(ii) What would be the frequency drop if the speed governor loop were nonexistent or open ? (7)