



**SET B**  
**Marking Scheme**

End-Sem Examination-I, Winter 2025

Academic Year: 2025-2026

Semester: I

Name of Programme: Electrical Engineering

Pattern: 2024

Name of Course: Computer-Aided Power System Analysis

Course Code: 2406501

Max Marks: 60

Duration: 2:30 Hr.

Q. No.	Details	(stepwise marks)	Max. Marks
Q.1.	Compare the GS method, NR method and fast decoupled load flow method.	6 M	[6]
Q.2.	The symmetrical components of a phase a voltage in a 3-phase unbalanced system are $V_{a0} = 10\angle 180^\circ V$ , $V_{a1} = 50\angle 0^\circ V$ , $V_{a2} = 20\angle 90^\circ V$ Determine the phase voltages $V_a, V_b$ and $V_c$ .	6 M	[6]
Q.3.	a) Consider a simple power system with three buses. Measurements are given for the real power flows and bus voltages. Formulate the state estimation problem using the WLS method.	8 M	[8]
	<b>OR</b>		
	b) Develop the mathematical formulation for the Weighted Least Squares (WLS) method in state estimation.	8 M	
	c) Explain the significance of Jacobian matrices in state estimation.	8 M	
	<b>OR</b>		[8]
d) Explain the false data injection attacks, and its impact in state estimation.	8 M		
Q.4.	a) There are two generating units in a thermal power plant having cost characteristics $C_1 = 200 + 2.5P_1 + 0.01P_1^2$ Rs/hr $C_2 = 400 + 2P_2 + 0.02P_2^2$ Rs/hr Where $P_1$ and $P_2$ in MW. The system is operating with economic dispatch with $P_1=325$ MW and $P_2=175$ MW and $\frac{dP_L}{dP_2} = 0.2$ . Find the penalty factor of plant 1 and plant 2.	8 M	



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	<b>OR</b>		[8]
	b) In a generating plant the fuel cost characteristics are : $F_1 = 60 + 30P_1 + 0.2P_1^2 \text{ Rs/hr}$ $F_2 = 80 + 20P_2 + 0.15P_2^2 \text{ Rs/hr}$ The Lagrangian Multiplier 120 Rs/MWhr, Assume the transmission line losses are neglected. Then, find most economic power generation of the units and also find total power demand.	8 M	
	c) Differentiate between economic load dispatch and unit commitment.	8 M	
	<b>OR</b>		[8]
	d) Describe the Lagrange multiplier method for solving optimal power flow problems with an example.	8 M	
<b>Q.5.</b>	a) Derive the formula for calculating loss coefficients using the sensitivity approach.	8 M	[8]
	<b>OR</b>		
	b) Describe the Generation Shift Sensitivity Distribution (GSSD). Provide its application in power systems.	5 M 3 M	
	c) Define loss coefficients. Explain their significance in power system analysis.	3 M 5 M	
	<b>OR</b>		
	d) Derive the transmission loss formula in terms of generation and demand at different buses.	8 M	[8]