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

Question Paper Code: 57302

B.E./B.Tech. DEGREE EXAMINATION, MAY 2024

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. Which of the following represents the annual average load? CO1- R

   (a) (KWh supplied in a day)/24 (b){(KWh supplied in a day)/ 24 } × 365

   (c){(KWh supplied in a month)/(30 x 24) (d) (KWh supplied in a year) / (24 × 365)

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

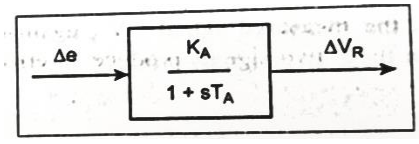
   (c) Speed increases and frequency increases (d) Speed decreases and frequency increases

3. Unit of Load damping constant ' D ' is CO2- R

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

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

   (a) 1/*R* (b) *D* (c) *D*+ 1/*R* (d) D - 1/*R*

5. This model may named as 

CO3- R

   (a) Comparator (b) Amplifier (c) Exciter (d) Synchronous Generator

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. Unit of λ is CO4- R

(a) Rs./hr (b) Rs./MW (c) Rs./MWh (d) MW/Rs

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. Security control system is a system of CO5- R

(a) Manual control (b) Integrated automatic control

(c) Conventional generation control (d) Both (a) and (b)

PART – B (5 x 2= 10Marks)

11. What is Load factor? CO1- R

12. What is meant by control area? CO2- R

13. What is meant by stability compensation? 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) A generating station has the following daily load curve CO1 App (16)

Time (hours)	0-6	6-10	10-12	12-16	16-20	20-24
Load (MW)	40	50	60	50	70	40

Draw the load curve, load duration curve and compute the maximum demand and Evaluate the units generated per day, average load and load factor for the above problem.

Or

(b) (i) Calculate the diversity factor and the annual load factor of a generating station, which supplies the following loads to various consumers: CO1 App (8)

Industrial consumers – 2000kW
Commercial load-1000kW
Domestic load- 200kW
Domestic light- 500kW

If the maximum demand on the station is 3000 kW, and the number ofunits produced per year is $50*10^5$.

(ii) Explain about plant level and system level controls. CO1- U (8)

17. (a) A two area power system has two identical areas ,consider the following data: CO2- App (16)

Area capacity = 1500MW
Nominal operating load = 750 MW
Inertia constant = 5 sec
Speed Regulation of all regulating generators = 3 %
Frequency = 50 Hz
Damping coefficient = 1%
Governor time constant = 0.06 sec
Turbine time constant = 0.25 sec

A load increases M_1 = 30MW occurs in area 1. Determine (i) Δf_{stat} and ΔP_{12stat}.

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) Draw the diagram of typical Automatic Voltage Regulator and develop Modelling of Automatic Voltage Regulator its block diagram representation CO3- U (16)

Or

(b) (i) Derive the relations between voltage, power and reactive power at a node for applications in power system control. CO3- U (8)

(ii) Discuss in detail about the generation and absorption of reactive power. CO3- U (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) (i) Analyze priority list using full load average production for the data given below. CO4- U (10)

Unit No	Loading limits		Fuel cost parameter			Fuel cost
	Min	Max	a_i	b_i	c_i	
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

P_D= 800MW.

(ii) Explain about the thermal unit constraints CO4- U (6)

20. (a) Enumerate the various operating states and the control strategies of a power system CO5- U (16)

Or

(b) Illustrate the different function that are performed by the SCADA system. CO5- U (16)