

Reg. No.

Question Paper Code

11919

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

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

- | | <i>Marks,
K-Level, CO</i> |
|---|-------------------------------|
| 1. What is Load duration curve? | 2,K1,CO1 |
| 2. Define Diversity factor. | 2,K1,CO1 |
| 3. Distinguish between the functions of speed governor and speed changer. | 2,K1,CO2 |
| 4. List the functions of ALFC? | 2,K1,CO2 |
| 5. When is feedback stability compensation used? | 2,K1,CO3 |
| 6. Write about static VAR compensator. | 2,K1,CO3 |
| 7. Define incremental cost. | 2,K1,CO4 |
| 8. Give the two forms of stopping rules in iterative procedure. | 2,K1,CO4 |
| 9. List some important control system functions of power systems. | 2,K1,CO5 |
| 10. What is the function of Data Acquisition System (DAS)? | 2,K1,CO5 |

PART - B (5 × 13 = 65 Marks)

Answer ALL Questions

11. a) A power station has to meet the following demand. 13,K3,CO1
Group A : 200 KW between 8 am and 6 pm
Group B : 100 KW between 6 am and 10 am
Group C : 50 KW between 6 am and 10 am
Group D: 100 KW between 10 am and 6 pm and then between 6 pm and 6 am.
Plot the daily load curve and determine diversity factor, units generated per day and load factor.
- OR**
- b) Two generators rated 700MW and 600MW are operating in parallel. 13,K3,CO1
The droop characteristics of their governors are 4% and 5% respectively from no load to full load. Assume that the generators are operating at 60Hz at no load, how would a load of 800MW be shared between them? What will be the system frequency at this load? Assume free governor operation.

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

11919

12. a) Draw the block diagram of ALFC for single area system and discuss the static and dynamic response of uncontrolled and controlled cases. 13,K3,CO2

OR

- b) Explain about tie-line bias control of two area system with neat sketch. 13,K3,CO2

13. a) Develop the block diagram of AVR and obtain its transfer function. 13,K3,CO3

OR

- b) Derive the equation for on-load tap changing transformer and explain its operation. 13,K3,CO3

14. a) The fuel-cost functions for three thermal plants in Rs./h are given by 13,K3,CO4

$$F_1 = 0.0045 P_1^2 + 5.2 P_1 + 580$$

$$F_2 = 0.0056 P_2^2 + 4.5 P_2 + 640$$

$$F_3 = 0.0079 P_3^2 + 5.8 P_3 + 820$$

Where P_1 , P_2 and P_3 are in MW. Find the optimal dispatch and the total cost when the total load is 925 MW with the following generator limits:

$$100\text{MW} \leq P_1 \leq 450\text{ MW}, 100\text{MW} \leq P_2 \leq 350\text{ MW}, 100\text{MW} \leq P_3 \leq 225\text{ MW}.$$

OR

- b) Determine priority list using full load average production cost for the data given. 13,K3,CO4

Unit No.	Loading limits		Fuel cost parameters			Fuel cost
1	100	400	0.006	7	600	1.1
2	50	300	0.01	8	400	1.2
3	150	500	0.008	6	500	1.0

15. a) Explain briefly the various functions of SCADA with a neat diagram. 13,K2,CO5

OR

- b) Draw the state transition diagram of a power system and Explain the different control actions. 13,K3,CO1

PART - C (1 × 15 = 15 Marks)

16. a) Two 1000kW alternators operate in parallel. The speed regulation of first alternator is 100% to 103% from full load to no load and that of the other is 100 to 105%. Show how the two alternators will share a load of 1200kW and at what load will one machine cease to supply any portion of the load. 15,K3,CO1

OR

- b) A plant has two generators supplying the plant bus and neither is to operate below 20MW or above 135MW. Incremental costs with P_{G1} and P_{G2} in MW are as follows. 15,K3,CO4

$$\frac{dF_1}{dP_{G1}} = 0.14P_{G1} + 21 \text{Rs/MWhr}$$

$$\frac{dF_2}{dP_{G2}} = 0.225P_{G2} + 16.5 \text{Rs/MWhr}$$

For economic dispatch, determine the plant λ when the demand equals
(a) 45 MW (b) 125MW (c) 250MW.