Enrolment No./Seat No_____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE- SEMESTER–VI (NEW) EXAMINATION – WINTER 2024

Subject Code: 3160920 Date:05-12-2024

Subject Name: Inter Connected Power System

Time: 02:30 PM TO 05:00 PM Total Marks:70

Instructions:

1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**
4. **Simple and non-programmable scientific calculators are allowed.**

			Marks
Q.1	**(a)**	List the advantages and disadvantages of the interconnected power system.	**03**
	(b)	Why the bus admittance matrix is a sparse matrix? (Answer in brief)	**04**
	(c)	Fig. 1 shows the four-bus network with interconnected lines. The value on each line indicates the impedance of the line. The shunt admittance at each bus is assumed to be negligible. Utilizing the given data from the Y_{BUS} for the given network for two cases, Case -1: The dotted line between bus 2 and bus 3 is disconnected. Case -2: The dotted line between bus 2 and bus 3 is connected.	**07**

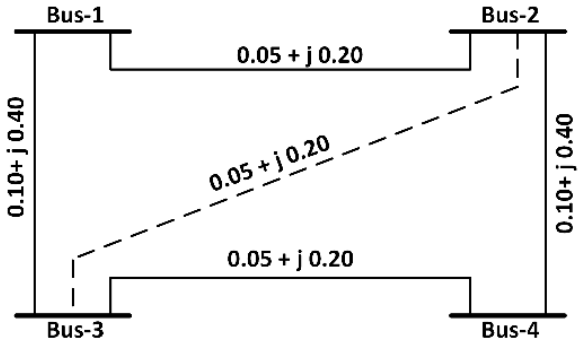

Fig. 1 Sample four bus network

Q.2	**(a)**	Explain the classification of buses. What is the significance of slack bus?	**03**
	(b)	Compare the GS and NR methods of load flow study.	**04**
	(c)	Discuss the Z_{bus} building algorithm.	**07**
		OR	
	(c)	Explain the Fast Decoupled load flow method with necessary assumptions.	**07**
Q.3	**(a)**	List out the methods to improve steady-state stability.	**03**
	(b)	Discuss the factors affecting the transient stability limit.	**04**
	(c)	Discuss any method of obtaining critical fault clearing time and angle.	**07**
		OR	
Q.3	**(a)**	What do you mean by infinite bus with reference to the power system?	**03**
	(b)	Explain with neat and clean waveforms (i) steady state stability and (ii) transient stability.	**04**
	(c)	Derive the swing equation using point by point method.	**07**
Q.4	**(a)**	Explain (i) heat rate curve and (ii) incremental heat rate curve.	**03**
	(b)	What is the penalty factor? Derive its expression in terms of incremental loss.	**04**
	(c)	A system having two generating plants connected through a line has the loss co-efficient: $B_{11} = 0.1 \times 10^{-2}$ MW^{-1}, $B_{12} = -0.01 \times 10^{-2}$ MW^{-1}, and $B_{22} = 0.13 \times 10^{-2}$ MW^{-1}. Power is being dispatched economically with	**07**

P_1 = 120 MW and P_2 = 200 MW. To raise the system load by 1 MW costs an additional Rs. 40 per hour. Find the penalty factor of plant 1 and the additional cost per hour to increase the output of the plant by 1 MW.

OR

Q.4 **(a)** Explain generator operating cost. **03**

(b) Briefly explain the unit commitment using the dynamic programming method. **04**

(c) A two-bus system is shown in Fig. 3. If 100 MW is transmitted from plant 1 to the load, a transmission loss of 10 MW is incurred. Find the required generation for each plant and the power received by the load when the system λ is Rs. 25/MWh. The incremental fuel costs of the two plants are given below: **07**

$dC_1/dPG_1 = 0.02PG_1 + 16.00$ Rs/MWh
$dC_2/dPG_2 = 0.04PG_2 + 20.00$ Rs/MWh

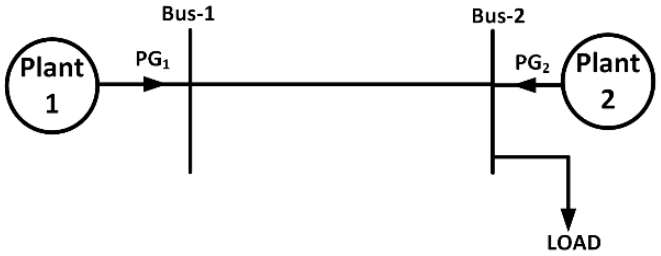

Fig. 2 A sample two-bus system.

Q.5 **(a)** Explain in brief cascade tripping (blackout). **03**

(b) Write basic criteria for economic division of load between units within a plant. **04**

(c) With the help of a neat diagram explain the turbine speed governing system. **07**

OR

Q.5 **(a)** Explain briefly the SCADA system. **03**

(b) State the names of load dispatch centres in hierarchical order and explain their functions. **04**

(c) Explain methods used for voltage control in a power system. **07**

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