

DIPLOMA WALLAH

JHARKHAND UNIVERSITY OF TECHNOLOGY (JUT)

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

SAMPLE PAPER - 1

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. An underground vertical or highly inclined excavation made from a lower level to a higher level is called a:

- (a) Winze (b) Raise
(c) Crosscut (d) Shaft

ii. Which stoping method is most suitable for steeply dipping veins where both the ore and the wall rock are strong?

- (a) Cut and Fill Stopping (b) Block Caving
(c) Shrinkage Stopping (d) Square-set Stopping

iii. The Alimak Raise Climber is primarily used for:

- (a) Shaft Sinking (b) Stopping
(c) Driving a Raise (d) Haulage of ore

iv. In metal mining, a tabular or sheet-like mineral deposit formed by filling a pre-existing fracture is called a:

- (a) Lode / Vein (b) Placer
(c) Gossan (d) Stockwork

v. The rock mass that lies immediately above an inclined ore body is known as:

- (a) Footwall (b) Hanging wall
(c) Sill pillar (d) Crown pillar

vi. Which of the following is a naturally supported stoping method?

- (a) Sub-level caving (b) Cut and Fill

(c) Open Stopping

(d) Top Slicing

vii. In shaft sinking, the process of removing the blasted broken rock is called:

(a) Scaling

(b) Mucking

(c) Hoisting

(d) Lining

Q.2 (A) Define the following basic terminologies used in Metalliferous Mining:

[7]

(i) Lode / Vein, (ii) Strike and Dip, (iii) Hanging wall and Footwall, (iv) Pitch and Plunge.

Q.2 (B) Write the major differences between Coal Mining and Metalliferous Mining concerning geological formations, mining methods, and hazards.

[7]

Q.3 (A) Explain the cycle of operations involved in conventional Shaft Sinking (Drilling, Blasting, Mucking, and Hoisting).

[7]

Q.3 (B) How is ventilation maintained during a shaft sinking operation? Describe the types of temporary and permanent lining used in shafts.

[7]

Q.4 (A) What is Raising? Explain the construction, operation, and working principle of an Alimak Raise Climber with a neat sketch.

[7]

Q.4 (B) Differentiate between a Raise and a Winze. Briefly explain the Drop Raising method using long hole drilling.

[7]

Q.5 (A) Explain the Shrinkage Stopping method. What are the favorable conditions required for its application?

[7]

Q.5 (B) Discuss the preparation, working cycle, merits, and demerits of the Shrinkage Stopping method.

[7]

Q.6 (A) Describe the Cut and Fill Stopping method in detail. What are the different types of fill materials used?

[7]

Q.6 (B) Differentiate between Overhand Stopping and Underhand Stopping with suitable diagrams.

[7]

Q.7 Write short notes on any FOUR of the following:

[4 × 3.5 = 14]

A. Ore Pass and Ore Bin

B. Grizzly and its functions

C. Breast Stopping

D. Rider and Crosshead in shaft sinking

E. Sub-level Stopping basics

PAPER 1 - ANSWER KEY & MODEL HINTS

Q1 (MCQ Answers): i-(b), ii-(c), iii-(c), iv-(a), v-(b), vi-(c), vii-(b)

Model Hints for Theory:

Q2(A) Terminology: *Hanging wall:* Rock mass resting above the ore body. *Footwall:* Rock mass existing below the ore body. *Strike:* The direction of the line of intersection of the ore body with a horizontal plane. *Dip:* Maximum angle of inclination of the ore body with the horizontal.

Q2(B) Coal vs Metal Mining: Coal seams are generally flat/gently dipping, wide, and stratified. Metal ores are often steeply dipping, irregular (veins/lodes), and harder. Coal mining faces explosive gas (methane) and coal dust hazards, while metal mining faces silicosis and heavy rock burst issues. Stopping is used in metal mining; Bord & Pillar/Longwall in coal.

Q3(A) Shaft Sinking Cycle: Drilling (using sinker drills/jumbos) -> Blasting (using delay detonators with a wedge cut or conical cut pattern) -> Ventilation (exhausting noxious fumes) -> Mucking (using cactus grab or manual loading) -> Hoisting (via kipples) -> Lining (concrete rings).

Q4(A) Alimak Raise Climber: A mechanized method of driving a raise. A platform travels up and down on a guide rail bolted to the wall of the raise. It provides a safe working platform for drilling and blasting. Compressed air/water pipes run through the guide rail to ventilate the face after blasting.

Q5(B) Shrinkage Stopping: An overhand stopping method where a portion of the blasted ore is left in the stope to serve as a working floor for miners drilling the next slice above. Since rock swells by about 30-40% upon breaking, that excess amount is drawn out from the bottom chutes. Only applied in steep dips ($>50^\circ$) with strong ore and strong wall rocks.

Q6(A) Cut and Fill Stopping: Ore is extracted in horizontal slices from bottom to top (overhand). Once a slice is removed, the void is filled with waste material (sand, tailings, or waste rock) to support the walls and provide a working floor for the next slice. Used when wall rocks are weak.