

# DIPLOMA WALLAH

## JHARKHAND UNIVERSITY OF TECHNOLOGY (JUT)

3rd Semester Diploma in Mining Engineering | Subject: Mine Surveying - I

### SAMPLE PAPER - 2

#### 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.
- Assume suitable data if missing in numericals.

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

**[7 × 2 = 14]**

**i. Which of the following tapes is most accurate and least affected by temperature variations?**

- (a) Metallic Tape
- (b) Steel Tape
- (c) Invar Tape
- (d) Cloth Tape

**ii. The Whole Circle Bearing (WCB) of a line is  $210^{\circ} 30'$ . Its Quadrantal Bearing (QB) will be:**

- (a) N  $30^{\circ} 30'$  W
- (b) S  $30^{\circ} 30'$  W
- (c) S  $30^{\circ} 30'$  E
- (d) N  $210^{\circ} 30'$  E

**iii. The horizontal angle between the true meridian and the magnetic meridian at a place is called:**

- (a) Dip
- (b) Local Attraction
- (c) Magnetic Declination
- (d) Azimuth

**iv. In levelling, the line normal to the plumb line at all points is known as:**

- (a) Horizontal line
- (b) Line of collimation
- (c) Level line
- (d) Vertical line

**v. The optical square is an instrument used in chain surveying primarily for:**

- (a) Measuring lengths
- (b) Setting out right angles ( $90^{\circ}$ )
- (c) Measuring bearings
- (d) Leveling the ground

**vi. Which method of plane table surveying is used to locate the position of an inaccessible point?**

(a) Radiation

(b) Resection

(c) Intersection

(d) Traversing

**vii. In the Height of Instrument (HI) method of levelling, HI is calculated as:**

(a)  $RL + \text{Fore Sight}$

(b)  $RL + \text{Back Sight}$

(c)  $RL - \text{Back Sight}$

(d)  $\text{Back Sight} - \text{Fore Sight}$

**Q.2 (A)** Explain the various types of errors in surveying (Systematic, Accidental, and Mistakes) with suitable examples. [7]

**Q.2 (B) (Numerical)** Convert the following Whole Circle Bearings (WCB) to Quadrantal Bearings (QB): [7]

(i)  $45^\circ 30'$

(ii)  $135^\circ 15'$

(iii)  $265^\circ 45'$

(iv)  $340^\circ 20'$

Also, convert the following QB to WCB:

(v) N  $25^\circ 10'$  E

(vi) S  $40^\circ 50'$  E

(vii) N  $55^\circ 30'$  W

**Q.3 (A)** Describe the temporary adjustments of a Dumpy Level. Explain the difference between the Line of Collimation and the Axis of the Telescope. [7]

**Q.3 (B) (Numerical)** The following consecutive readings were taken with a leveling instrument at intervals of 20 meters: [7]

1.205, 1.850, 2.345, 1.120, 1.950, 2.450, 0.980, 1.560.

The instrument was shifted after the 3rd and 6th readings. The Reduced Level (RL) of the first station (Bench Mark) is 150.000 m. Calculate the RL of all points using the **Height of Instrument (HI) Method**. Apply the usual arithmetic check.

**Q.4 (A)** What is Magnetic Declination? Explain the different types of variations in magnetic declination (Diurnal, Annual, Secular, and Irregular). [7]

**Q.4 (B)** Explain the "Three-Point Problem" in Plane Table Surveying. Mention any two methods to solve it. [7]

**Q.5 (A)** Describe the different types of measuring tapes used in surveying. Why is an Invar tape considered the most accurate? [7]

**Q.5 (B) (Numerical)** A series of offsets were taken at 15m intervals from a straight chain line to a curved boundary. The lengths of the offsets (in meters) are: [7]

2.50, 3.80, 4.60, 5.20, 6.10, 4.90, 3.20, 1.50.

Calculate the total area enclosed between the chain line, the boundary, and the end offsets using the **Trapezoidal Rule**.

**Q.6 (A)** What is Contouring? Discuss the direct and indirect methods of locating contours in the field. [7]

**Q.6 (B)** Compare a Dumpy Level with an Auto Level. What are the specific advantages of using an Auto Level in mine surveying? [7]

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

- A. Optical Square
- B. Line of Collimation vs Axis of Bubble Tube
- C. Advantages and Disadvantages of Plane Table Surveying
- D. Agonic and Isogonic lines
- E. Intersection method in Plane Tabling

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## PAPER 2 - ANSWER KEY & MODEL HINTS

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

**Model Hints for Theory & Numericals:**

**Q2(A) Types of Errors:** *Systematic (Cumulative):* Follow a physical law and can be corrected mathematically (e.g., tape expansion due to temp). *Accidental (Compensating):* Random in nature, beyond surveyor's control. *Mistakes:* Caused by human carelessness (e.g., misreading 6 as 9).

**Q2(B) Bearing Conversions Hint:**

(i)  $45^{\circ}30'$  is in 1st Quad  $\rightarrow$  **N  $45^{\circ}30'$  E**

(ii)  $135^{\circ}15'$  is in 2nd Quad  $\rightarrow 180^{\circ} - 135^{\circ}15' =$  **S  $44^{\circ}45'$  E**

(iii)  $265^{\circ}45'$  is in 3rd Quad  $\rightarrow 265^{\circ}45' - 180^{\circ} =$  **S  $85^{\circ}45'$  W**

(iv)  $340^{\circ}20'$  is in 4th Quad  $\rightarrow 360^{\circ} - 340^{\circ}20' =$  **N  $19^{\circ}40'$  W**

(v) N  $25^{\circ}10'$  E  $\rightarrow$   **$25^{\circ}10'$**

(vi) S  $40^{\circ}50'$  E  $\rightarrow 180^{\circ} - 40^{\circ}50' =$   **$139^{\circ}10'$**

(vii) N  $55^{\circ}30'$  W  $\rightarrow 360^{\circ} - 55^{\circ}30' =$   **$304^{\circ}30'$**

**Q3(A) Temporary Adjustments:** (1) Setting up the level over the station. (2) Leveling up the instrument using foot screws so the bubble is central. (3) Elimination of parallax by focusing the eyepiece and objective.

**Q3(B) HI Method Levelling Hint:**

Instrument shifted after 3rd and 6th readings.

BS: 1.205, 1.120, 0.980.

FS: 2.345, 2.450, 1.560.

IS: 1.850, 1.950.

Table: Station, BS, IS, FS, HI, RL.

HI = RL + BS. For next points, RL = HI - IS (or FS).

Arithmetic Check:  $\Sigma$ BS -  $\Sigma$ FS = Last RL - First RL.

**Q4(B) Three-Point Problem:** Locating the station point on the plane table by sighting three well-defined points whose positions are already plotted on the sheet. Methods to solve: Tracing Paper (Mechanical) method, Bessel's Graphical method, Trial and Error (Lehmann's) method.

**Q5(B) Trapezoidal Rule Area Hint:**

Formula: Area =  $d \times [ (O_1 + O_n)/2 + (O_2 + O_3 + \dots + O_{n-1}) ]$

Interval (d) = 15m. Number of offsets = 8.

Area =  $15 \times [ (2.50 + 1.50)/2 + (3.80 + 4.60 + 5.20 + 6.10 + 4.90 + 3.20) ]$

Calculate the bracket sum and multiply by 15 for the final area in sq. meters.

**Q6(A) Contouring Methods:** *Direct Method:* The contours to be plotted are actually traced on the ground by finding points of equal elevation using a level (slow but very accurate). *Indirect Method:* Spot levels are taken at regular grids/cross-sections and contours are interpolated in the office (faster, used for large hilly areas).

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