Question Paper Code	12663

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

Sixth Semester

Electrical and Electronics Engineering

20EEPC602 – POWER SYSTEM OPERATION AND CONTROL

Regulations - 2020

Duration: 3 Hours   Max. Marks: 100

PART - A (10 × 2 = 20 Marks)
Answer ALL Questions

		Marks	K-Level	CO
1.	List the types of loads.	2	K1	CO1
2.	Classify the types of load forecasting.	2	K2	CO1
3.	Define per unit droop.	2	K1	CO2
4.	Discuss about Area Control Error.	2	K2	CO2
5.	Summarize the various components in AVR loop.	2	K2	CO3
6.	Describe about the stability compensation.	2	K2	CO3
7.	State the unit commitment problem.	2	K1	CO4
8.	List the merits and demerits of priority list methods.	2	K1	CO4
9.	Define Energy Control Centre.	2	K1	CO5
10.	Discuss about the major functions of EMS.	2	K2	CO5

PART - B (5 × 13 = 65 Marks)
Answer ALL Questions

11. a) A generating station has the following daily load cycle   13   K3   CO1

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

Draw the load curve and calculate
   (i)   Maximum demand
   (ii)   Unit generated per day
   (iii)   Average load
   (iv)   Load factor

OR

b) A power supply is having the following loads   13   K3   CO1

Type of load	Maximum demand(KW)	Diversity factor of group	Demand factor
Domestic	10.000	1.2	0.8
Commercial	30,000	1.3	0.9
Industrial	50,000	1.35	0.95

If the overall system diversity factor is 1.5, calculate

K1 – Remember; K2 – Understand; K3 – Apply; K4 – Analyze; K5 – Evaluate; K6 – Create   **12663**

(i)   Maximum demand

(ii)   Connected load of each type

12. a) Two thermal generating units are operating in parallel at 60 Hz. To supply a total load of 700 MW unit 1 with a rated output of 600 MW and 4% speed drop characteristics and unit 2 which has a rated output of 500 MW and 5% speed drop. If total load increases to 800 MW, calculate loading of each unit and the common frequency change before any supplementary action occurs. Neglect losses. *13 K3 CO2*

OR

b) Analyze the static response of load frequency control of single area system in uncontrolled and controlled cases with neat diagram. *13 K3 CO2*

13. a) Explain in detail about the generation and absorption of reactive power with suitable sketches. *13 K2 CO3*

OR

b) Classify the different methods of voltage control. Explain in detail about the Static VAR compensator with neat diagram. *13 K2 CO3*

14. a) Determine the economic generation schedules of three generating units in a power system to meet the system load of 925 MW. The operating limits and cost function is given below *13 K3 CO4*

Operating limits $250 \text{ MW} \leq P_{G1} \leq 450 \text{ MW}$
$$200 \text{ MW} \leq P_{G2} \leq 450 \text{ MW}$$
$$125 \text{ MW} \leq P_{G3} \leq 225 \text{ MW}$$

Cost function is $F_1(P_{G1}) = 0.0045P^2_{G1} + 5.2\ P_{G1} + 580$
$F_2(P_{G2}) = 0.0056P^2_{G2} + 4.5\ P_{G2} + 640$
$$F_3(P_{G3}) = 0.0079P^2_{G3} + 5.8\ P_{G3} + 820$$

OR

b) Obtain the priority list of unit commitment using FLAPC for the given data *13 K3 CO4*

Heat rate for unit 1, $H = 510 + 7.2\ P_{G1} + 0.00142\ P^2_{G1}$ MW/hr
Heat rate for unit 2, $H = 310 + 7.85\ P_{G2} + 0.00194\ P^2_{G2}$ MW/hr
Heat rate for unit 3, $H = 78 + 7.97\ P_{G3} + 0.00482\ P^2_{G3}$ MW/hr
$P_D = 550$ MW

Unit	Minimum(MW)	Maximum(MW)	Fuel Cost (K)
1	150	600	1.1
2	100	400	1.0
3	50	200	1.2

15. a) Explain in detail about the Energy Control Centre with neat diagram. *13 K2 CO5*

OR

b) i) Explain detail about the functions of SCADA. *7 K2 CO5*

ii) Explain briefly about the state transition of power system with neat diagram. *6 K2 CO5*

K1 – Remember; K2 – Understand; K3 – Apply; K4 – Analyze; K5 – Evaluate; K6 – Create **12663**

PART - C (1 × 15 = 15 Marks)

16. a) i) A plant has two generators supplying the plant by and neither is to be operated below 20MW or above 135MW. Incremental costs with PG1 and PG2 in MW are
$dF_1/dP_{G1}=0.14P_{G1}+21$ Rs/MWhr $dF_2/dP_{G2}=0.225P_{G2}+16.5$ Rs/MWhr
For economic dispatch, build the plant when the demand equals 45MW   *8 K3 CO4*

   ii) Explain the various controls for secure operation.   *7 K3 CO5*

OR

   b) i) With the help of Flow chart explain Economic dispatch by λ Iteration method with losses.   *8 K2 CO4*

   ii) Write short notes on state estimation? Explain the weighted least square estimation with the help of flow chart.   *7 K3 CO5*