

# DIPLOMA WALLAH

## JHARKHAND UNIVERSITY OF TECHNOLOGY (JUT)

3rd Semester Diploma in Mining Engineering | Subject: Opencast Mining (MIN301)

### 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 method of mining uses high-pressure water jets to break the un-consolidated mineral/rock?**

- (a) Auger mining
- (b) Hydraulic mining
- (c) Placer mining
- (d) Dredging

**ii. The distance between two adjacent blastholes in the same row is known as:**

- (a) Burden
- (b) Spacing
- (c) Stemming
- (d) Sub-grade drilling

**iii. Which of the following is NOT a functional part of a Dragline excavator?**

- (a) Boom
- (b) Hoist rope
- (c) Bucket
- (d) Dipper stick

**iv. Sub-grade drilling is primarily done to:**

- (a) Reduce powder factor
- (b) Prevent toe formation
- (c) Decrease bench width
- (d) Increase flyrock generation

**v. A Scraper is primarily used in opencast mining for:**

- (a) Drilling hard rock
- (b) Secondary blasting
- (c) Scraping, loading, and hauling soft topsoil
- (d) Dewatering

**vi. A major limitation of opencast mining compared to underground mining is:**

- (a) Lower overall production
- (b) Severe land degradation and environmental impact

(c) High artificial ventilation cost

(d) Lower percentage recovery of ore

**vii. What is the main cutting component of a Bucket Wheel Excavator (BWE)?**

(a) A stationary blade

(b) A rotating wheel with buckets

(c) A drag chain

(d) A ripper tooth

**Q.2 (A)** Define Sub-grade drilling. Explain the geometric relationship between Burden, Spacing, and Depth of hole in a standard bench blasting design. [7]

**Q.2 (B)** Briefly explain the controlled blasting techniques used in opencast mines to minimize ground vibration and flyrock. [7]

**Q.3 (A)** What is a Box Cut? Explain the various geological and operational factors deciding the location of a box cut in a new surface mine. [7]

**Q.3 (B)** Despite higher production, Opencast Mining has its drawbacks. What are the major limitations and environmental impacts of Opencast Mining? [7]

**Q.4 (A)** Describe the construction, rigging operation, and working principle of a Dragline bucket. [7]

**Q.4 (B)** Explain the working principle of a Continuous Surface Miner. How does it eliminate the need for drilling and blasting? [7]

**Q.5 (A)** Explain the construction and specific uses of the following initiation devices in blasting: (i) Safety fuse, (ii) Detonating fuse. [7]

**Q.5 (B)** Differentiate between Pop shooting and Plaster shooting with respect to procedure, explosive consumption, and application. [7]

**Q.6 (A)** Discuss the principles of operation and uses of a Scraper in opencast mining. Mention the conditions where it is most suitable. [7]

**Q.6 (B)** Give a brief comparison between manual and mechanized bench design regarding production scale, bench dimensions, and safety. [7]

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

**[4 × 3.5 = 14]**

A. Hydraulic mining vs Dredging

B. Front-end Loader (Wheel Loader) working

C. Factors for selecting haulage equipment

D. Haul road safety measures

E. Sluicing

## PAPER 3 - ANSWER KEY & MODEL HINTS

---

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

### Model Hints for Theory:

**Q2(A) Sub-grade drilling:** Drilling 10-20% slightly below the floor level of the bench to ensure a smooth floor and prevent hard rock humps (toe formation). Generally, Spacing = 1.2 to 1.5 times of Burden.

**Q3(A) Box Cut Location:** The initial cut that opens the mine. Location is decided by dip of the seam (preferably at the shallowest depth/outcrop), topography, surface structures, and minimizing the initial overburden stripping ratio.

**Q4(B) Continuous Miner:** Uses a rotating cutting drum equipped with tungsten carbide picks to mill the rock surface continuously. Mined material is transferred directly to dumpers via conveyors, entirely eliminating the cyclic process of drilling, blasting, and primary crushing.

**Q5(B) Pop vs Plaster Shooting:** *Pop Shooting:* Requires drilling a small hole into the boulder, inserting a small charge, and blasting. Highly efficient explosive use. *Plaster Shooting (Mud-capping):* Placing explosive directly on the boulder and covering it with mud. High explosive consumption but no drilling required.

**Q6(A) Scraper:** A machine that digs, loads, hauls, and dumps material in a single continuous cycle. Best suited for soft earth, clay, or topsoil removal over short to medium distances where road conditions are relatively good.

**Q7 Short Notes:** *Hydraulic mining:* Using high-pressure water monitors to wash away unconsolidated deposits. *Dredging:* Excavating minerals from underwater using a floating vessel (dredge). *Sluicing:* Flowing water over a sloped surface with riffles to separate heavy valuable minerals from lighter waste.