

DIPLOMA WALLAH

JHARKHAND UNIVERSITY OF TECHNOLOGY (JUT)

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

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.
- Assume suitable data if missing in numericals.

Q.1 Choose the correct option for the following:

[7 × 2 = 14]

i. The correction for sag in chain surveying is always:

- (a) Additive
- (b) Subtractive
- (c) Zero
- (d) Additive or Subtractive depending on weather

ii. The dip of the magnetic needle at the magnetic equator is:

- (a) 0°
- (b) 45°
- (c) 90°
- (d) 180°

iii. Which instrument is used in Plane Table Surveying for sighting the objects?

- (a) Plumb bob
- (b) U-fork
- (c) Alidade
- (d) Trough compass

iv. Prismoidal rule for calculating volume is applicable only when the number of cross-sections is:

- (a) Even
- (b) Odd
- (c) Divisible by 3
- (d) Any number

v. When the bubble of a level tube is exactly in the center, the axis of the bubble tube is:

- (a) Vertical
- (b) Parallel to line of collimation
- (c) Horizontal
- (d) Inclined

vi. Contour lines crossing a V-shaped valley curve point towards the:

(a) Downstream (lower elevation)

(b) Upstream (higher elevation)

(c) Perpendicular to the valley

(d) Parallel to the valley

vii. The Shrinkage Factor of a map is defined as the ratio of:

(a) Original length to Shrunk length

(b) Shrunk length to Original length

(c) True area to Shrunk area

(d) Map scale to Ground scale

Q.2 (A) What are the various types of corrections applied to linear measurements using a tape? Explain the correction for Temperature and Pull. [7]

Q.2 (B) (Numerical) The length of a survey line was measured with a 20-meter tape and was found to be 250 meters. Later, when the tape was standardized, it was found to be 0.1 meter too long. Calculate the **True Length** of the survey line. [7]

If the same line had to be plotted on a map with a scale of 1 cm = 10 m, what would be the drawn length on the paper?

Q.3 (A) Explain the concept of "Closing Error" in a closed traverse. State Bowditch's Rule and Transit Rule for balancing a closed traverse. [7]

Q.3 (B) (Numerical) Calculate the included angles for a closed compass traverse ABCD from the following Whole Circle Bearings (WCB): [7]

Line AB: $40^{\circ} 30'$

Line BC: $125^{\circ} 15'$

Line CD: $210^{\circ} 45'$

Line DA: $320^{\circ} 00'$

Apply the geometric check for the sum of the interior angles.

Q.4 (A) Define the 'Sensitiveness of a bubble tube' in levelling. What are the factors that affect the sensitiveness of a level tube? [7]

Q.4 (B) (Numerical) Reciprocal levelling was conducted across a wide river to determine the true difference in elevation between two points A and B. The following readings were recorded: [7]

Instrument at Station	Reading on Staff at A	Reading on Staff at B
A	1.155 m	2.595 m
B	0.985 m	2.415 m

Calculate the **True difference in elevation** between points A and B. If the RL of point A is 100.000 m, find the RL of point B.

Q.5 (A) Discuss the Traversing method of Plane Table Surveying. Under what conditions is this method preferred? [7]

Q.5 (B) Explain the Two-Point Problem and Three-Point Problem in Plane Table surveying. Which one gives a more accurate orientation and why? [7]

Q.6 (A) Differentiate between the Trapezoidal Rule and the Prismoidal Rule for calculating volume. Why is the Prismoidal Rule considered more accurate? [7]

Q.6 (B) (Numerical) The areas enclosed by the contour lines of an opencast mine pit are given below. The contour interval is 5 meters. [7]

Area of contour 100m = 100 sq. m

Area of contour 105m = 150 sq. m

Area of contour 110m = 200 sq. m

Calculate the total volume of excavation between the 100m and 110m contours using the **Prismoidal Rule**.

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

- A. Well-conditioned and Ill-conditioned triangles
- B. Inverted staff reading in levelling
- C. Contour Interval vs Horizontal Equivalent
- D. Magnetic Dip and Magnetic Declination
- E. Shrinkage of Map

Diplomawallah.in

PAPER 3 - ANSWER KEY & MODEL HINTS

Q1 (MCQ Answers): i-(b) [Tape sags creating an arc, measuring longer than actual, so correction is negative], ii-(a), iii-(c), iv-(b), v-(c), vi-(b), vii-(b)

Model Hints for Theory & Numericals:

Q2(B) True Length Numerical Hint:

Nominal tape length (L) = 20 m.

Actual tape length (L') = 20 m + 0.1 m = 20.1 m.

Measured length = 250 m.

True Length = $(L' / L) \times \text{Measured Length} = (20.1 / 20) \times 250 = \mathbf{251.25 \text{ meters}}$.

Drawn length on map (Scale 1 cm = 10 m): $251.25 / 10 = \mathbf{25.125 \text{ cm}}$.

Q3(B) Included Angles Numerical Hint:

Formula: Interior Angle = BB of previous line - FB of next line.

Find the Back Bearings (BB = FB \pm 180°):

BB of AB = 220° 30', BB of BC = 305° 15', BB of CD = 30° 45', BB of DA = 140° 00'.

Angle B = BB of AB - FB of BC = 220° 30' - 125° 15' = 95° 15'

Angle C = BB of BC - FB of CD = 305° 15' - 210° 45' = 94° 30'

Calculate similarly for D and A. Apply geometric check: Sum of interior angles = $(2N - 4) \times 90^\circ = (2 \times 4 - 4) \times 90^\circ = 360^\circ$.

Q4(B) Reciprocal Levelling Numerical Hint:

True difference in elevation (h) = $[(a_1 - b_1) + (a_2 - b_2)] / 2$

Where $a_1 = 1.155$, $b_1 = 2.595$, $a_2 = 0.985$, $b_2 = 2.415$ (Note: taking difference from A to B).

$h = [(2.595 - 1.155) + (2.415 - 0.985)] / 2 = [1.440 + 1.430] / 2 = 1.435 \text{ m}$.

Since reading at B is greater than reading at A, B is **lower** than A.

RL of B = RL of A - h = 100.000 - 1.435 = **98.565 m**.

Q6(B) Volume by Prismoidal Rule Hint:

Formula: $V = (d / 3) \times [(A_1 + A_n) + 4(A_2 + A_4 + \dots) + 2(A_3 + A_5 + \dots)]$

Here $d = 5\text{m}$. Areas: $A_1 = 100$, $A_2 = 150$, $A_3 = 200$ (Odd number of areas, Prismoidal rule is applicable).

$V = (5 / 3) \times [(100 + 200) + 4(150)]$

$V = (5 / 3) \times [300 + 600] = (5 / 3) \times 900 = \mathbf{1500 \text{ cubic meters}}$.

Q7 Short Notes: *Well-conditioned triangle:* All angles are between 30° and 120° ensuring sharp intersections. *Inverted*

Staff: Placed upside down to find RL of ceiling or overhanging structure; recorded with a negative (-) sign. *Shrinkage*

Factor: Old map paper shrinks over time; SF = Shrunken length / Original length.