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

B.E / B.TECH. DEGREE EXAMINATION, MAY 2023

Sixth Semester

EE18601 – POWER SYSTEM OPERATION AND CONTROL

Electrical and Electronics Engineering

(Regulation 2018)

TIME: 3 HOURS **MAX. MARKS: 100**

CO 1 Apply the load forecasting techniques and identify suitable power controls at system and plant levels

CO 2 Model load frequency dynamics and analyze real power - frequency control

CO 3 Model voltage dynamics and analyze reactive power - voltage control

CO 4 Formulate and solve unit commitment and economic dispatch problems

CO 5 Ascertain the structure and functionalities of Energy Management System

PART- A (10 x 2 = 20 Marks)

(Answer all Questions)

		CO	RBT LEVEL
1.	Why it is desirable to have high load factor?	1	2
2.	State the purpose of load forecasting technique in the power system.	1	2
3.	How is automatic load frequency control implemented in the power system?	2	2
4.	List the assumptions made in the dynamic response of uncontrolled case.	2	2
5.	Compare P-F and Q-V control methods.	3	2
6.	Enumerate various methods of voltage control in the transmission system.	3	2
7.	Why does the incremental cost criterion include the transmission losses?	4	2
8.	Distinguish economic dispatch and unit commitment.	4	2
9.	Write the significant role SCADA plays in the electrical power systems.	5	2
10.	Identify the responsibilities of regional load dispatch centre.	5	2

PART- B (5 x 14 = 70 Marks)

			Marks	CO	RBT LEVEL
11. (a)	(i)	Analyze the structure and capability of the Indian Power Grid.	(7)	1	3
	(ii)	A generating station has a maximum demand of 30 MW, a load factor of 60%, a plant capacity factor of 50% and a plant use factor of 72%. Find the (i) reserve capacity of the plant (ii) daily energy produced and (iii) maximum energy that could be produced daily, if the plant running were fully loaded.	(7)	1	3
		(OR)			

(b)	(i)	What are the techniques used to predict the load on power system? Explain the method of least squares fit load forecasting.	(7)	1	3
	(ii)	Discuss plant level controls applied in the operation of power system.	(7)	1	3
12. (a)		Derive the transfer function of the speed governor mechanism from basics with an aid of a block diagram.	(14)	2	3
		(OR)			
(b)		For an isolated single area, consider the following data: Area capacity = 1000 MW Normal operating load = 500 MW Inertia constant = 5 sec Speed Regulation R = 5 % Operating frequency f_0 =50 Hz The load decreases by 1 percent for a decrease in frequency by 1 percent. Find the gain and time constants of the power system represented by a first order transfer function. If it is an uncontrolled area, then find out the change in frequency due to an increase of load by 75 MW.	(14)	2	3
13. (a)		Develop a typical excitation system and derive the transfer function models.	(14)	3	3
		(OR)			
(b)		What are the different types of SVC? With the help of V-I characteristics discuss the voltage control by SVC.	(14)	3	3
14. (a)		Three power plants of a total capacity of 500 MW are scheduled for operation to supply a total system load of 350 MW. Find the optimum load scheduling if the plants have the following incremental cost characteristics and the generator constraints: $IC_1 = 40 + 0.25\ P_{G1}$, $30 \le P_{G1} \le 150$ $IC_2 = 50 + 0.30\ P_{G2}$, $40 \le P_{G2} \le 125$ $IC_3 = 20 + 0.20\ P_{G3}$, $50 \le P_{G3} \le 225$	(14)	4	3
		(OR)			
(b)		Develop the forward dynamic programming solution method of unit commitment problem with a neat flow-chart.	(14)	4	3
15. (a)		Categorize the various functions of EMS and analyze the role of EMS in the operation and control of power system.	(14)	5	3
		(OR)			
(b)	(i)	Discuss major functions of power system security.	(4)	5	3
	(ii)	Enumerate the various operating states and the control strategies of a power system.	(10)	5	3

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PART- C (1 x 10 = 10 Marks)

(Q.No.16 is compulsory)

		Marks	CO	RBT LEVEL
16.	A power station has to meet the following demand: Group A: 180 KW between 8 A.M. and 6 P.M. Group B: 120 KW between 6 A.M. and 10 A.M. Group C: 60 KW between 6 A.M. and 10 A.M. Group D: 110 KW between 10 A.M. and 6 P.M. and then between 6 P.M. and 6 A.M. Sketch the daily load curve and load duration curves, and determine (i) units generated per day, (ii) load factor, and (iii) diversity factor.	**(10)**	**1**	**5**

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