

GUJARAT TECHNOLOGICAL UNIVERSITY-AHMEDABAD  
DARSHAN INSTITUTE OF ENGINEERING AND TECHNOLOGY -RAJKOT

**B.E. CIVIL -SEM-IV**  
**SUBJECT: SURVEYING (3140601)**

**TUTORIAL-1**  
**PLANE TABLE SURVEYING**

1	Describe various accessories required for Plane table surveying and discuss its functions. Also discuss the steps required for setting up a plane table.
2	List out the methods of plane table survey and describe them with neat sketch.
3	Explain the sources of errors in plane tabling.

**TUTORIAL-2**  
**THEODOLITE TRAVERSING**

1	Explain the temporary adjustment of a vernier transit theodolite.																		
2	Enlist and explain different types of permanent adjustment of theodolite.																		
3	Define the following terms: (1)Centring (2)Transisting (3) Face Left (4) Face Right (5) Swinging the Telescope (6) Vertical Axis (7) Horizontal Axis (8) Line of Collimation (9)Axis of the Plate Level (10) Axis of the Altitude Level Tube																		
4	Describe the methods of balancing the closing error in a closed traverse.																		
5	<p>Following are the lengths and bearings of the lines of a closed traverse ABCDA. Find out closing error and its direction.</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 15%;">Line</th> <th style="width: 15%;">AB</th> <th style="width: 15%;">BC</th> <th style="width: 15%;">CD</th> <th style="width: 15%;">DA</th> </tr> </thead> <tbody> <tr> <td>Length(m)</td> <td>235.1</td> <td>317.4</td> <td>215</td> <td>281.6</td> </tr> <tr> <td>Bearing</td> <td>338° 20'</td> <td>82° 22'</td> <td>167° 00'</td> <td>259° 40'</td> </tr> </tbody> </table>	Line	AB	BC	CD	DA	Length(m)	235.1	317.4	215	281.6	Bearing	338° 20'	82° 22'	167° 00'	259° 40'			
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6	<p>Prepare Gale's Traverse Table to adjust the closing error of the closed traverse ABCDA for the following data:</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 20%;">Line</th> <th style="width: 15%;">AB</th> <th style="width: 15%;">BC</th> <th style="width: 15%;">CD</th> <th style="width: 15%;">DA</th> </tr> </thead> <tbody> <tr> <td>Length(m)</td> <td>110</td> <td>80</td> <td>95</td> <td>160</td> </tr> <tr> <td>Corrected W.C.B.</td> <td>110°</td> <td>170°</td> <td>250°</td> <td>350°</td> </tr> </tbody> </table>	Line	AB	BC	CD	DA	Length(m)	110	80	95	160	Corrected W.C.B.	110°	170°	250°	350°			
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8	<p>A Closed Traverse was conducted round an obstacle and the following observations were made.</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 15%;">Line</th> <th style="width: 15%;">AB</th> <th style="width: 15%;">BC</th> <th style="width: 15%;">CD</th> <th style="width: 15%;">DE</th> <th style="width: 15%;">EA</th> </tr> </thead> <tbody> <tr> <td>Length(m)</td> <td>480</td> <td>625</td> <td>470</td> <td>?</td> <td>?</td> </tr> <tr> <td>W.C.B.</td> <td>99°</td> <td>31°05'</td> <td>301°20'</td> <td>235°</td> <td>153°25'</td> </tr> </tbody> </table> <p>Find out the missing lengths of the lines DE and EA.</p>	Line	AB	BC	CD	DE	EA	Length(m)	480	625	470	?	?	W.C.B.	99°	31°05'	301°20'	235°	153°25'
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**TUTORIAL-3**  
**TRIGONOMETRIC LEVELLING**

1	Derive the expression for computing horizontal distance and elevation in trigonometric levelling while the base of the object is inaccessible and instrument stations are in the same vertical plane with elevated object for the instrument axes at (i) Same level (ii) different level.
2	A theodolite was setup at P and the angle of elevation of the top of the building at R was $8^{\circ}30'$ . The horizontal distance between the vertical axis of theodolite and the projected position of the top of the building is 150m. Determine the reduced level of the top of the building, if the R.L of the instrument axis was 550.00m.
3	Find the reduced level of a church spire C from the following observations taken from the two stations A and B, 50m apart. Angle BAC= $60^{\circ}$ Angle ABC= $50^{\circ}$ Angle of elevation from A to the top of the Spire = $30^{\circ}$ Angle of elevation from B to the top of the Spire = $29^{\circ}$ Staff reading from A on B.M. = 2.5m. Staff reading from B on the same B.M. = 0.50m. R.L. of B.M.=200m
4	The observations were made on the top S of flag SR on a hill from two instrument station P and Q, 100m apart the station P and Q being in the line with S. The angles of elevation of S at P and Q were $30^{\circ}20'$ and $17^{\circ}50'$ respectively. The staff reading upon the B.M. of RL = 350.300m were respectively 2.680 and 3.825 when the instrument was at P and Q and telescope being horizontal. Determine the elevation of the foot R of flag if SR is 4m.

**TUTORIAL-4**  
**CURVES**

1	Why are curves provided? State various types of curves with sketch. Draw the neat sketch of simple circular curve showing various elements of it.
2	Write a short note on transition curve.
3	Two straight AB and BC intersect at a chainage of 4242.0 m. The deflection angle is $40^{\circ}$ and radius of curve is 344 m. Calculate : (i) Tangent length (ii). Length of curve (iii) Chainage of point of Curve (iv) Chainage of Point of tangency (v) Length of Long chord (vi) Degree of curve and (vii) Apex distance.

**TUTORIAL-5**  
**AREA AND VOLUME**

1	Derive equation for Trapezoidal and Simpson's rule to find out area of an irregular boundary.																		
2	The following perpendicular offsets were taken from a chain line to an irregular boundary <table border="1" style="margin-left: 20px;"> <tr> <td>Chainage (m)</td> <td>0</td> <td>30</td> <td>60</td> <td>90</td> <td>120</td> <td>150</td> <td>180</td> <td>210</td> </tr> <tr> <td>Offset lengths (m)</td> <td>0</td> <td>2.65</td> <td>3.8</td> <td>3.75</td> <td>4.65</td> <td>3.6</td> <td>5</td> <td>5.8</td> </tr> </table> <p>Calculate the area between the line and irregular boundary by (i) Average ordinate rule. (ii) mid-ordinate rule (iii) Trapezoidal rule, and (iv) Simpson's rule</p>	Chainage (m)	0	30	60	90	120	150	180	210	Offset lengths (m)	0	2.65	3.8	3.75	4.65	3.6	5	5.8
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3	A single-level section has a formation width of 7.5 m. and side slopes 2:1. The depths of cutting at the centre at every 30 m intervals are 1.8, 2.175, 2.55, 2.925, and 3 m. Find the volume of earthwork in the length of 120 by Trapezoidal formula and Prismoidal formula.																		
4	The Latitudes and departures of the lines of a closed traverse are given below. Calculate the area of traverse																		

	Line	Northing	Southing	Easting	Westing
	AB		157.2	154.8	
	BC	210.5		52.5	
	CD	175.4			98.3
	DA		228.7		109

**TUTORIAL-6**  
**TACHEOMETRIC SURVEYING**

1	What is the principle of Tachometry? Derive the expressions for horizontal and vertical distances in the fixed hair method when the staff is held vertically and the measure angle is that of elevation.
2	Explain in detail the field procedure of tacheometric survey which you have carried out.
3	What is tacheometer? Explain the procedure of finding its coefficients in the field. <b>OR</b> Explain how the stadia constant K and C are determined by the various methods.
4	What is tangential method of tacheometry? Derive the expressions for horizontal and vertical distances by the tangential method when both the angles measured are those of elevation.
5	Write short note on the anallactic lens.

**TUTORIAL-7**  
**GEODETTIC SURVEYING**

1	What is meant by triangulation? How will you select base line and triangulation stations? Explain strength of figure.
2	What is triangulation? What are the factors that affect the selection of triangulation stations?
3	Discuss (i) Selection of triangulation station (ii) Reduction to centre in geodetic triangulation.
4	What considerations you would have while selecting the site for the baseline?
5	What is meant by base net? Explain how the base line is extended.

**TUTORIAL-8**  
**THEORY OF ERRORS**

1	Explain the theory of least squares.
2	Explain the method of correlates. What are its advantages over the normal equation method?
3	Define accidental error, true value, direct observation, conditioned quantity, Most probable value, true error, normal equation, independent quantity, weight of observation
4	Define weight of an observed quantity? Discuss various laws of weights.

**TUTORIAL-9**  
**MODERN SURVEYING INSTRUMENTS**

1	What is total station? Describe uses of total station in surveying.
2	What is the principle of E.D.M.? Discuss electromagnetic waves and electromagnetic spectrum.
3	Classify the Electromagnetic distance measurement instruments depending upon the type of carrier wave employed. Write a short note on Geodimeter.
4	What are the properties of electromagnetic waves? Draw complete electromagnetic spectrum showing all wavelengths.