A **Reg. No. :** | | | | | | | | | | |

Question Paper Code: 57302

B.E./B.Tech. DEGREE EXAMINATION, APRIL 2019

Seventh Semester

Electrical and Electronics Engineering

15UEE702 – POWER SYSTEM OPERATION AND CONTROL

(Regulation 2015)

Duration: Three hours Maximum: 100 Marks

Answer ALL Questions

PART A - (10 x 1 = 10 Marks)

1. Load curve is a plot of CO1- R

   (a) Load versus generation capacity (b) Load versus current

   (c) Load versus time (d) Load versus cost of power

2. What happens to frequency if the load on the generator increases? CO1- R

   (a) Speed increases and frequency decreases

   (b) Speed decreases and frequency decreases

   (c) Speed increases and frequency increases

   (d) Speed decreases and frequency increases

3. Unit of speed regulation is _____. CO2- R

   (a) Hz / MVAr (b) Hz / MVA (c) Hz / MW (d) Hz

4. Area of frequency response characteristic 'β' is CO2- R

   (a) $1/R$ (b)B (c)$B + 1/R$ (d)$B - 1/R$

5. An over-excited synchronous motor running on no load is known as CO3- R

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   (a) Alternator (b). Synchronous condenser

   (c) Synchronous Induction generator (d). None of these

6. For synchronous condensers, the p.f. improvement apparatus should be located at CO3- R

(a) Sending end (b) Receiving end (c) Both (a) and (b) (d) None of these

7. The optimum allocation of generator at each generating station at various station load levels is called _____. CO4- R

(a) Load forecasting (b).State Estimation (c). Unit commitment (d). SCADA

8. The equality constraint, when the transmission line losses are considered, is CO4- R

(a) $\sum_{i=1}^{n} P_{G_i} - P_L = 0.$ (b) $\sum_{i=1}^{n} P_{G_i} - P_D = P_L + P_G.$

(c) $\sum_{i=1}^{n} P_{G_i} - P_D = 0.$ (d) $\sum_{i=1}^{n} P_{G_i} - P_L = P_D.$

9. State estimation scheme uses CO5- R

(a) Lagrangian function method (b) Negative gradient method

(c) Lyapunov method (d) Weighted least square method

10. If the normal system fails to pass any one of the contingency tests, it is declared to be CO5- R

(a) Steady state secure (b) Steady state insecure

(c) Transient state secure (d)Transient state insecure.

PART – B (5 x 2= 10Marks)

11. What decides the loading of generating stations? CO1- R

12. Differentiate between static and dynamic response of an ALFC loop. CO2- R

13. Draw the phasor diagram of a static VAR compensator. CO3- R

14. Comparison between unit commitment and economic dispatch CO4 -R

15. What is Energy Management System ? What are the major functions of it? CO5- R

PART – C (5 x 16= 80Marks)

16. (a) (i) State the need for load forecasting in a power system. Discuss how loads are forecasted for a typical power system using any one technique. CO1-U (8)

(ii) Draw the load curve and load duration curve for a sample power system and explain the importance of these curves for economic operation of power system. CO1-App (8)

Or

	(b)	A diesel station supplies the following loads to various consumers: Industrial consumer = 1500 kW. Commercial Establishment = 750 kW, Domestic power = 100 kW, Domestic light = 450 kW. If the maximum demand on the station is 2500 kW and the number of kWh generated per year is $45x10^6$, determine (i). Diversity factor (ii). Annual load factor.	CO1- App	(16)
17.	(a)	Derive the transfer function of an uncontrolled load frequency control of a single area power system and derive the expression for static error following a step load change.	CO2- App	(16)
		Or		
	(b)	Develop a transfer function of the speed governing mechanism and sketch a block diagram. What are the components of speed governor system of an alternator? Explain in detail.	CO2- App	(16)
18.	(a)	Describe the following methods of voltage control. (i) Tap changing transformer. (ii) Secondary voltage control – STATCOM.	CO3- Ana	(16)
		Or		
	(b)	(i) Derive the relations between voltage, power and reactive power at a node for applications in power system control.	CO3- Ana	(8)
		(ii) Discuss in detail about the generation and absorption of reactive power	CO3- Ana	(8)
19.	(a)	(i) Explain how the forward dynamic programming solution is applied in unit's commitment problem describe by using flow chart.	CO4 -U	(8)
		(ii) Illustrate the λ- iteration method for finding the solution of economic dispatch without transmission losses with a neat flow chart.	CO4 -U	(8)
		Or		
	(b)	The fuel cost of two generating units are given by, $F_1 = 1.6 + 25\ P_{G1} + 0.1P_{G1}^2$ Rs / hr. $F_2 = 2.1 + 32\ P_{G2} + 0.1\ P_{G2}^2$ Rs/ hr. If the total demand on the generators is 250 MW, Calculate the economic load scheduling of the two units.	CO4-Ana	(16)

20.	(a)	Draw and explain the state transition diagram showing various state transitions and control strategies for secure operation of a typical power system.	CO5-U	(16)
		Or		
	(b)	Illustrate the different function that are performed by the SCADA system.	CO5-U	(16)