Enrollment No./Seat No.:

GUJARAT TECHNOLOGICAL UNIVERSITY

Bachelor of Engineering - SEMESTER - III EXAMINATION - WINTER 2025

Subject Code: BE03022031 **Date: 19-12-2025**

Subject Name: Development of Mineral Deposits

Time: 10:30 AM TO 01:00 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 three common methods for the classification of mineral deposits based on their mode of origin.	**03**
	(b)	Differentiate between a long-hole drill and a rotary-percussive drill based on their principle of action and primary use in mining.	**04**
	(c)	Apply the concept of development to explain why an inclined shaft would be preferred over a vertical shaft for a shallow, moderately dipping mineral deposit, considering the challenges in transportation and ventilation.	**07**
Q.2	**(a)**	Define the terms Stripping Ratio and Overall Pit Slope as they relate to surface mining.	**03**
	(b)	Explain the concept of Cut-off Grade and discuss its significance in deciding whether a mineral body is economically viable for mining.	**04**
	(c)	Analyze the operational cycle and applicability conditions of a Bucket Wheel Excavator (BWE). Provide a justification for why BWEs are primarily used in large-scale coal or soft rock mines.	**07**
		OR	
	(c)	Apply the principles of blasting to illustrate and explain the concept of Cushion Blasting. State two applications where this technique is essential.	**07**
Q.3	**(a)**	State three important parameters that define the geometry of a blast hole pattern.	**03**
	(b)	Explain the difference between Drift and Cross-cut in the context of underground mine development networks, and state the primary function of each.	**04**
	(c)	Describe the sequential steps and techniques involved in Ore Reserve Estimation using the Vertical Cross-Section Method.	**07**
		OR	
	(a)	Define Sustainable Development in the context of mineral resource extraction.	**03**
	(b)	Apply the knowledge of drilling techniques to explain the selection criteria for choosing between Rotary Drilling and DTH (Down-The-Hole) Drilling for bench blasting in a hard rock quarry.	**04**

	(c)	Analyze the problems associated with Shaft Sinking through water-bearing strata and describe one specialized technique used to overcome this challenge.	**07**
Q.4	**(a)**	Define the terms Adit and Ramp in mine development and identify one geological factor that favours the use of an Adit over a Shaft.	**03**
	(b)	Explain how Bench Geometry impacts the stability of a surface mine slope and the efficiency of loading operations.	**04**
	(c)	Describe the mechanism of rock breakage due to blasting. Explain the roles of detonation velocity (VOD) and explosive energy in achieving effective fragmentation.	**07**

OR

	(a)	List three key physical properties of a mineral deposit that influence the selection of its mining method.	**03**
	(b)	Apply the principles of reclamation to describe the two main objectives of Waste Dump Re-shaping in a post-mining scenario.	**04**
	(c)	Analyze the difference in purpose, geometry, and cost between Exploration Development and Production Development in a typical underground metal mine.	**07**
Q.5	**(a)**	List three types of mineral deposits classified based on their attitude.	**03**
	(b)	Describe and illustrate the various components that constitute a typical ANFO blast hole charge for primary breaking in surface mining.	**04**
	(c)	Describe the layout and cycle of operations for the Strip Mining method, and discuss its primary environmental disadvantage.	**07**

OR

	(a)	State three essential considerations when determining the optimal location for a Shaft at a new mine site.	**03**
	(b)	Explain the difference between Proved Reserves and Probable Reserves based on the level of geological assurance and exploration data.	**04**
	(c)	Describe the working principle, advantages, and limitations of Non-Electric Initiation Systems compared to conventional electric systems in blasting.	**07**

***