Q. Code:883761

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

B.E / B.TECH. DEGREE EXAMINATIONS, MAY 2024

Sixth Semester

EE18601 – POWER SYSTEM OPERATION AND CONTROL

(Electrical and Electronics Engineering)

(Regulation 2018/2018A)

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

COURSE OUTCOMES	STATEMENT	RBT LEVEL
CO 1	Apply the load forecasting techniques and identify suitable power controls at system and plant levels	**3**
CO 2	Model load frequency dynamics and analyze real power - frequency control	**4**
CO 3	Model voltage dynamics and analyze reactive power - voltage control	**4**
CO 4	Formulate and solve unit commitment and economic dispatch problems	**3**
CO 5	Ascertain the structure and functionalities of Energy Management System	**3**

PART- A (10 x 2 = 20 Marks)

(Answer all Questions)

		CO	RBT LEVEL
1.	Determine the plant capacity of a generating station, which has a maximum demand of 50 MW, a load factor of 80 % and a plant capacity factor of 40 %.	**1**	**3**
2.	Describe the purpose of load forecasting technique in the operation of power system.	**1**	**2**
3.	How an Area Control Error can be reduced in the secondary Load Frequency Control?	**2**	**2**
4.	What makes the state variable model essential to the functioning of the power system?	**2**	**2**
5.	Distinguish between P-f and Q-V control techniques.	**3**	**4**
6.	Enumerate the different methods of controlling the power transmission system's voltage.	**3**	**2**
7.	Formulate the problem statement for Economic Load Dispatch.	**4**	**2**
8.	Examine the differences between Unit Commitment and Economic Load Dispatch.	**4**	**3**
9.	List the various responsibilities of Regional Load Dispatch Centre.	**5**	**2**
10.	Describe how a power system's state can be estimated.	**5**	**2**

PART- B (5 x 14 = 70 Marks)

		Marks	CO	RBT LEVEL
11. (a)	The daily demands of three consumers are given below:	**(14)**	**1**	**3**

Time	Consumer 1	Consumer 2	Consumer 3
12 midnight to 8 A.M.	No load	300W	No load
8 A.M. to 2 P.M.	500 W	No load	200 W
2 P.M. to 4 P.M.	200 W	900 W	1100 W
4 P.M. to 10 P.M.	700 W	No load	500W
10 P.M. to midnight	No load	200 W	100 W

Plot the station load curve and find (i) Maximum demand of individual consumer (ii) Load factor of individual consumer (iii) Diversity factor and (iv) Load factor of the station.

(OR)

(b) Illustrate various techniques of load forecasting with applications in the operation and control of power systems. **(14) 1 3**

12. (a) Determine the speed governor mechanism's transfer function from the functional block diagrams. **(14) 2 3**

(OR)

(b) Two alternators rated 400 MW and 600 MW are operating in parallel with governor droop characteristics of 4 percent and 5 percent respectively, from no load to full load. If a load of 800 MW is connected to the system, find the share of load for each alternator, and also the system operating frequency. Assume the no load frequency to be 50 Hz. **(14) 2 3**

13. (a) Outline a typical excitation system and derive the model of an Automatic Voltage Regulator. Also analyze its open loop gain performance. **(14) 3 4**

(OR)

(b) Illustrate and compare the operating principle and V-I characteristics of SVC and STATCOM in inductive/capacitive mode. **(14) 3 4**

14. (a) Three power plants of total capacity of 600 MW are scheduled for operation to supply a total system load of 350 MW. Determine the economic load scheduling if the plants have the following incremental cost characteristics and the generator constraints: **(14) 4 3**

$IC_1 = 40 + 0.25\ P_{G1}; \qquad 40 \leq P_{G1} \leq 120$

$IC_2 = 50 + 0.3\ P_{G2}$; $30 \leq P_{G2} \leq 150$

$IC_3 = 20 + 0.20\ P_{G3}$; $60 \leq P_{G3} \leq 220$

(OR)

		Marks	CO	RBT LEVEL
(b)	Demonstrate the forward dynamic programming solution method of unit commitment problem with a neat flow-chart.	**(14)**	**4**	**3**
15. (a)	Examine various functions of SCADA and analyze the role of it in the operation and control of power system.	**(14)**	**5**	**3**

(OR)

(b)	Illustrate different operating states of a power system with state transition and control strategies.	**(14)**	**5**	**3**

PART- C (1 x 10 = 10 Marks)

(Q.No.16 is compulsory)

		Marks	CO	RBT LEVEL
16.	An isolated single area has the following data: Area capacity = 1000 MW Normal operating load = 600 MW Inertia constant = 6 sec Speed Regulation = 5 % Operating frequency = 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 evaluate the change in frequency due to an increase of load by 85 MW.	**(10)**	**2**	**5**

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