OR	iii.	Explain the block diagram representation of a single-area control system for load frequency control.	**7**	2	1-3	3	1
Q.5	i.	Define Tie-line Bias Control and its importance in a two-area Load Frequency Control (LFC) system.	**4**	3	1-3	4	1
	ii.	Explain the block diagram of Load Frequency Control (LFC) for a two-area system in the uncontrolled case.	**6**	2	1-3	4	1
OR	iii.	Explain the block diagram of Load Frequency Control (LFC) for a two-area system in the controlled case.	**6**	2	1-3	4	1
Q.6		Attempt any two:					
	i.	Define steady-state, dynamic, and transient stability in power systems.	**5**	1	1-3	5	1
	ii.	What is the swing equation and why is it significant in power system stability studies?	**5**	3	1-3	5	1
	iii.	Discuss the application of the equal area criterion for determining transient stability. Illustrate with a suitable diagram.	**5**	3	1-3	5	1

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Total No. of Questions: 6 *Total No. of Printed Pages:4*

Enrollment No.....

Faculty of Engineering
End Sem Examination Dec 2024
EE3CO40 Power System -II

Programme: B.Tech. Branch/Specialisation: EE

Duration: 3 Hrs. **Maximum Marks: 60**

Note: All questions are compulsory. Internal choices, if any, are indicated. Answers of Q.1 (MCQs) should be written in full instead of only a, b, c or d. Assume suitable data if necessary. Notations and symbols have their usual meaning.

			Marks	**BL**	**PO**	**CO**	**PSO**
Q.1	i.	In the Z-bus matrix, the diagonal elements represent: (a) Impedance between different buses (b) Power generation at each bus (c) Voltage at each bus (d) Self-impedance of a bus	**1**	1	1-3	1	1
	ii.	Which method is best suited for large power systems due to its faster convergence? (a) Gauss-Seidel Method (b) Newton-Raphson Method (c) Fast Decoupled Method (d) Simple Iteration Method	**1**	1	1-3	1	1
	iii.	What is the incremental fuel cost of a generating unit? (a) The total cost of fuel for generating a given amount of power (b) The change in total fuel cost due to a small change in power generation (c) The cost of additional equipment needed for more power generation (d) The efficiency of the generating unit	**1**	1	1-3	2	1

iv.	What does the heat rate curve of a thermal power plant represent? (a) Efficiency of the plant with respect to time (b) Relationship between fuel input and power output (c) Fuel input per unit of electricity generated (d) Cost of fuel per unit of power generated	**1**	1	1-3	2	1
v.	The mathematical model of a steam turbine is essential for: (a) Controlling the load distribution among generators (b) Predicting the environmental impact of the plant (c) Estimating the time required for steam generation (d) Simulating the dynamic response and transient behaviour	**1**	1	1-3	3	1
vi.	What is the main purpose of the speed governing system in a generator? (a) To control the voltage output (b) To maintain constant frequency (c) To optimize fuel consumption (d) To control the active power generation	**1**	1	1-3	3	1
vii.	When implementing load frequency control in a two-area system, the area control error (ACE) is defined as the: (a) Difference between the actual and scheduled tie-line power (b) Difference between the system's frequency deviation and the load demand (c) Difference between the generation capacity and the total load (d) Sum of frequency deviations in both areas	**1**	1	1-3	4	1
viii.	In the economic dispatch control, the goal is to: (a) Minimize frequency deviations across the system (b) Balance the reactive power across all generators	**1**	1	1-3	4	1

	(c) Maximize the transfer of power between areas (d) Minimize the generation cost while satisfying system load demand						
ix.	Transient stability limit of the power can be increased by introducing: (a) Series inductance (b) Shunt inductance (c) Series capacitance (d) Shunt capacitance	**1**	1	1-3	5	1
x.	The use of high speed breakers can: (a) Increase the transient stability (b) Decrease the transient stability (c) Increase the steady state stability (d) Decrease the steady state stability	**1**	1	1-3	5	1
Q.2 i.	Explain the significance of the per unit (p.u.) system in power system analysis.	**2**	1	1-3	1	1
ii.	Classify the various types of buses in power system for power flow studies.	**3**	2	1-3	1	1
iii.	Explain clearly with flow chart the computational procedure for power flow solution using Gauss Seidel method when the system contains all types of buses.	**5**	2	1-3	1	1
OR iv.	Derive the expression for the Y-bus matrix using the step-by-step method.	**5**	2	1-3	1	1
Q.3 i.	Explain the difference between incremental fuel cost and incremental production cost.	**2**	2	1-3	2	1
ii.	Explain the significance of the heat rate curve and cost curve in the optimal operation of thermal power plants.	**8**	3	1-3	2	1
OR iii.	Derive the general transmission line loss formula and explain the significance of loss coefficients.	**8**	2	1-3	2	1
Q.4 i.	Write the transfer function of a steam turbine and its significance.	**3**	2	1-3	3	1
ii.	Derive the mathematical modelling of a speed governing system in a power plant.	**7**	2	1-3	3	1

Marking Scheme
EE3CO40 Power System -II

			Marks
Q.1	i.	(d) Self-impedance of a bus	**1**
	ii.	(b) Newton-Raphson Method	**1**
	iii.	(b) The change in total fuel cost due to a small change in power generation	**1**
	iv.	(c) Fuel input per unit of electricity generated	**1**
	v.	(d) Simulating the dynamic response and transient behaviour	**1**
	vi.	(b) To maintain constant frequency	**1**
	vii.	(a) Difference between the actual and scheduled tie-line power	**1**
	viii.	(d) Minimize the generation cost while satisfying system load demand	**1**
	ix.	(c) Series capacitance	**1**
	x.	(a) Increase the transient stability	**1**
Q.2	i.	Explain the significance of the per unit (p.u.) system in power system analysis.	**2**
	ii.	Classify the various types of buses in power system for power flow studies.	**3**
	iii.	Explain clearly with flow chart the computational procedure for power flow solution using Gauss Seidel method when the system contains all types of buses.	**5**
OR	iv.	Derive the expression for the Y-bus matrix using the step-by-step method.	**5**
Q.3	i.	Explain the difference between incremental fuel cost and incremental production cost.	**2**
	ii.	Explain the significance of the heat rate curve **4M** cost curve in the optimal operation of thermal power plants. **4M**	**8**
OR	iii.	Derive the general transmission line loss formula and explain the significance of loss coefficients.	**8**
Q.4	i.	Write the transfer function of a steam turbine and its significance.	**3**
	ii	Derive the mathematical modelling of a speed governing system in a power plant.	**7**
OR	iii	Explain the block diagram representation of a single-area control system for load frequency control.	**7**
Q.5	i.	Define Tie-line Bias Control and its importance in a two-area Load Frequency Control (LFC) system.	**4**
	ii	Explain the block diagram **3M** Load Frequency Control (LFC) for a two-area system in the uncontrolled case. **3M**	**6**

OR	iii	Explain the block diagram **3M** Load Frequency Control (LFC) for a two-area system in the controlled case. **3M**	**6**
Q.6		Attempt any two:	
	i	Define steady-state, dynamic, and transient stability in power systems.	**5**
	ii	What is the swing equation **2M** why is it significant in power system stability studies? **3M**	**5**
	iii	Discuss the application of the equal area criterion for determining transient stability. Illustrate with a suitable diagram.	**5**