DIPLOMA WALLAH

JHARKHAND UNIVERSITY OF TECHNOLOGY (JUT)

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

SAMPLE PAPER - 1

Instructions to Candidates:

- **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 fundamental principle of surveying "Working from whole to part" is done to:

(a) Save time   (b) Prevent accumulation of errors

(c) Make plotting easier   (d) Use fewer instruments

ii. In a Prismatic Compass, the graduations are marked inverted because:

(a) It looks better   (b) Readings are taken through a prism

(c) The needle points South   (d) It is a manufacturing defect

iii. The magnetic bearing of a line is 132° 45'. If the magnetic declination is 5° 15' East, what is the true bearing?

(a) 127° 30'   (b) 138° 00'

(c) 132° 45'   (d) 140° 15'

iv. Which of the following is NOT a method of Plane Table Surveying?

(a) Radiation   (b) Intersection

(c) Resection   (d) Tacheometry

v. The first reading taken on a leveling staff after setting up the instrument is called:

(a) Fore sight (FS)   (b) Intermediate sight (IS)

(c) Back sight (BS)   (d) Change point

vi. Local attraction in a compass survey is suspected when the difference between Fore Bearing (FB) and Back Bearing (BB) is NOT exactly:

(a) 90°   (b) 180°

(c) 270°   (d) 360°

vii. The imaginary line on the ground joining points of equal elevation is known as:

(a) Contour line   (b) Level line

(c) Horizontal line   (d) Isogonic line

Q.2 (A) State and explain the fundamental principles of surveying.   **[7]**

Q.2 (B) (Numerical) The following fore and back bearings were observed in traversing with a compass where local attraction was suspected.   **[7]**

Line	Fore Bearing (FB)	Back Bearing (BB)
AB	68° 15'	248° 15'
BC	145° 45'	322° 30'
CD	215° 30'	37° 00'
DA	310° 15'	128° 45'

Identify the stations affected by local attraction and calculate the corrected bearings of all lines.

Q.3 (A) Differentiate between Height of Instrument (HI) method and Rise & Fall method of levelling. Which one is more suitable for calculating the RL of intermediate points?   **[7]**

Q.3 (B) (Numerical) The following consecutive readings were taken with a dumpy level along a chain line at a common interval of 20 meters: **[7]**

0.850, 1.250, 2.850, 1.650, 2.150, 1.050, 0.950, 2.450.

The instrument was shifted after the 3rd and 6th readings. If the Reduced Level (RL) of the first point was 100.000 m, calculate the RLs of all other points using the **Rise and Fall Method**. Apply the usual arithmetic checks.

Q.4 (A) What are the various obstacles encountered in chain surveying? Explain the method to overcome an obstacle where both vision and chaining are obstructed (e.g., a building).   **[7]**

Q.4 (B) (Numerical) A series of offsets were taken from a chain line to a curved boundary at an interval of 10 meters. The offsets (in meters) are: **[7]**

0, 2.5, 3.8, 4.6, 5.2, 4.8, 3.5, 2.0, 0.

Calculate the area enclosed between the chain line, the curved boundary, and the end offsets using **Simpson's Rule**.

Q.5 (A) What is Plane Table Surveying? Describe the "Radiation" and "Intersection" methods of plane table surveying with neat sketches. **[7]**

Q.5 (B) Define the following terms: (i) Magnetic Declination, (ii) True Meridian, (iii) Isogonic lines, (iv) Agonic lines. **[7]**

Q.6 (A) What is Reciprocal Levelling? State the conditions under which it is performed. How does it eliminate the errors due to curvature and refraction? **[7]**

Q.6 (B) Explain the characteristics of Contour lines. What are the engineering uses of a contour map in mining operations? **[7]**

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

A. Difference between WCB (Whole Circle Bearing) and QB (Quadrantal Bearing)

B. Sensitiveness of a bubble tube

C. Optical Square and its use

D. Trapezoidal Rule vs Simpson's Rule

E. Advantages and Disadvantages of Plane Table Surveying

Q1 (MCQ Answers): i-(b), ii-(b), iii-(b) [TB = MB + East Dec = 132°45' + 5°15' = 138°00'], iv-(d), v-(c), vi-(b), vii-(a)

Model Hints for Theory & Numericals:

Q2(A) Principles: (1) Work from whole to part (to prevent accumulation of errors and localize minor errors). (2) Locate a new point by at least two independent measurements (linear or angular) from two fixed reference points.

Q2(B) Compass Numerical Hint:
Check difference between FB and BB for all lines.
Line AB: 248°15' - 68°15' = 180°00'. Since the difference is exactly 180°, **Stations A and B are free from local attraction.**
This means FB of AB, BB of DA, and FB of BC are correct.
For BC: Correct FB = 145°45'. Correct BB should be 145°45' + 180° = 325°45'. Error at C = Observed BB (322°30') - Correct BB (325°45') = -3°15'. Apply this correction (+3°15') to FB of CD to find the true bearings.

Q3(A) HI vs Rise & Fall: Rise & Fall method provides a complete arithmetic check ($\Sigma BS - \Sigma FS = \Sigma Rise - \Sigma Fall = $ Last RL - First RL), which checks the intermediate sights too. Therefore, Rise & Fall is more suitable and accurate for intermediate points, though calculations take more time.

Q3(B) Levelling Numerical Hint:
Instrument shifted after 3rd and 6th readings. So:
BS: 0.850, 1.650, 0.950.
FS: 2.850, 1.050, 2.450.
IS: 1.250, 2.150.
Create table (Station, BS, IS, FS, Rise, Fall, RL). Fall/Rise = Previous reading - Current reading. (E.g., 0.850 - 1.250 = Fall of 0.400). Apply the arithmetic check in the end to verify your answer.

Q4(B) Area Numerical Hint:
Simpson's Rule: Area = $(d/3) \times [(O_1 + O_n) + 4(O_2 + O_4 + O_6...) + 2(O_3 + O_5 + O_7...)]$.
Here d = 10m. Number of offsets (n) = 9 (Odd number, Simpson's rule is applicable).
Area = $(10/3) \times [(0 + 0) + 4(2.5 + 4.6 + 4.8 + 2.0) + 2(3.8 + 5.2 + 3.5)]$ = Calculate the final value in sq. meters.

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