

BT-204 Basic Civil Engineering & Engineering Mechanics

Unit–2 Notes Surveying & Positioning

UNIT–2 TOPICS

- Introduction to Surveying
- Surveying Instruments
- Levels
- Theodolites
- Plane Tables
- Electronic Surveying Instruments
- Measurement of Distances
- Conventional Methods of Distance Measurement
- EDM Methods
- Measurement of Directions
- Measurement of Elevations
- Reciprocal Leveling

1. INTRODUCTION TO SURVEYING

Surveying is science and art of determining relative positions of points on the surface of earth.

Objectives of Surveying:

- Preparation of maps
- Measurement of land area
- Construction planning
- Route alignment

Types of Surveying:

- Plane surveying
- Geodetic surveying

2. SURVEYING INSTRUMENTS

Surveying instruments are devices used to measure distances, angles and elevations.

Main Instruments:

- Levels
- Theodolites
- Plane tables
- EDM instruments

3. LEVELS

Level is instrument used to determine difference in elevation between points.

Types of Levels:

- Dumpy level
- Tilting level
- Auto level

Uses:

- Road construction
- Canal alignment
- Building construction

4. THEODOLITE

Theodolite is precision instrument used for measurement of horizontal and vertical angles.

Main Parts:

- Telescope
- Vertical circle
- Horizontal circle
- Spirit level

Applications:

- Triangulation
- Alignment work
- Tacheometric surveying

5. PLANE TABLE

Plane table surveying is graphical method of surveying.

Main Components:

- Drawing board
- Alidade
- Spirit level
- Plumbing fork

Advantages:

- Fast method
- Field plotting possible

Disadvantages:

- Low accuracy
- Affected by weather

6. ELECTRONIC SURVEYING INSTRUMENTS

Modern electronic instruments improve speed and accuracy of surveying.

Types:

- Total station
- GPS instruments
- Electronic theodolite

Advantages:

- High accuracy
- Faster calculations
- Digital data storage

7. MEASUREMENT OF DISTANCES

Distance measurement is important part of surveying.

Methods:

- Conventional methods
- Electronic methods

8. CONVENTIONAL METHODS OF DISTANCE MEASUREMENT

These methods use chains and tapes.

Types:

- Chain surveying
- Tape surveying

Advantages:

- Simple method

- Low cost

Disadvantages:

- Less accurate
- Time consuming

9. EDM (ELECTRONIC DISTANCE MEASUREMENT)

EDM measures distance electronically using electromagnetic waves.

Types of EDM Instruments:

- Infrared wave instruments
- Microwave instruments
- Light wave instruments

Advantages:

- High precision
- Long distance measurement
- Quick results

10. MEASUREMENT OF DIRECTIONS

Direction measurement is done using bearings and angles.

Methods:

- Compass surveying
- Theodolite surveying

Types of Bearings:

- True bearing
- Magnetic bearing

11. MEASUREMENT OF ELEVATIONS

Elevation measurement determines height difference between points.

Methods:

- Spirit leveling
- Trigonometric leveling
- Barometric leveling

12. RECIPROCAL LEVELING

Reciprocal leveling is method used when two points are separated by obstacles like rivers.

Advantages:

- Eliminates instrumental errors
- Gives accurate results

Applications:

- River crossings
- Valley surveys

MOST IMPORTANT 14 MARK QUESTIONS

1. Explain surveying and its objectives.
2. Explain surveying instruments with uses.
3. Explain different types of levels with neat sketch.
4. Explain construction and working of theodolite.

5. Explain plane table surveying with advantages and disadvantages.
6. Explain electronic surveying instruments and their applications.
7. Explain conventional methods of distance measurement.
8. Explain EDM methods with advantages.
9. Explain measurement of directions by different methods.
10. Explain measurement of elevations by different methods.
11. Explain reciprocal leveling with neat diagram.
12. Differentiate conventional and EDM methods.

IMPORTANT 7 MARK QUESTIONS

1. Define surveying.
2. Explain dumpy level.
3. Explain auto level.
4. Explain electronic theodolite.
5. Explain chain surveying.
6. Explain tape surveying.
7. Explain reciprocal leveling.
8. Define bearings.

IMPORTANT NUMERICALS

1. Level book calculations.
2. Rise and fall method numerical.
3. Height of instrument method numerical.
4. Distance measurement calculations.

EXAM TIPS

- Draw neat diagrams of surveying instruments.
- Practice leveling numerical problems regularly.
- Learn definitions carefully.
- Revise EDM and leveling methods properly.
- Focus on repeated PYQ questions.