Seat No./Enrollment No.: _____

GUJARAT TECHNOLOGICAL UNIVERSITY
BACHELOR OF ENGINEERING – SEMESTER 7 – EXAMINATION – SUMMER 2026

Subject Code: 3172212 **Date: 29/05/2026**

Subject Name: Mine System Engineering

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.**

Q.1	**(a)**	Define 'System Analysis' and its role in mine planning.	**03**
	(b)	Explain the classification of systems based on their complexity and environment.	**04**
	(c)	Discuss the application of Linear Programming (LP) in the blending of coal from different seams to meet quality specifications.	**07**
Q.2	**(a)**	What is a 'Basic Feasible Solution' in the context of the Simplex method?	**03**
	(b)	Explain the concept of 'Duality' in Linear Programming and its economic interpretation.	**04**
	(c)	Describe the algorithm for the Assignment Problem (Hungarian Method) and its use in deploying heavy machinery in an open-cast mine.	**07**
		OR	
Q.2	**(c)**	Explain the creative aspects of planning and design. How can brainstorming techniques help in finding alternative mining solutions?	**07**
Q.3	**(a)**	Define 'Criticality Index' in project management.	**03**
	(b)	Explain how to calculate the 'Probability of Completing a Project' by a specific due date using PERT statistics.	**04**
	(c)	Discuss the concept of 'Lowest Cost Schedule' (Crashing) in project management with a mining case study example.	**07**
		OR	
Q.3	**(a)**	Define 'Redundant Jobs' in a network diagram and how to identify them.	**03**
	(b)	Explain the 'Shortest Route Problem' and its application in optimizing underground haulage routes.	**04**
	(c)	Detail the algorithm for the Transportation Problem (e.g., VAM or Stepping Stone) to minimize mineral transport costs.	**07**
Q.4	**(a)**	What are the primary limitations of Simulation techniques in mining?	**03**
	(b)	Explain the method of generating input data for a mine simulation model.	**04**
	(c)	Describe how Monte-Carlo simulation is applied to model equipment maintenance and downtime in a mine.	**07**
		OR	
Q.4	**(a)**	List the components that constitute 'Inventory Carrying Costs'.	**03**
	(b)	Explain the 'Classical EOQ Model' and its significance in spare parts management.	**04**

	(c)	Discuss the 'EOQ model with quantity discounts' and its impact on the total annual cost of mining supplies.	**07**
Q.5	**(a)**	Define 'Static vs. Dynamic' inventory problems in the mining industry.	**03**
	(b)	Explain the 'Minimal Spanning Tree' network model and its role in connecting power grids to various mine sections.	**04**
	(c)	Compare and contrast the assumptions of PERT and CPM regarding time estimates and nature of activities.	**07**

OR

Q.5	**(a)**	What do you understand by 'System Environment' in a mining context?	**03**
	(b)	Describe the interpretation of the Simplex table, focusing on the Zj - Cj row.	**04**
	(c)	Discuss the variations on Classical Transportation models and how they are solved for 'Unbalanced' mining problems.	**07**

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