

# DIPLOMA WALLAH

## JHARKHAND UNIVERSITY OF TECHNOLOGY (JUT)

3rd Semester Diploma in Mining Engineering | Subject: U/G Metalliferous Mining

### SAMPLE PAPER - 3

#### Instructions :

- **Full Marks:** 70 | **Time:** 3 Hours
- Question No. 1 is **compulsory** (7 MCQs x 2 Marks = 14 Marks).
- Answer any **FOUR** questions from the remaining (Q.2 to Q.7). Each carries 14 marks.
- Illustrate your answers with neat sketches/diagrams wherever necessary.

**Q.1 Choose the correct option for the following:**

**[7 × 2 = 14]**

**i. Which stoping method is typically used for flat or low-dipping (less than 30°) ore bodies?**

- (a) Shrinkage Stopping
- (b) Breast Stopping
- (c) Block Caving
- (d) Sub-level Stopping

**ii. The Cementation method of shaft sinking is most applicable in strata that is:**

- (a) Hard and dry
- (b) Highly fissured and water-bearing rock
- (c) Loose dry sand
- (d) Running mud

**iii. In the Drop Raising method, the drilling is done:**

- (a) Upwards from the lower level
- (b) Downwards from the upper level
- (c) Horizontally
- (d) Without any pattern

**iv. Which of the following is a Caving method of stoping?**

- (a) Top Slicing
- (b) Cut and Fill
- (c) Shrinkage Stopping
- (d) Square-set Stopping

**v. The heavy iron grating placed over an ore pass to prevent oversized boulders from blocking it is called:**

- (a) Ore bin
- (b) Skip
- (c) Grizzly
- (d) Chute

**vi. Increasing the diameter of an existing shaft is known as:**

- (a) Shaft Sinking
- (b) Shaft Deepening

(c) Shaft Widening

(d) Shaft Raising

**vii. What is the primary purpose of a 'Crown Pillar' in underground stoping?**

(a) To support the track above the stope

(b) To protect the lower level drift

(c) To store broken ore

(d) To act as a ventilation barrier

**Q.2 (A)** What is Sub-level Caving? Explain the basic principle, preparation, and extraction process of the Sub-level Caving method. [7]

**Q.2 (B)** Make a detailed comparison between Sub-level Caving and Block Caving. Mention the geological conditions suitable for both. [7]

**Q.3 (A)** Explain the "Cementation Method" of shaft sinking. What are the sequence of operations involved when passing through heavily fissured, water-bearing rock? [7]

**Q.3 (B)** Discuss the procedure of Shaft Widening. What safety precautions must be taken to protect the workers and equipment during this operation? [7]

**Q.4 (A)** What is the Top Slicing method of stoping? Explain its working mechanism. What are its major limitations? [7]

**Q.4 (B)** Explain the Drop Raising method using long hole drilling. Why is it considered safer than conventional raising methods? [7]

**Q.5 (A)** Describe the layout and functioning of an underground Shaft Station (Pit Bottom) in a metal mine. Show the arrangement of the Ore Pass, Grizzly, and Ore Bin with a neat sketch. [7]

**Q.5 (B)** Explain the Breast Stopping method. In what type of ore body geometry is this method most effective? [7]

**Q.6 (A)** What are the various factors that influence the selection of a Stopping method for a particular ore body? [7]

**Q.6 (B)** Explain the different types of artificial supports used in underground metal mines (e.g., Timbering, Rock bolting, Steel sets). [7]

**Q.7 Write short notes on any FOUR of the following:** [4 × 3.5 = 14]

A. Grizzly and its sizing

B. Stope preparation

C. Winzing method and its drawbacks

D. Difference between Lode and Placer deposits

## PAPER 3 - ANSWER KEY & MODEL HINTS

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**Q1 (MCQ Answers):** i-(b), ii-(b), iii-(b) [Drilled downwards, blasted upwards], iv-(a), v-(c), vi-(c), vii-(a)

### Model Hints for Theory:

**Q2(A) Sub-level Caving:** Used when the ore is moderately strong but the hanging wall is very weak and caves easily. The ore is divided into sublevels. Drilling and blasting are done in a fan pattern from sublevel drifts. As the broken ore is drawn out, the weak hanging wall caves in, filling the void.

**Q3(A) Cementation Method:** Used for sinking shafts through highly fissured rocks bearing heavy water. Liquid cement slurry is injected under high pressure into the rock fissures through boreholes. The cement sets and seals the cracks, making the rock mass impermeable and stronger, after which normal sinking resumes.

**Q4(A) Top Slicing:** An expensive and labor-intensive caving method. The ore body is extracted in horizontal slices from top to bottom. As each slice is mined, a timber mat is laid on the floor. The roof is then deliberately caved onto the timber mat. When the next lower slice is mined, the miners work under the protection of this timber mat and caved rock.

**Q4(B) Drop Raising:** A highly mechanized and safe method. Long blast holes are drilled vertically downwards from the upper level to the lower level. The holes are then charged and blasted from the bottom upwards in slices (using spherical charges like VCR). Since miners drill from the upper level, they never have to enter the hazardous raise itself.

**Q5(A) Shaft Station Layout:** The area near the shaft at any working level. Broken ore from stopes is transported by LHDs/locomotives and dumped on a **Grizzly** (heavy steel bars). Oversize boulders are broken here. The undersize falls into the **Ore Pass**, which acts as a vertical chute transferring ore to the **Ore Bin** at the pit bottom. From the bin, ore is loaded into skips and hoisted to the surface.

**Q6(A) Factors for Stopping Selection:** Dip of the ore body, width/thickness of the vein, strength of the ore, strength of hanging wall and footwall, grade of the ore (high grade needs selective mining like cut & fill, low grade needs bulk mining like block caving), and depth of deposit.