Gandhi Institute of Engineering and Technology University, Odisha, Gunupur
(GIET University)

B. Tech (Sixth Semester - Regular) Examinations, April 2026

23BELPC36002/23BEEPC36002 - Power System Operation and Control (EE/EEE)

Time: 3 hrs Maximum: 60 Marks

Answer ALL questions

(The figures in the right hand margin indicate marks)

PART – A **(2 x 5 = 10 Marks)**

	Q.1. Answer ***ALL*** questions	CO #	Blooms Level
a.	Describe the importance of selecting base values in the per-unit system.	CO1	K2
b.	Mention any two practical applications of load flow analysis.	CO2	K2
c.	What is understood by a tie-line in interconnected power systems?	CO3	K1
d.	Explain the concept of a control area in power system operation.	CO5	K2
e.	What is the swing equation? State its significance in rotor dynamics.	CO6	K2

PART – B **(10 x 5 = 50 Marks)**

	Answer ***ALL*** the questions	Marks	CO #	Blooms Level
2. a.	A balanced three-phase load operates at 33 kV with a line current of 80 A and a lagging power factor of 0.85. Determine: (a) Active power (b) Reactive power (c) Apparent power	5	CO1	K3
b.	Explain the load flow problem in power systems. Classify different types of buses and discuss the significance of load flow studies.	5	CO2	K2
	(OR)			
c.	Describe the procedure for forming the Y-bus matrix and explain how mutually coupled elements are incorporated.	5	CO1	K3
d.	A 3-bus power system has: Z12 = j0.25 pu, Z23 = j0.20 pu, Z13 = j0.40 pu. Neglect shunt admittance. Form the complete Y-Bus matrix.	5	CO2	K4
3.a.	A 2-bus system has the following data: Slack Bus: $V_1 = 1.0\angle 0^\circ$ Bus $2 P_2 = -0.8pu, Q_2 = -0.3pu$ Line impedance: $Z_{12} = j0.4$pu Perform one iteration of the Gouss-Seidel method to compute the voltage at Bus 2	5	CO2	K4
b.	Explain the concepts of single subscript and double subscript notation used in power systems. Also derive expressions for complex power in a single-phase AC circuit and explain the power triangle with neat diagrams.	5	CO1	K2
	(OR)			
c.	Explain the input-output characteristics of generating units and discuss incremental cost.	5	CO3	K2
d.	The cast functions of two generating units are	5	CO3	K4

$$C_1 = 0.4P_1^2 + 160P_1 + K_1$$
$$C_2 = 0.45P_2^2 + 120P_2 + K_2$$

For a total demand of 162.5 MW:

(a) Find optimal load sharing

(b) Calculate daily loss if load is equally shared

4.a.	Explain the distribution of load between generating units within a plant and between different plants.	5	CO3	K2
b.	A system has three units: • Unit 1: $200 + 7P_1, 50 - 200$MW • Unit 2: $180 + 6P_2, 40 - 150$MW • Unit 3: $140 + 5P_3, 30 - 100$MW For a demand of 270 MW : (a) Find optimal commitment (b) Perform economic load allocation	5	CO3	K4
	(OR)			
c.	Explain the turbine-generator model and the concept of accelerating power	5	CO4	K2
d.	Describe the working of a speed governor with a neat block diagram	5	CO4	K3
5.a.	Explain the static and dynamic response of the primary ALFC loop for a sudden load disturbance and discuss influencing parameters.	5	CO4	K2
b.	Explain the need and working of the secondary (reset) ALFC loop	5	CO4	K3
	(OR)			
c.	Explain tie-line bias control and its advantages in multi-area systems	5	CO5	K2
d.	Develop the block diagram representation of a two-area system	5	CO5	K4
6.a.	Explain the power-angle relationship of a synchronous machine and discuss its importance in stability analysis.	5	CO6	K3
b.	Explain the Equal Area Criterion used for transient stability analysis of a single machine connected to an infinite bus.	5	CO6	K3
	(OR)			
c.	Discuss the step-by-step method for solving the swing equation and explain how swing curves are used for stability assessment.	5	CO6	K3
d.	Explain the role of computer programs in transient stability analysis and their advantages.	5	CO6	K2

--- End of Paper ---