SURVEY FIELD WORK

DEPARTMENT OF CIVIL ENGINEERING
SESHADRI RAOGUDLAVALLERU ENGINEERING COLLEGE
An Autonomous institute with permanent affiliation to JNTUK,
Kakinada SESHADRI RAO KNOWLEDGE VILLAGE:
GUDLAVALLERU

II B.Tech I Semester
(2021-22)

Name :……

Regd. No : …….

Year &Semester :……

Academic Year :…….

SESHADRI RAO GUDLAVALLERU ENGINEERING COLLEGE
An Autonomous institute with permanent affiliation to JNTUK, Kakinada

SESHADRI RAO KNOWLEDGE VILLAGE: GUDLAVALLERU

Sl. No	Date	Name of the Experiment	Marks	Signature
1		Conduct cross staff survey for determining area between the given points.		
2		Determination of distance between the points in case of a) When there is a river as obstacle. b) When there is a building as obstacle.		
3		Conduct a compass survey for determining included angles between the lines in the given bounded area.		
4		Determine the distance between two inaccessible points.		
5		Determination of reduced levels using height of the instrument and raise & fall methods.		
6		Conduct profile levelling for widening of roads.		
7		Conduct levelling in determination of contours.		
8		Determination of horizontal angles by repetition and reiteration method.		
9		Determination of height of building when base is accessible and inaccessible.		
10		Determine tacheometric constants.		
11		Conduct curve setting by any one method of linear and angular methods		
12		Conduct remote elevation and remote distance measurement.		
13		Determine the given bounded area in the field.		
14		Stake out.		

ExperimentNo: **Date:**

CONDUCT A CROSS STAFF SURVEY FOR DETERMINING AREA BETWEEN THE GIVEN POINTS

Aim: To survey an open field by chain survey in order to calculate the area of the open field.
Equipments: Chain, Tape, Ranging Rods, Arrows, Cross Staff. Procedure for surveying the given open field (Closed Traverse)
Note: This procedure is general procedure only. This procedure varies with the experiment given to students. Therefore students are required to write the procedure according to the experiment given to them.

Example 1:

1. ABCDEF is the required closed traverse open field to be surveyed for calculating the area as shown in Fig 2. From the station A the length of all the opposite corners such as AC, AD and AE are measured with a chain and the longest distance is considered for laying off the main chain line. In this case AD is the longest and a chain line running from A to D is laid.
3. Offsets to corner points B, C, E and F are now laid from the chain line AD either by tape or cross-staff and their foot of offsets are G, I, J, Hrespectively.
4. All the offset lengths GB, HF, IC and JE are measured either by chain or tape depending onthe length ofoffsets.
5. The distances between all the points AG, GH, HI, IJ and JD are also measured along thechain line.
6. Area Calculations :(Note: Areas of all triangles and trapeziums are calculated and added together to calculate the total area of open field (Closed Traverse) as described

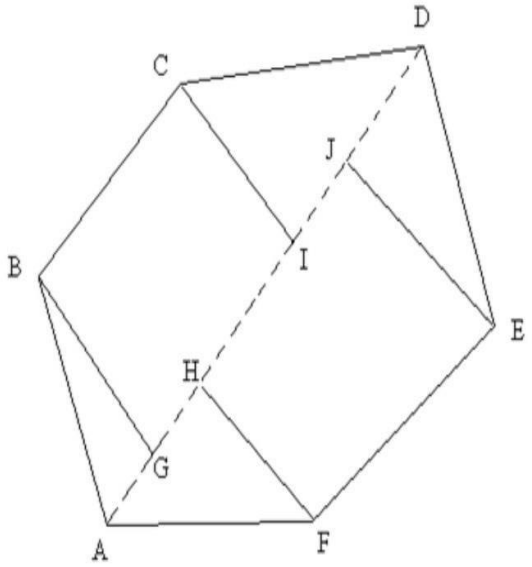


Figure 1: Survey of an Open Field (Closed Traverse)

inclass).

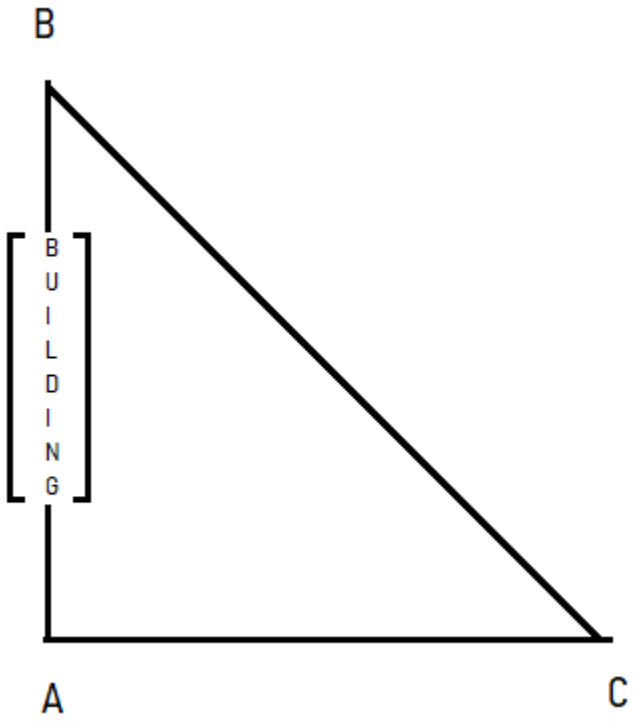
Experiment No **Date:**

A) DETERMINE THE DISTANCE BETWEEN TWO POINTS IN CASE OF BUILDING AS OBSTACLE

Aim: To determine the distance between the points in case ofa building as obstacle.

Equipment: Tape, ranging rod, cross staff, arrows.

Procedure:



1. Let us consider two fixed points A & B, which are on the either sides of the building.
2. To find out the distance between these points we consider another point C which is parallel to the point A by using Cross staff.
3. We fix the C point such a way that it should be sighted from the point B.
4. By using the Pythagoras theorem method we can be able to find out the distance between the two fixed points A and B

Result:

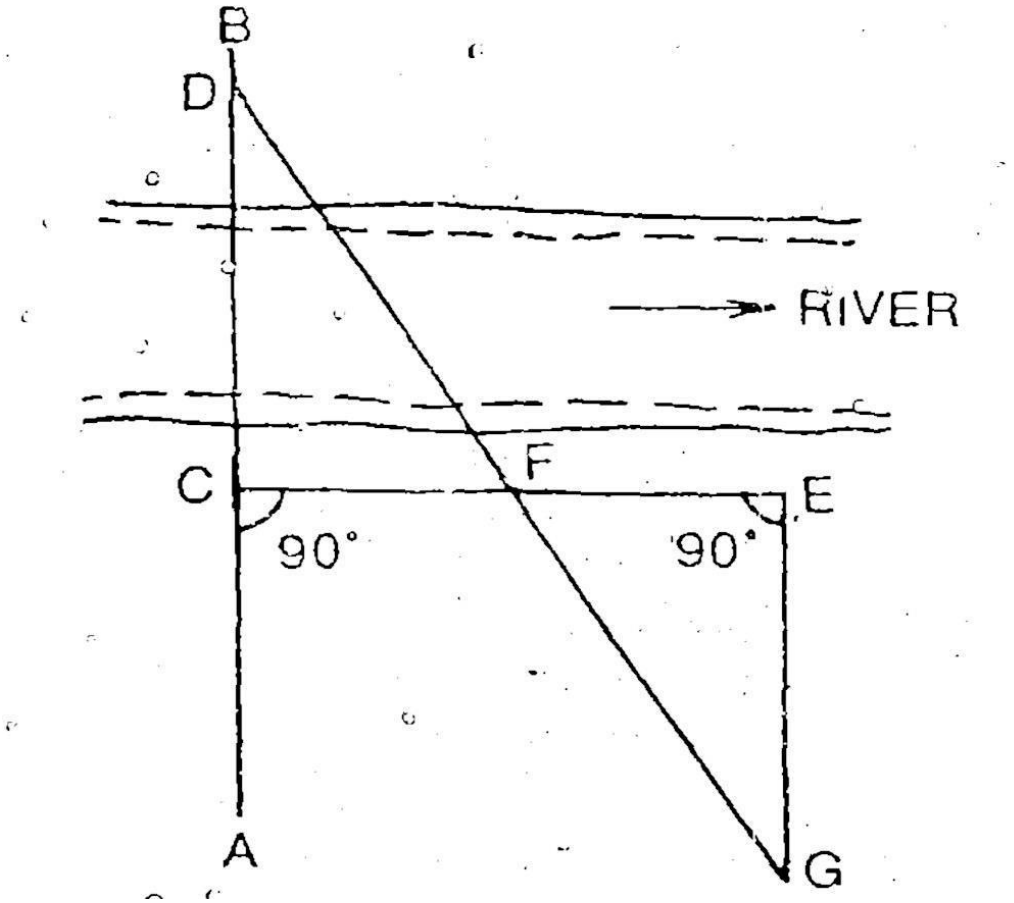
Experiment No: **Date:**

B) DETERMINE THE DISTANCE BETWEEN TWO POINTS IN CASE OF RIVER AS OBSTACLE

Aim: To determinethe distance between the points in case of a river as obstacle.

Equipment: Tape, ranging rod, cross staff, arrows.

Procedure:



1. A small river comes across the chain line. Suppose AB is chain line.
2. Two-points C and D are selected on this line on opposite bank of the river.
3. At C a perpendicular CE is erected and bisected at F.
4. A perpendicular is set out at E and a point G is selected on it such that D, F and G are in the same straight line.
5. From triangle DCF and GEF; GE = CD

Result:

Experiment No: **Date:**

CONDUCT A COMPASS SURVEY FOR DETERMINING INCLUDED ANGLES BETWEEN THE LINES IN THE GIVEN BOUNDED AREA.

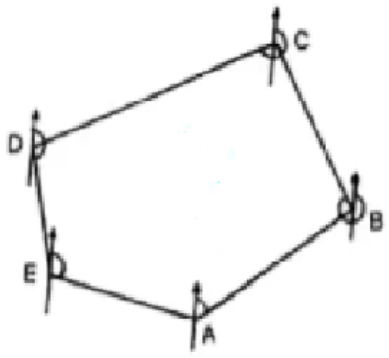
Aim: To find the bearings of various station points and to calculate the included angles.

Equipment: Prismatic compass, Tripod, Ranging rods, etc.

Procedure:

1. Let 'O' be the instrument station selected from which all other points are visible.
2. Complete all station adjustments like setting, centering and leveling accurately.
3. Sight the object 'A' looking through the prism vane, while the object vane is directed towards the object.
4. Observe the bearing by looking through the prism.
5. Enter the readings in the tabular form.
6. Repeat the process at all objects stations B,C, D etc. and enter the readings.

Formula: Included angle: bearing of 2nd line bearing of first line. (If the value is more than 180º than subtract the value from 360º).



Experimentno: **Date:**

DETERMINATION OF DISTANCE BETWEEN TWO INACCESSIBLE POINTS USINGCOMPASS

Aim: To determine the distance between two in accessible points with compass.
Equipment: Tape, ranging rod, cross staff, off sets, Prismatic compass Tripod, arrows.
Theory:

1. The principle of compass traversing is it contains a magnetic needle and dividing into degrees and half degree graduations starts from$N=180^0 S= O^0$ $E = 90^0 W=270^0$.

2. Eye wane and object wane passes through the centre of prism. A glass cover is provided into the compass box. Incline mirror is provided to measure too low or too tall ofobjects.

Centering:

A tripod is placed over the stations with its legs, spread with a part. So that it is a workable height. The compass is firmed on the tripod. It is the centre over the station where the bearing is to be taken (i.e.,) the centre of the compass pivot is brought exactly above the ground station. A plumb bob is hung from the centre of compass. In case of arrangement of work plumb bob is not provided as stone is should flow on the peg working the ground station.

Leveling:

The compass is leveled by high judgment. This is essential so that the graduated ring swings freely. Sometimes, in surveys compass two plate levels at right angles are also provided to level the instrument. The leveling is achieved by a ball and socket arrangement which is adjusted till the bubbles becomes centre in both the plane levels.

Local attraction:

The magnetic needle does not point to the north when it is under the influence of the external attractive forces in the presence of magnetic material such as iron pipes, Iron lamps, steel structures, Iron lamps, rails cables, chain arrows, mineral deposits in ground etc. The needle is deflected from its (ground) normal position. Hence local attraction by the magnetic materials is disturbing influence on the magnetic needle.

Procedure:

1. Let P and Q are the two points and there is an obstacle between them. Now we have to measure the distance between P and Q by compass. Select two points A and B such that line AB is almost parallel to the line PQ and the distance between A and B is measured with achain.

2. Place the compass and station a centering and levelly with centre A. Note the readings of AP, AQ and AB then shift the compass to stations B after centering and leveling its place the bearing of BA, BP andBQ.
3. Applying Cosine rule ΔAPQ:
   $$\mathbf{PQ^2 = PA^2 + AQ^2 - 2\ PA.AQ\ Cos(PAQ)}$$
4. From Δ APB , on applying Sinerule:

5. From ΔABQ, on applying Sinerule:

Precautions:

1. Ranging rod should be ranged accurately.
2. Magnetic needle should be perfectly straight.
3. Vertical hair of the compass may not be loose eye wave and direct wave should be vertical changing, reading, measuring, leveling and centering should be done without parallaxerror.

Result:

The distance between the two inaccessiblepointsis_____.

Experiment No: **Date:**

DETERMINATION OF REDUCED LEVELS USING HEIGHT OF THE INSTRUMENT METHOD

Aim: To find the elevations of a given stations by height instrument method.

Apparatus: Leveling staff, Tripod.

Theory:

The process of keeping height of instrument axis at differential levels and finding out the reduced levels of the station is called the differential leveling.

Procedure:

1. Set up the level instrument at P (nearer to the temporary bench mark) and level the instrument roughly with the leveling screws. Till the circular bubbles comes to the centre by using foot screws, till the bubble is in an exactcoincidence.
2. Focus the eye piece through the point. Telescope towards the object and focus theobjective.
3. Focus the Telescope toward the temporary bench mark and bisect the staff correctly and takethe back sight as it and record the readings is leveling field book as shown in thetable.
4. Keep the leveling staff at the stations as intermediate sights and enter the readings beforeshifting the instrument to the nextstation.
5. The readings must be entered in the foresight column in the field book. Shift the instrument to the next station and follow the same procedure which you have doneabove.

Precautions:

1. The staff should be held vertically when the reading is taken. The staff man should be behind the staff.
2. While taking readings, always make sure that the bubble of the level is at the center.
3. Read the staff correctly, there should be no parallaxerror.

Result:

Reduced levels at required stations are obtained.

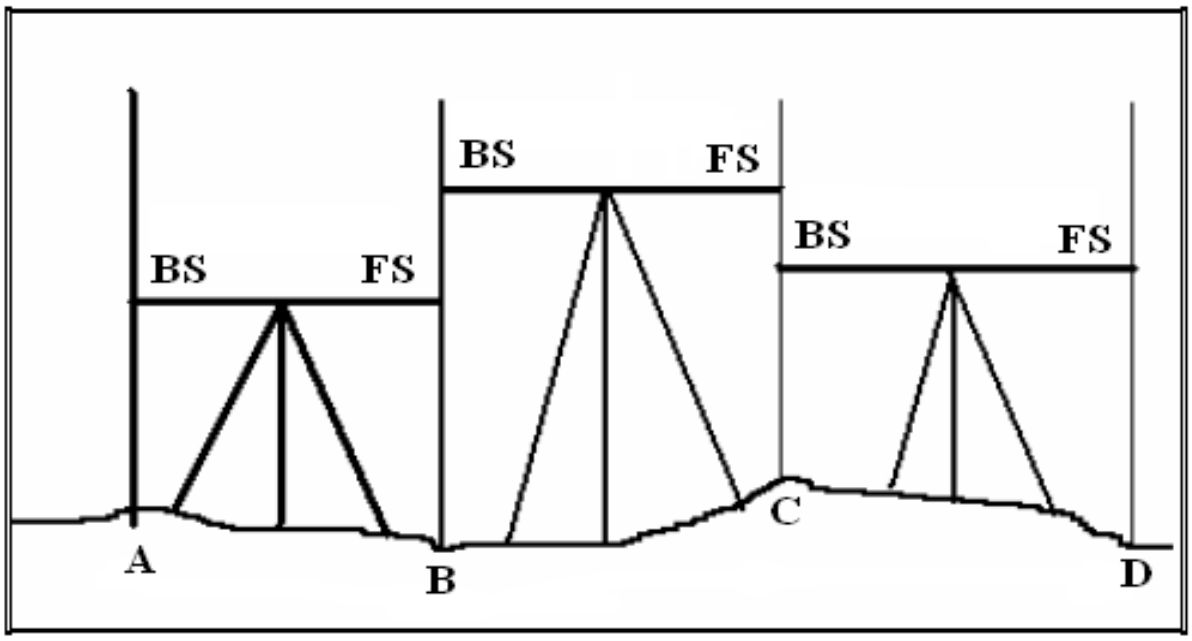
ExperimentNo: **Date:**

DETERMINATION OF REDUCED LEVELS USING RISE AND FALL METHOD

Aim: To find the difference in elevation and calculate the reduced level of various points by Rise and fall method.

Apparatus: Dumpy level, tripod and Leveling staff.

Figure:



Procedure:

1. The field procedure and reduction of Levels of points are same as for Fly leveling.
2. The instrument position marked (1) is selected such that it can be observe staff reading on the maximum number of points 1, 2, 3 and so on. The points are shown on plan in and in elevation as marked 1, 2, 3 respectively in figure along with the bench mark marked BM.
3. The instrument is setup and leveled up over the station point.
4. Observe the reading on the staff held at B.M. Let us express the reading in accordance with the convention a when "a" is the staff reading on the point for the position of the instrument.
5. If the R.L of B.M. is "h" and A is the staff reading on the BM. The first staff reading which is termed as back-sight or B.S. Then the height of instrument position (1) may be designated as :

H.I (1) = h + a1 BM (or) H.I = R.L +B.S.

Tabulation:

STATION	READINGS			RISE	FALL	REDUCED LEVEL	REMARKS
	B.S	I.S	F.S				

Result :

Reduced levels at required stations are obtained.

ExperimentNo: **Date:**

CONDUCT PROFILE LEVELLING FOR WIDENING OF ROADS

Aim: To determine the configuration of ground survey by conducting – Longitudinal & Cross Sectional leveling.

Instruments: Dumpy Level, Leveling Staff, Tripod and Chain or Tape.

Procedure:

1. Establish the bench mark near the starting point of the proposed profileby running check levels. Erect the ranging rods along the longitudinalsection and cross section alignment. Fix intermediate points at less than the chain (or) tapelength.

2. Thenfixpegsatequalintervalssay5monthepproposedalignment.

3. Setupthelevelingalignmentinstrumentonthesideofthealignmentsuchthatitwill covermaximum.

4. Takethebacksight(BS)onthebenchmarktodeterminetheHSofInstrument.

5. Hold the staff at equal interval points and determine the reduce levels ofthe points by heights of instrumentmethod.

6. Iftheanypointisnotvisibleclearlytakethechangepointsonturningpoints and complex the profile leveling with necessarychecks.

Result:

Thelongitudinalsectioning&crosssectioningiscarriedoutandtheprofileis plottedonthegraphsheet.

Experiment No: **Date:**

CONDUCT LEVELLING IN DETERMINATION OF CONTOURS.

Aim: - Draw the contour by indirect methods

Apparatus: Dumpy level, Leveling staff, wooden peg, Tape, ranging rod

Theory: Indirect Methods In this method, levels are taken at some selected points and their levels are reduced. Thus in this method horizontal control is established first and then the levels of those points found. After locating the points on the plan, reduced levels are marked and contour lines are interpolated between the selected points.

For selecting points anyone of the following methods may be used:

(a) Method of squares,

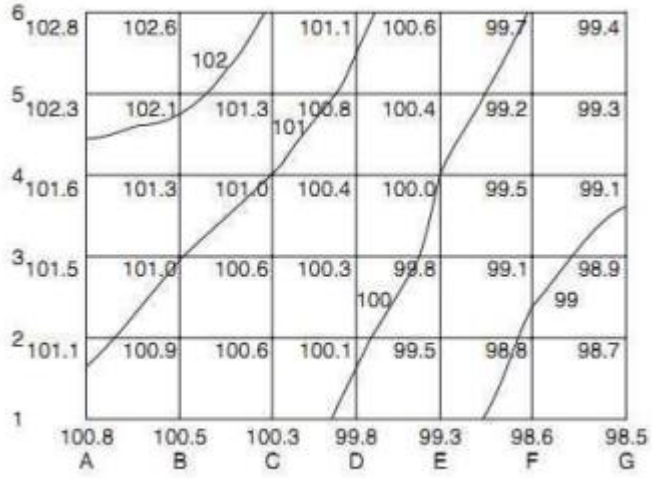
(b) Method of cross-section

(c) Radial line method

Procedure:

Method of Squares:

In this method area is divided into a number of squares and all grid points are marked.



Contour with Method of Square

Commonly used size of square varies from 5 m × 5 m to 20 m × 20 m. Levels of all grid points are established by levelling. Then grid square is plotted on the drawing sheet. Reduced levels of grid points marked and contour lines are drawn by interpolation.

Drawing Contours:

After locating contour points smooth contour lines are drawn connecting corresponding points on a contour line. French curves may be used for drawing smooth lines

Result:

ExperimentNo: **Date:**

DETERMINATION OF HORIZONTAL ANGLES BY OF REPETITION & RE-ITERATION

A. REPETITION METHOD

AIM: To determine the horizontal angles between the two stations by the repetition method by using transit theodolite.

Apparatus:

Theodolite	-	1
Tripod	-	1
Ranging Rod	-	2
Tape	-	1
Arrow	-	1
Plumb bob	-	1

Procedure:

The Repetition method is used to measure a horizontal angle very accurately. In this method, the horizontal angle is measured several times, and the value is added. The horizontal angle is equal to the accumulated value divided by number of repetitions made. The Least count of the theodolite instrument is20".

The following procedure is used for the measurement of the horizontal angle PQR at Q by repetitionmethod.

1. Set up the instrument over the station Q. Centre it and level up accurately. Keep the telescope in the normal position, with the vertical circle on theleft.
2. Release both the upper and lower clamps. Set the vernier A to Zero. Tighten the clamp. Bring it exactly to zero by means of the upper tangent screw. Take also the reading of the vernierB.
3. Turn the telescope in the horizontal plane and point it at the station P which is on the left side. Tighten the lower clamp. Bisect the signal at P exactly by using the lower tangent screw. Check that the readings of the verniers have not changed, and they are still 0^0 and180^0.
4. Loosen the upper clamp screw, and turn the telescope clockwise until the line of sight is set on the signal R. Tighten the upper clamp. Use the upper tangent screw for exactbisection.
5. Read both the verniers and determine the anglePQR.
6. Unclamp the lower plate, and turn the telescope clockwise to sight the signal P again. Tighten the lower clamp. Check the vernier readings have notchanged.

7. Release the upper clamp and turn the telescope clockwise to sight the signal R. Tighten the upper clamp. The vernier A will give the value which is about twice the anglePQR.
8. Repeat steps 6&7 once again. The final reading of the vernier A will be approximately thrice the anglePQR.
9. Divide the final reading by three to get the value of the anglePQR.
10. Change the face of the instrument to the face right. The telescope will be in the inverted conditions. Repeat the steps 2 & 9 with the face right and determine the value of the anglePQR.
11. Determine the average value of the angles obtained with the face left and right. The values are to be noted in the followingtable.

Precautions:

1. Theodolite should have been free fromerrors.
2. The readings while been taken both the vernier are to be carefullyread.

Result: The horizontal angle between the two stations is

Table - 1 : Repetition Method

Instrument at	Sighted to	Face Left										Face Right										Average Horizontal Angle		
		A			B			Mean			Horizontal Angle	A			B			Mean			Horizontal Angle			
		0	‘	“	0	‘	“	0	‘	“		0	‘	“	0	‘	“	0	‘	“		0	‘	“

B. REITERATION METHOD

AIM: To determine the horizontal angles between the two stations by the repetition method by using transit theodolite.

Apparatus:

Theodolite	-	1
Tripod	-	1
Ranging Rod	-	2
Tape	-	1
Arrow	-	1
Plumb bob	-	1

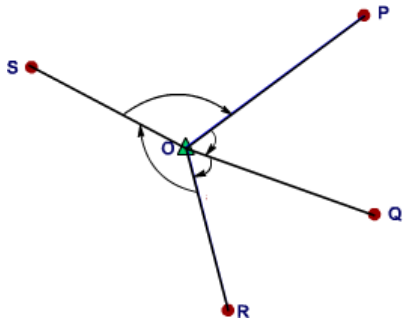
Procedure:

The Least count of the theodolite instrument is 20".

The following procedure is used for the measurement of the horizontal angle.

1. Two points one on each of the lines, say P and Q, and are to be marked.
2. A transit theodolite is to be set at the point of intersection of the lines, say at O. Initially, the instrument is in the face left condition and its temporary adjustment is to be done over the pointO.
3. Both the lower and upper plate main screws are to released and get the vernier Aset to 0° (or 360°) mark on the main scale. After clamping the upper main screw, index of vernier A is to be brought exactly to the zero of the main scale using the upper plate tangent screw.
4. At this stage the reading of the vernier B should be180°.
5. Swing the telescope in the horizontal plane and point it to the left station, say P. Tighten the lower plate clamp screw, and bisect the signal at P exactly using the lower plate tangent screw. Record the readings in thetable
6. Loosen the upper plate main screw and turn the telescope the signal at Q is sighted. Tighten the upper clamp screw and bisect the ranging pole at Q exactly using the upper plate tangentscrew.
7. Read both the verniers A and B and record the readings. The reading of the vernier A is the angle POQ. The vernier B gives the value of angle POQ after deducting from it 180°. The mean of two values of the angles obtained from the verniers A and B is the required angleP'O'Q'.
8. Loosen the upper plate clamp screw and turn the telescope clockwise until the station R is sighted. Tighten the upper clamp screw. Use the upper tangent screw for placing the object R on the vertical cross hair. Read both the verniers, and record readings in the table. Compute the angle QOR. And note down in thetable.

9. Likewise, determine the angleROS.
10. Finally, close the horizon by sighting the reference object P again. Note down the readings. The vernier A should now read zero (or360°).
11. Now change the face left of the instrument to the face right by transiting (plunging) the telescope and swinging it through 180°. Repeat steps 3 to 10 in the anti-clockwise direction.
12. The average value of each angle obtained with the face left and the face right provides the observed values of the angles.



Precautions:

3. Theodolite should have been free fromerrors.
4. The readings while been taken both the vernier are to be carefullyread.

Result: The horizontal angle between the two stations is

Table - 2 : Reiteration Method

Instrument at	Sighted to	Face Left										Face Right										Average Horizontal Angle		
		A			B			Mean			Horizontal Angle	A			B			Mean			Horizontal Angle			
		0	‘	“	0	‘	“	0	‘	“		0	‘	“	0	‘	“	0	‘	“		0	‘	“

ExperimentNo: **Date:**

DETERMINATION OF BUILDING HEIGHT USING THEODOLITE

A. Base of the building isaccessible

Aim: To determine the R.L. of top of the building **when the base of the building is accessible** by transittheodolite.

Equipment:

Theodolite	-	1
Tripod	-	1
Levelling staff	-	1
Tape	-	1
Arrow	-	1
Plumb bob	-	1

Procedure:

1. Set up a theodolite at a convenient distance from the object and measure the horizontal distance between them accurately by steel or invar tape. Let this distance be 'D'meters.
2. Centre the theodolite over the station point exactly and level it by mean altitude Bubble and platelevels
3. The line of collimation of the theodolite is then made horizontal by adjusting the verniers of the vertical circle to readzero.
4. Loosen the lower clamp and vertical clamp and rotate the telescope in horizontal plane and vertical plane till the top of the tower is bisected. Tighten the lower clamp and vertical clamp and by means of lower tangent screws and vertical tangent screws make finebisection.
5. Read both the verniers C and D find the mean of these two readings gives vertical angle α1
6. Now loosen the vertical clamp and bisect the bottom of object exactly with vertical tangent screw. The mean of the two readings gives the vertical angle α_2.

$$H_1 = D \tan \alpha_1$$

$$H_2 = D \tan \alpha_2$$

Height oftheobject $H_1+H_2 = H$

$$= D (\tan\alpha_1 + \tan \alpha_2)$$

B.M= D= H.I=

Precautions: 1. Graduations errors should be eliminated.
2. Eccentricity of vertical axis iseliminated.
3. Errors of Bisection and improper centering are alsoeliminated.

Result: Thus we are determining the R.L of the top of the Building when the base of the building is accessible.

Table - 1 : When base is accessible

Instrument at	Sighted to	Face Left										Face Right										Average Vertical Angle		
		C			D			Mean			Vertical Angle	C			D			Mean			Vertical Angle			
		0	‘	“	0	‘	“	0	‘	“		0	‘	“	0	‘	“	0	‘	“		0	‘	“

B. Base of the building isInaccessible

Aim: To determine the horizontal distance between instrument stations and object and R.L. of the top of the object **where base is inaccessible**.

Equipments:

Theodolite	-	1
Tripod	-	1
Levelling staff	-	1
Tape	-	1
Arrow	-	1
Plumb bob	-	1

Procedure:

1. Set up the theodolite at 'A' and level it and let the angle of elevation be α1. The B.S. reading taken on B.M. beS_1.
2. The theodolite is moved and set up at B and the angle of elevation of α2is measured. The B.S. reading taken on B.M beS_2.
3. The difference of elevation of two instrument axis = $S_1 - S_2$
   D is the horizontal distance between B andQ
   b is the horizontal distance between two instrument stations.

Instruments

H_1 = height of the point Q above the instrument axis at 'A'
H_2 = height of the point Q above the instrument axis at 'B'
Q_1 = the projection of Q on the horizontal line through 'D'
Q_2 = the project of Q on the horizontal line through 'R'

When the height of theodolite at R is higher than at 'B'.

Formula:

Distance 'D' = $\frac{(b+S \cot \alpha_2) \tan \alpha_2}{(\tan \alpha_1 - \tan \alpha_2)}$

$H1 = D \tan \alpha_1$ $H2 = (b+D) \tan \alpha_2$

Precautions:

1. Graduation errors areeliminated.
2. Eccentricity of vertical axis iseliminated.
3. Errors of Bisection and improper centering are alsoeliminated.

Result:

Thus we are determining the horizontal distance between instrument stations and object and R.L. of the top of the object where base is inaccessible.

Instrument at	Sighted to	Face Left												Face Right												Average Vertical Angle		
		C			D			Mean			Vertical angle			C			D			Mean			Vertical angle					
		O	‘	“	O	‘	“	O	‘	“	O	‘	“	O	‘	“	O	‘	“	O	‘	“	O	‘	“	O	‘	“

ExperimentNo: **Date:**

DETERMINATION OF TACHEOMETRIC CONSTANTS

Aim: Determine the multiplying constant (K) or (t/i) and additive constant (c) or (f+d) of a givenTachometer, using field observations and distance between the two stations.

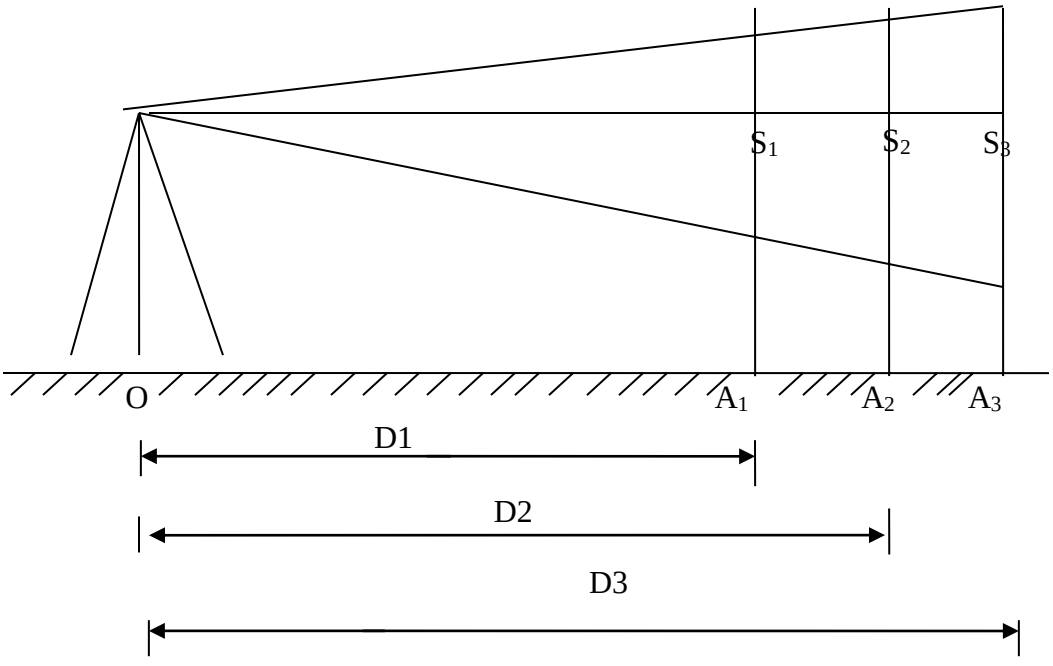
Equipment Used: Tacheometer, leveling staff, chain or tape, ranging rods.

Objective of the Experiment:

Determine the multiplying constant (K) or (f/i) and Additive Constant (C) or (f+d) of a given Tacheometer, using field observations.

Theory:

Horizontal and Vertical distances between the stations are determined from tachometric observations, where in measurements either by chain or tape are completely eliminated. The calculations are based on the principle of Isosceles triangles, which states "In Isosceles Triangles, the ratio of the perpendiculars from the vertex on their bases and their bases inconstant".



PROCEDURE:

a) Select a fairly level ground set up the tacheometer on station 'O' and complete all the temporaryadjustment.

b) Measure a line OA_3 on a straight line, 60 m long and fix the pegs, A_1, A_2 and A_3 at 20 m apart.

c) With line of collimation horizontal hold to staff vertical over station A_1 take the stadia hair readings (top and bottom hair readings). Let the Intercept beingS_1.

d) Similarly the staff intercepts A_2 and A_3 betaken. Let the intercepts being S_2 and S_3 respectively.

Observations & Tabulations:

Instrument Station	Staff reading on	Distance (mt)	Stadia readings			Staff Intercept (Upper - Lower) S_L& S_U
			Lower	Middle	Upper	

Caculation:

D=ks+c

Result: The tacheometric constants of the given instrumentare_____

ExperimentNo: **Date:**

CURVE SETTING USING THEODOLITE

Aim:

To set out a simple circular curve using one theodolite and chain/ tape.

Equipment used:

Transit Theodolite, Chain, Tape, Arrows, Pegs.

Objectives of the Practical:

To set out a simple circular curve using one theodolite and a chain/tape.

Theory: It is an instrumental method of setting a simple circular curve. Theodolite is used for making angular observations, chain/ tape is used for making linear measurements. A Rakine's tangential angle (δ) is the angle made by any chord with the tangent at the first point of that chord. The total tangential angle (Δ) of the any point on the curve in the angle made by the chordjoining that point and the first tangent point (T_1) with the rear tangent. The total tangential angle of whole are will be equal to half of the deflection angle ($\emptyset/2$) of thearc.

Tangential angle of n^{th} chord, δ_n =

Where C_n = Length of n^{th} chord Φ =

R = Radius of the curve =

Total tangential angle of n^{th}chord, interval =

$\Delta_n = \delta_1 + \delta_2 + \delta_3 \text{----------} + \delta_n$

Note: Tangential angles, deflection angles, Rankiness tangential angles and Rankines deflection angle are one and the same.

Equipment used:

The following equipment is required to conduct the field work.

1. Transittheodolite
2. Chain (20 m. or 30m.)
3. Tape
4. Arrows
5. Pegs

Procedure of setting out the curve:

1. Set the theodolite at the point of curve (T_1), with both plates clamped to zero, direct the theodolite to bisect the point of intersection (B). The line of sight is thus in the direction of the rear tangent (T_1B).
2. Release the upper plate end set angle Δ_1 on the vernier of theodolite. The line of sight isthus directed along the chord'T.M'.
3. With the zero and of the tape at 'T_1' and an arrow held at a distance T_1M = c along it with chain/ tape, swing the tape around T_1 till the arrow is bisected by the crosshairs. Thus the first point 'M' isfixed.
4. Set the second deflection angle 'Δ_2' on the vernier so that the line of sight is directed along'T_1N'.
5. With the zero end of the tape at M, and an arrow held at a distance MN=C along it, swing the tape around 'M' till the arrow is bisected by the cross-hairs, thus fixing the point'N'.
6. Repeat steps (4) and (5) till the last point 'T_2' isreached.

Check:

The last point 'T_2' thus located must coincide with the previously located tangent point T_2. If the discrepancy is small, last few pegs may be adjusted. If it is more, the whole curve should bereset.

Inst.at	Sight to	Chord Length, C	Tangential angle, δ			Total tangential angleΔ			Theodolite reading			Remarks
		m	0	I	II	0	I	II	0	I	II	

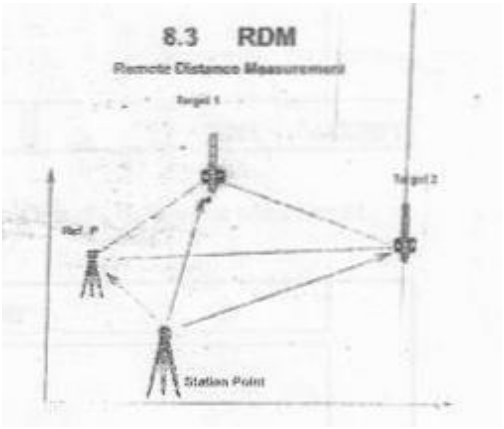
Result:

The required curve is set out on the field by this one theodolite + chain / tape method, which can be observed on the field.

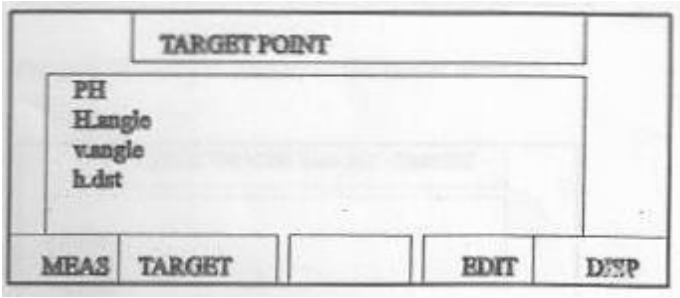
EXPERIMENT NO: **Date:**

DETERMINATION OF REMOTE DISTANCE MEASUREMENT & REMOTE ELEVATION MEASUREMENT

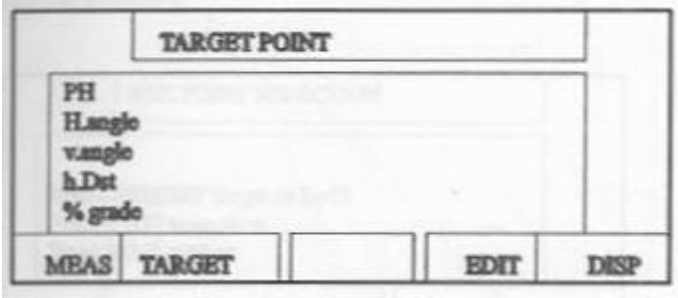
A. REMOTE DISTANCEMEASUREMENT



With RDM measurement, the Horizontal, vertical and slope distance and % of slope between the reference point and the target point are measured. The distance between target 1 and target 2 are also measured any target point can be changed to the new reference point.
From the power Topolite screen, press [F5][PAGE] two and press [F4][RDM] .
Press [F4][EDIT] select PH and input the prism height press ENT two times.
Place the prism at Reference point.
Aim at the references point and press [F1][MEAS] to measure the reference point it turn to TARTGET POINT screen automatically.

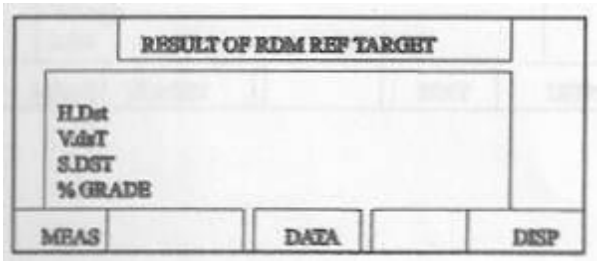


Aim at the target 1 and press [F1][MEAS] to measure a distance. The distance between reference point and target point 1 isdisplayed.



- V.dst. and % grade are displayed by minus mark when the target point is lower position. Press the [F3][DATA] to view the TARGET POINTscreen.

Aim at the target 2 and press [F1][MEAS] to measure distance. The distance between reference point and target point 2 isdisplayed.



Press[F5][DISP] to displayed the target distance.

Result:

B. REMOTE ELEVATIONMEASUREMENT

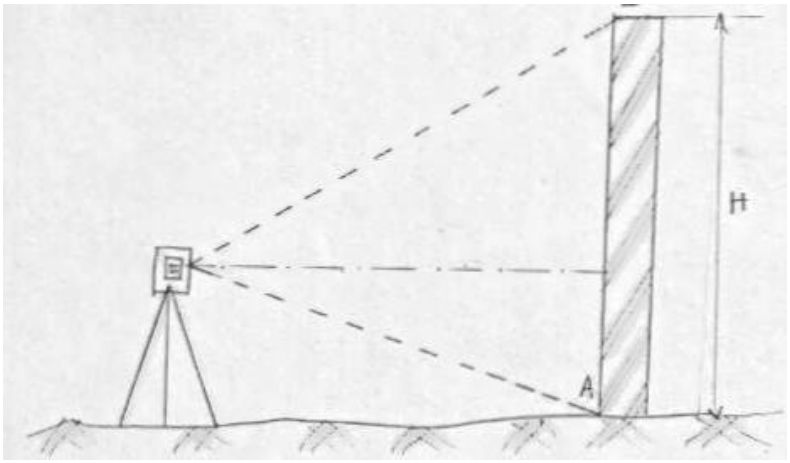
Aim: To calculate height of given object by using total station.
Apparatus: Total Station
Tape
Tripod
Procedure:

- Fix the tripod stand on ground & place the total station on it and approximatelevelling should be done by eyeadjustment.
- Levelling should be done by using screws & bubble should be in centre in dry direction to turn thetelescope.

To calculate the height of the tower we will use this programmer.

1. Switch on the instrument levelit.
2. Place the prism at the bottom of pole to which we want to calculate theheight.
3. In the instrument press F5(MODE) then press F1(SFUNC), press F5 (PAGE) onetime. Press F2(CALC). Select REM and pressENT.
4. Press F4 (EDIT), select PH and press ENT. Input prism height) and press ENT twotimes.
5. Sight the prism and measureit.
6. After completion of measurement press ENT. At the bottom the horizontal distancewill be changed toREM.
7. Turn the telescope vertically to the top and sight the top point of thetower.
8. Opposite to REM we can see the height of thetower.

Result:
Height of the object is



EXPERIMENTNO: **Date:**

DETERMINATION OF GIVEN BOUNDED AREA IN THE FIELD USING TOTAL STATION

Aim: To find out the area of a given land portion by using total station.

Apparatus (or) equipment:

1. Tripodstand
2. Totalstation
3. Prism
4. Prismrod
5. Pegs
6. Rangingrods

Procedure:

1. Fix the ranging rods at the boundaries of the givenarea.
2. Fix the instrument station on the tripod stand & do the levelling &centering
3. Levelling should be done by any tripod screws. First turn the level tube and adjust the bubbles in centre by using these screws and turn the level tube perpendicular to the these two screws and centre by using third screw to check the level tube is in centre in any direction.
4. Focusing the telescope towards plain wall and by using focusing screw adjusting the eye piece until the cross hairs are clearlyvisible.
5. Measure the co-ordinates of all the boundary points and save them in the internal memory.
6. From mode A screen pressF5(MODE)
7. PressF1(SFUNC)
8. Press F5(PAGE) onetime.
9. Press F2(CALC)
10. Select 2D surface &area.
11. From the screen select the points measured on the boundary by pressing ENT andpress down arrow F4 again press ENT. While selecting the points all the points are to be selected in order as they are on theground.
12. After completion of selection of points press F2(ACCEPT).
13. The area will be displayed on the screen of totalstation.

Result:

Calculated area of a given site by using total station =

Point	Code	N	E	Z

EXPERIMENT NO: **Date:**

STAKE OUT

Aim: To find a specific point in the field using Total Station

Apparatus: Total station, Prism, Tripod, Pegs

Procedure:

Place the total station in the spot from which you want to stake out points after you have finished entering the coordinates for the area into the total station's internal memory.

1. Make sure that the total station is level and on secure, even ground before continuing.
2. Press the "Power" button to turn on the instrument.
3. Press the "Menu" button and use the navigation arrows to move down to the "Stake Out" menu option. Press the "Select" button to enter the stake out menu.
4. Select the method to stake out the point. Select "XY" to stake out by coordinates which will be the most common method.
5. Press the "Yes" button to continue the process using the coordinates on the screen.
6. If the coordinates are incorrect, press the "No" button to try again.
7. In the next screen, use the keypad to enter the coordinates or distances and press the "OK" button to measure.
8. The results will be displayed on the following screen.

Calculation: Select Stake function---> calculation---> 2D surface----> all------> accept

Result: