ARYA COLLEGE OF ENGINEERING

CIVIL ENGINEERING DEPARTMENT

3CE4-05: SURVEYING

III Semester, B.Tech. (II Year), 2025-26

UNIT 1 LINEAR AND ANGULAR MEASUREMENTS

1. Define linear measurement in surveying.

2. What is meant by slope correction in chain measurement?

3. Write the formula for temperature correction in tape measurement.

4. Define fore bearing and back bearing.

5. What is ranging in surveying?

6. Write any two methods of angular measurement.

7. Give any two temporary adjustments for a theodolite.

8. What is meant by closing error in traverse?

9. Define latitude and departure of a traverse line.

10. State Bowditch's rule in brief.

UNIT 2 LEVELLING

1. Define levelling in surveying.

2. What is meant by differential levelling?

3. Define trigonometrical levelling.

4. What is a profile levelling?

5. State any two characteristics of contour lines.

6. Define digital level and auto level.

7. Give two causes of errors in levelling.

8. Define direct and indirect contouring.

9. Write any two uses of contours.

10. Define reduced level (RL).

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UNIT 3 CURVE SURVEYING

1. Define a simple curve in surveying.

2. Define a compound curve.

3. What is a circular curve?

4. What is a transition curve?

5. Write the difference between circular and reverse curves.

6. Define radius, tangent, and length of curve.

7. Name any types of vertical curves.

8. What is tangent correction?

9. State any two elements of a circular curve.

10. Define deflection angle.

UNIT 4- Tacheometry & Photogrammetry

1. Define stadia hairs.

2. What is tacheometry?

3. Define relief displacement.

4. Name one method of flight planning in aerial photogrammetry.

6. Define settlement derive the formula for horizontal distance in stadia tacheometry (horizontal sight).

7. Explain inclined sight tacheometry for staff vertical.

8. Differentiate between terrestrial and aerial photogrammetry.

9. Explain tilt displacement in aerial photographs.

10. A tacheometer has constants k = 100, c = 0.2 m. Staff readings are 1.2 m, 1.5 m, 1.8 m. Compute distance and RL of the staff.

11.Given flying height, photo scale, and elevation of ground points, calculate ground distances using photogrammetric principles.

12. Explain the procedure of terrestrial photogrammetry for determining the height of a building.

Unit- 5 SETTING OUT WORKS & MODERN FIELD SURVEY SYSTEMS

1. Define setting out in surveying.
2. Name any two instruments used for setting out a building.
3. What is a batter board?
4. What is centre line marking?
5. Define baseline in building setting out.
6. What is the purpose of marking "offsets" on site?
7. What is a site benchmark?
8. Mention two methods for setting out a right angle.
9. Define ranging rod and its use.
10. What is a plumb bob used for in setting out?

4-Marks Questions:

UNIT 1

1. Explain direct and indirect ranging with neat sketches.

2. Describe methods of linear measurement used in surveying.

3. Derive the formula for correction to measured length for slope.

4. Explain correction to tape length for tension and temperature.

5. Explain designation of bearing with a numerical example.

6. Write a short note on traverse with tape and compass.

7. Explain correction to measured bearing due to local attraction with example.

8. Explain temporary adjustments of a theodolite.

9. Explain the method of measuring horizontal and vertical angles by theodolite.

10. A line of 100 m is measured with a tape at a slope of 1 in 20. Find horizontal distance.

UNIT 2

1. Explain the methods of direct levelling with a neat sketch.

2. Describe differential levelling procedure.

3. Explain trigonometrical levelling with formula.

4. Describe profile leveling and cross-sectional levelling.

5. Explain characteristics of contour lines.

6. Describe direct and indirect methods of contouring.

7. Numerical: A staff reading at a point A is 1.250 m and at B is 2.675 m. The instrument is placed midway with RL of 100 m. Find the RL of B.

UNIT 3

1. Explain elements of a simple circular curve with a neat sketch.

3. Describe the elements of transition curves and their uses.

4. Explain methods of setting out a simple circular curve using chain and theodolite.

5. Describe methods of setting out transition and reverse curves.

6. Explain types of vertical curves with sketches.

7. Derive formula for length of vertical curve.

8. Explain tangent corrections in circular curves.

9. A simple circular curve has a radius of 300 m and deflection angle of 20°. Find the length of the curve, tangent length, external distance, and mid-ordinate.

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10.ABCD is a transverse. The included angle are measured as <A=110°, <B = 54° and <D=71°. Calculate the bearing of the transverse lines with A as origin and AB as arbitrary meridian.

11.A compound curve has radii R1 = 400 m and R2 = 250 m with deflection angles 10° and 15°. Find lengths of both curves and tangents.

UNIT 4

1. Explain any four advantages of tacheometric surveying.
2. Differentiate between stadia system, tangential system and subtense system of tacheometry.
3. Explain the principle of the stadia system with neat sketch.
4. Derive the distance formula for horizontal sights in the stadia system.
5. Derive the elevation (RL) formula for horizontal sights in tacheometry.
6. Explain the procedure for determining tacheometric constants (K and C).
7. Write short notes on ‘Multiplying Constant’ and ‘Additive Constant’.
8. Write the distance and elevation formulae for inclined sights with staff vertical.
9. List the sources of error in tacheometric surveying.
10. Explain the basic concept of perspective geometry of an aerial photograph.
11. Explain relief displacement with sketch and formula.
12. What is tilt displacement? Explain with neat diagram.
13. Differentiate between vertical and tilted aerial photographs.
14. Write a short note on terrestrial photogrammetry.
15. Explain the terms: principal point, nadir point, isocenter, and plumb line.
16. What is parallax? Explain its significance in height determination.
17. Explain the concept of scale of an aerial photograph.
18. Explain flight planning for aerial photography.
19. Describe the factors affecting photographic scale in aerial photogrammetry.

UNIT – 5

1. Explain the procedure of setting out a building using centerline method.
2. Describe the instruments used for setting out buildings at site.
3. Write the step-by-step method of setting out a culvert.
4. Explain the importance of reference pillars (RPs) and benchmarks in culvert setting out.
5. Describe the method of setting out sewer lines using boning rods and sight rails.
6. Explain the term ‘gradient’ in sewer setting out and how it is maintained.

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7. Explain the working principle of Electronic Distance Measurement (EDM).
8. Explain the concept of modulation in EDM with neat sketch.
9. Discuss the different types of EDM instruments (Microwave, Infrared, Light-wave).
10. List and explain any four advantages of EDM over conventional methods.
11. Write short notes on: (a) Phase measurement (b) Carrier wave in EDM.
12. Explain the sources of error in EDM measurement.

10-Marks Questions:

UNIT 1

1.Traverse Computation Problem:

A closed traverse ABCDA was measured with the following data:

Line	Length (m)	Bearing
AB	50	N45°E
BC	70	S60°E
CD	60	S30°W
DA	40	N20°W

* Compute latitude and departure.

* Determine closing error.

* Adjust the traverse using Bowditch's rule.

* Plot the traverse to scale.

2.A 30 m steel tape is used to measure a line. Standard pull is 10 kg. The actual pull applied is 15 kg, temperature is 5°C above standard, tape is sagging 0.05 m. Find the corrected length of a measured line of 200 m. (Take $\alpha = 11 \times 10^{-6}$ /°C)

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3 Two points A and B are 120 m apart. Obstacles prevent direct ranging. Using offsets measured from an offset line, determine coordinates of intermediate points. Plot the survey line.

UNIT 2

1. A theodolite at point A measures the vertical angle to point B as 4°30′ and horizontal distance AB = 200 m. The instrument height = 1.6 m, staff at B = 1.2 m. Calculate RL of B if RL of A = 100 m.
   A surveyor conducts differential levelling between points A and B. Observations are as follows:
   | Station | Backsight (m) | Foresight (m) |
2. | ------- | ------------- | ------------- |
3. | A | 1.250 | 2.100 |
4. | B | 1.800 | 0.900 |
5. Calculate Reduced Levels of all points using Height of Instrument (HI) method. And rise and fall method

UNIT 3

1. Radius of curve = 500 m, deflection angle = 30°. Compute:

* Length of curve (L)

* Tangent (T)

* External distance (E)

* Middle ordinate (M)

* Degree of curve (D)

* Draw a neat sketch of the curve.

2. Design a transition curve of length 50 m connecting a tangent to a circular curve of radius 400 m. Compute super elevation, rate of change of super elevation, and setting out offsets at 10 m intervals.

3. What is a transition curve? Why is it required? Describe the types of transition curves and derive the general equation of a spiral (clothoid) transition curve. Explain its important properties.

4. Explain tangent corrections in detail. Derive expressions for correction to tangents, chord correction, and explain their importance in setting out curves.

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5. Difference between simple, compound, reverse and transition curves with sketches.

UNIT -4

1.Describe in detail the different systems of tacheometric measurements—(a) Stadia System, (b) Tangential System, (c) Subtense System. Compare them with advantages and limitations.

2. A tacheometer with constants K = 100 and C = 0 is used to observe staff readings of 1.120, 1.780 and 440 at a point. The vertical angle is +6°. Calculate the horizontal distance and RL of the station.

3. Describe various errors in aerial photographs such as tilt error, relief error, scale error, atmospheric error, and camera lens distortion.

4. Discuss flight planning for aerial photography. Explain flight lines, overlap, sidelap, altitude, exposure intervals and ground coverage with neat sketches.

5. Explain the stadia system of tacheometry in detail. Derive the horizontal distance and elevation (RL) formulae for horizontal sights with neat sketches.

6. The following readings are successively taken from an instrument in a levelling work**:**

0.255, 0,385, 0.520, 1.785, 1.895, 2.300, 1,785, 0.335, 0.858, 1.255. The position of the instrument was changed after taking second and third readings. Draw out the form of a level field book and enter the above readings properly Assume the R.L of the first point as 80.0 m. Calculate the R.Ls of all the points using Rise and fall system and apply usual arithmetic check

UNIT 5

1.Explain the complete procedure for setting out a building with neat sketch.

2. Describe the step-by-step method of setting out a culvert with reference pillars and benchmarks.

3. Explain the detailed procedure of setting out sewer lines using sight rails and boning rods.

4. Describe the instruments used for setting out buildings, culverts and sewer lines.

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5. Explain the principle of Electronic Distance Measurement (EDM) with modulation and phase measurement.

6. Describe the types of EDM instruments – Microwave, Infrared and Light-wave EDM.

7. Explain the construction, working and applications of a Distomat.

8. Explain the major parts and working principle of a Total Station with neat sketch.

9. Describe the applications and advantages of Total Station in modern field surveying.

10. Explain the field procedure for setting up, observing and collecting data using a Total Station.

11. Write short notes on modulation and phase comparison method in EDM.

12. Explain the concept and working of reflectorless EDM instruments.