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GEOMATICS & AERIAL SUREVYING LAB MANUAL

LIST OF EXPERIMENTS

a. Study various parts of a theodolite

b. Measurement of horizontal and vertical angles with theodolite

c. Measurement of Tachometric constants.

d. Calculating horizontal distance and elevations using tachometer.

e. Exercise of triangulation including base line measurement.

f. Setting out simple circular curves by deflection angle method.

g. Study the various parts of a total station.

h. Measurements of distance, elevation, coordinate with total station.

i. Special problems with total station.

<u>EXPERIMENT NO - 1</u>

OBJECT: - To study the functions of various parts of theodolite.

APPARATUS: - Theodolite.

THEORY: - Fig 1 and 2 show diagrammatic sections of a venire theodolite and is mounted on a spindle known as horizontal axis (2).

(i) Telescope:- The telescope may be internal focusing type or external focusing type. In most of the transits and internal focusing telescope is used.

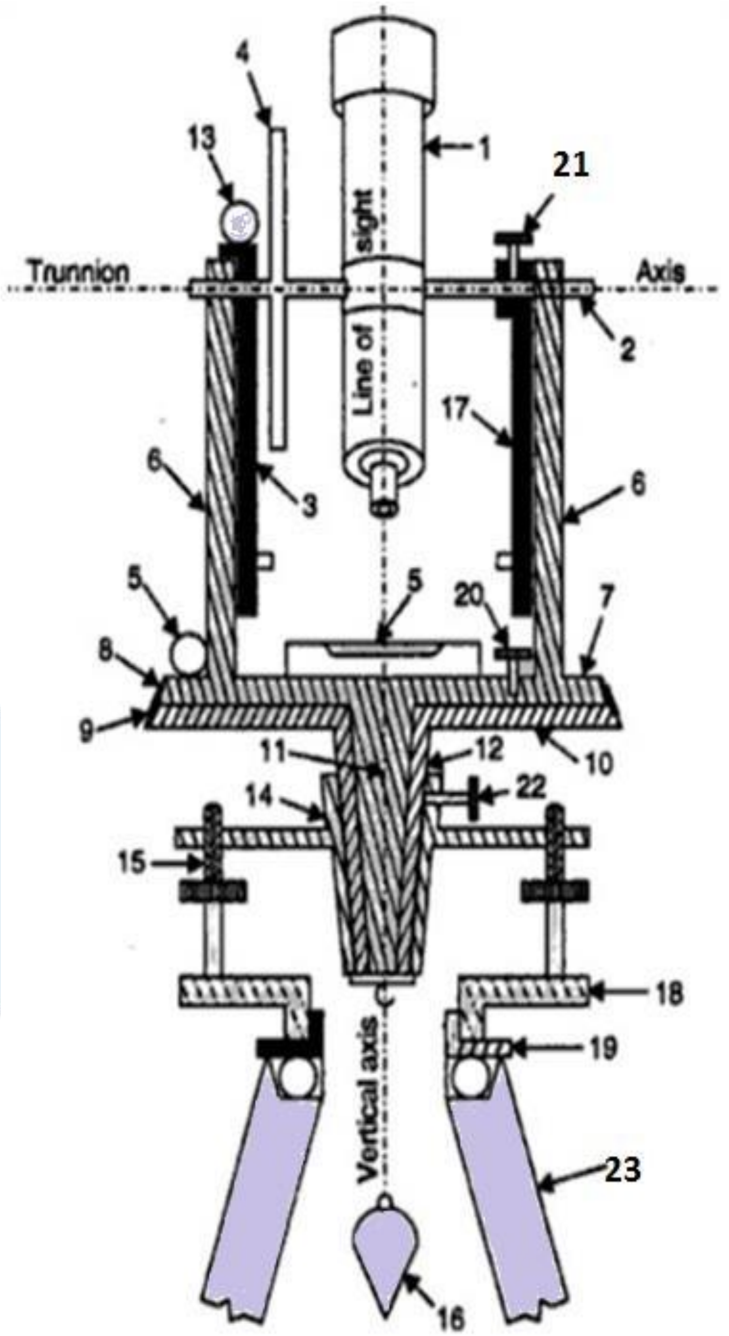
(ii) The vertical circle: - The vertical circle is a circular graduated are attached to the turn-on axis of the telescope consequently the later is turned about horizontal axis. By means of vertical circle clamp (24) and is corresponding slow motion or tangent screw (25) the telescope can be set accurately at any desired position in vertical plane. The circle is either graduated continuously 0^o to 360^0 in clockwise direction or it is divided into 4 grad rants.

(iii) The index frame (or t-frame or venire frame):- The index frame (3) is a T-shaped consisting of a vertical leg known as clipping arm or index arm (29) at the 2 extremities of the index arm are fitted low venires to read the vertical circle. The index arm is centered on the trunnion axis in front of vertical circle and remains fixed when the telescope is moved in the vertical plane. The vertical circle moves related to the venires with the help of which reading can be taken. For adjustments purpose however the index ovum can be rotated slightly with the help of a clip screw (27) fitted to the clipping arm at its lower end. Glass magnifiers (30) are placed in front of each venire to magnify the reading a long sensitive bubble tube sometimes know as the attitude bubble (13) is placed on the index of index frame.

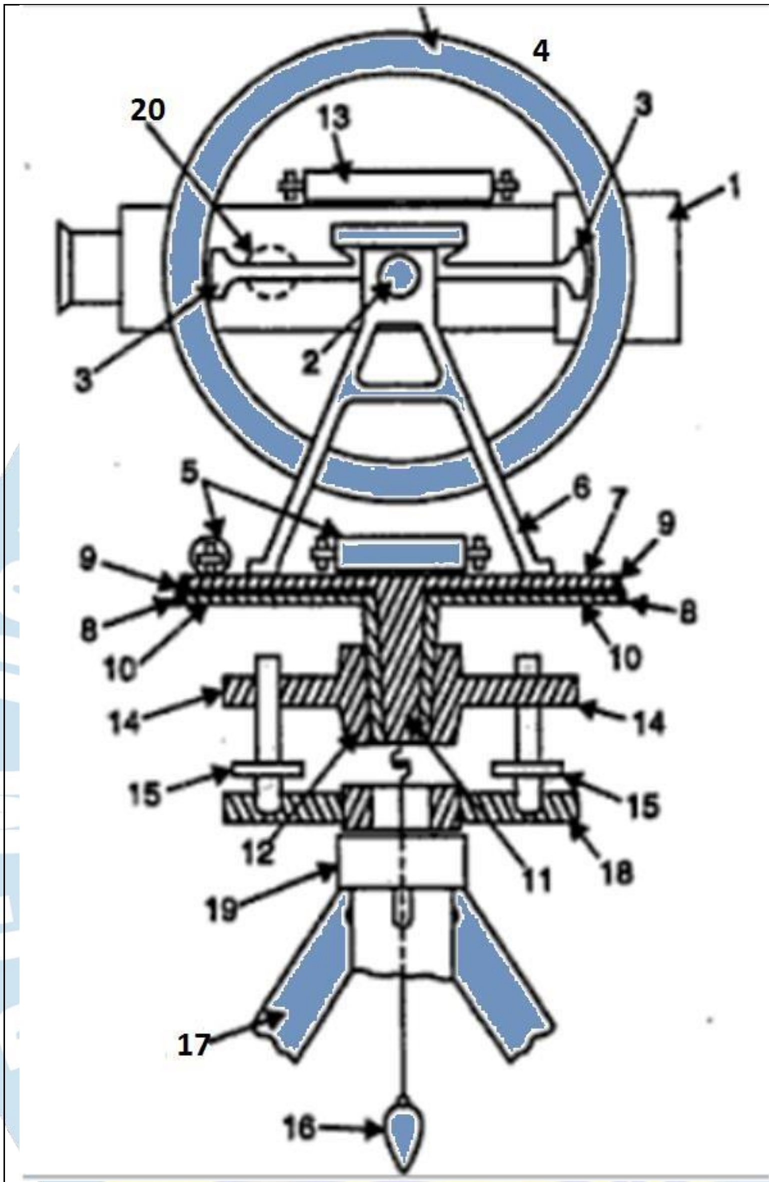
(iv)The standards or a Frame: - Two standards (B) resembling the letter (A) one mounted on the upper plates (7) the trunnion axis of the telescope is supported on these. The T-frame and the arm of vertical circle clamp (17) one also attached to the A frame.

(V) The leveling Head. : - The leveling head (14) usually consist of 2 parallel triangular plates known as tribrach plates. The upper tribrach has 3 arms each carrying a leveling screw (15). The lower tri branch plates or foot plates (18) has a circular hole through which a plumb (16) may be suspended. In some instruments, for leveling screws C also called foot scrooges are provided between 2 parallel plates a leveling head has 3 distinctive functions.

- To support the main part of instrument.
- To attach the theodolite to the tripod.
- To provide a mean for leveling the theodolite.



1. TELESCOPE
2. TRUNION AXIS
3. VERNIER FRAME
4. VERTICAL CIRCLE
5. PLATE LEVEL
6. STANDARDS (A-FRAME)
7. UPPER PLATE
8. HORIZONTAL PLATE VERNIER
9. HORIZONTAL CIRCLE
10. LOWER PLATE
11. INNER AXIS
12. OUTER AXIS
13. ALTITUDE LEVEL
14. LEVELING HEAD
15. LEVELING SCREW
16. PLUMB BOB
17. ARM OF VERTICAL CIRCLE CLAMP
18. FOOT PLATE
19. TRIPOD HEAD
20. UPPER CLAMP
21. VERTICAL CIRCLE CLAMP
22. LOWER CLAMP
23. TRIPOD



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15. LEVELING SCREW
16. PLUMB BOB
17. TRIPOD
18. FOOT PLATE
19. TRIPOD HEAD
20. FOCUSING SCREW

(vi) The two spindles (or axis or centers):- The inner spindle or axis (11) is solid and conical and fits into the outer spindle (12) which is hollow and ground conical in the interior. The inner spindle is also called the upper axis since it carries the venire or upper plate (7). The outer spindles carry the scale or lower plate (10) and are known as lower axis. Both the axis have common axis.

(vii) The lower plate (or scale plate) the lower plate (10) is attached to the outer spindle. The lower plate carries a horizontal circle (9) at its leveled edge and known as scale plate. The lower plate carries a lower clamp screw and a corresponding slow motion or tangent screw (23) with the help of which it can be fixed accurately in desired position.

When the clamp is lightened the lower plate is fixed to the upper tribrach of leveling head. On turning the taught screw the lower plate can be rotated slightly.

(viii) The upper plate or venire: - The upper plate (7) or venire plate is attached to the inner axis and carries 2 venires (8) with magnifiers (3) at 2 extremities diametrically opposite. The upper plate support a standards (6) It carries an upper clamp screw (2) and a corresponding tangent screw (2) for the purpose of accurately fixing it to the lower plate. On clamping the upper hand in clamping the lower clamp. The instrument can rotate on its outer axis without any relative motion between - 2 plates.

ix) The plate's level: - The upper plate carries 2 plate level (5) placed at right angles to each other on of the plate level is kept to turn-on axis. In some thodolites only one plate is provided. The plate level can be centered with the help of screws (15).

(x) TRIPOD: - When in use the theodolite is supported on a tripod (26) which consists of 3 solid on framed legs at the lower end sleds are provided with pointed shoes. The tripod head carries at its upper surface an external strews to which foot plate (18) of the leveling head can be screwed.

(xi) The Plumb Bob: - It is suspended from hook fitted to the bottom of inner axis to centre to the instrument exactly over the station mark.

(xii) Compass: - Provided with a compass which can be either tubular type or through type a through compass is consists of a long narrow rack hex along the longitudinal axis of which is provided a needs balanced upon a steel picot.

PRECUATIONS:-

1) While studying handle the theodolite carefully.
2) Avoid touching the tripod stand so as not to disturb setting of instrume

EXPERIMENT NO – 2

Aim: - Measurement of horizontal and vertical angles with theodolite

THEORY:

The theodolite is the most intricate and accurate instrument used for measurement of horizontal and vertical angles. When it is required to measure horizontal angles with great accuracy as in the case of traverse, the method of repetition may be adopted. In this method the same angle is added several times by keeping the vernier. To remain clamped each time at the end of each measurement instead of setting it back to zero when sighting at the previous station. The corrected horizontal angle is then obtained by dividing the final reading By the number of repetitions. Usually six reading, three with face left and three with face right, are taken The average horizontal angle is then calculated. In repetition method each angle is measure independently with the help of vernier theodolite equipped with a slow motion screw for the lower plate.

It is noteworthy that during entire processes

- Error due to eccentricity of vernier and centre are eliminated by taking both vernier (A and B) reading.
- Error due to inadjustment of line of collimation and trunnion axis are eliminated by taking both face (Left and Right) reading.
- Error due to inaccurate graduation in vernier is eliminated by taking reading at different part of the vernier.
- All other errors such inaccurate bisection of object are eliminated by repeated observations.

PROCEDURE:

(a) Measurement of horizontal angle

- Let LOM is the horizontal angle to be measured as shown in fig. O is the station point fixed on the ground by a peg. Set up the theodolite over the peg 'o' and level it accurately.
- Set the horizontal graduated circle venire A to read zero or 360° by upper clamp screw and slow motion screw. Clamp the telescope to bisect the bottom shoe of the flag fixed at point 'L' and tighten the lower clamp. Exactly intersect the centre of bottom shoe by means of

lower slow motion screw. Check that the face of the theodolite should be left and the telescope in normal position.

- Check the reading of the venire A to see that no slip has occurred .Also see that the plate levels are in the centre of their run. Read the venire B also.
- Release the upper clamp screw and turn the theodolite clockwise. Bisect the flag bottom shoe fixed at point M by a telescope. Tighten the upper clamp screw and bisect the shoe exactly by means of upper slow motion screw.
- Note the reading on both the venire to get the approximate value of the angle LOM.

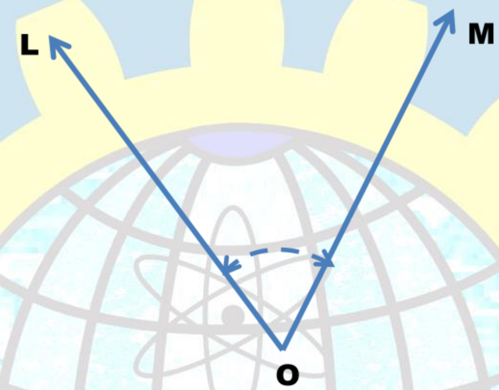


Figure 1: Measurement of Horizontal Angle

- Release the lower clamp screw and rotate the theodolite anticlockwise a azimuth Bisect again the bottom shoe of the flag at 'L' and tighten the lower clamp screw. By means of slow motion screw bisect exactly the centre of the shoe.
- Release now the upper clamp screw and rotate the theodolite clockwise. Bisect the bottom shoe of the flag fixed at M and tighten the upper clamp screw. By means of slow motion screw bisect exactly the centre of the shoe. The venire readings will be now twice of the angles.
- Repeat the process until the angle is repeated the required number of times (usually 3). Add 360° for every complete revaluation to the final reading and divided the total angle by number of repetitions to get the value of angle LOM.
- Change the face of the theodolite the telescope will now be inverted. Repeat the whole process exactly in the above manner and obtain value of angle LOM.
- The average horizontal angle is then obtained by taking the average of the two angles obtained with face left and face right.
- Usually three repetitions face left and three with face right should be taken and the mean angle should be calculated.

(b) Measurement of vertical angle

- A vertical angle is the angle between the inclined line of sight to an object and the horizontal. It may be an angle of elevation or on angle of depression according as the point is above or below the horizontal plane passing through the turn-on axis of the instrument. To measure angle of elevation or depression LOM shown in fig. proceed as follows:
- Set up the theodolite at station point O and level it accurately with reference to the altitude level.
- Set vertical venires C and D exactly to zero by using the vertical circle clamp and tangent screw, while the altitude level should remain in the centre of its run. Also the face of the theodolite should be left.
- Release the vertical circle clamp screw and rotate the telescope in vertical plane so as to bisect the object M. tighten the vertical circle clamp and exactly bisect the object by slow motion screw.
- Read both venires C and D. the mean of the tow readings gives the value of the required angle.
- Similar observation may be made with other face. The average of the tow values thus obtained gives the value of the required angle which is free from instrumental errors.
- Similarly the angle of depression can be measured following the above steps:

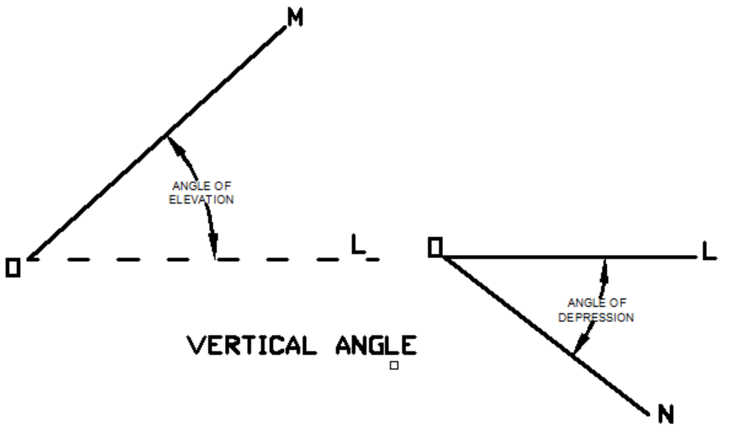


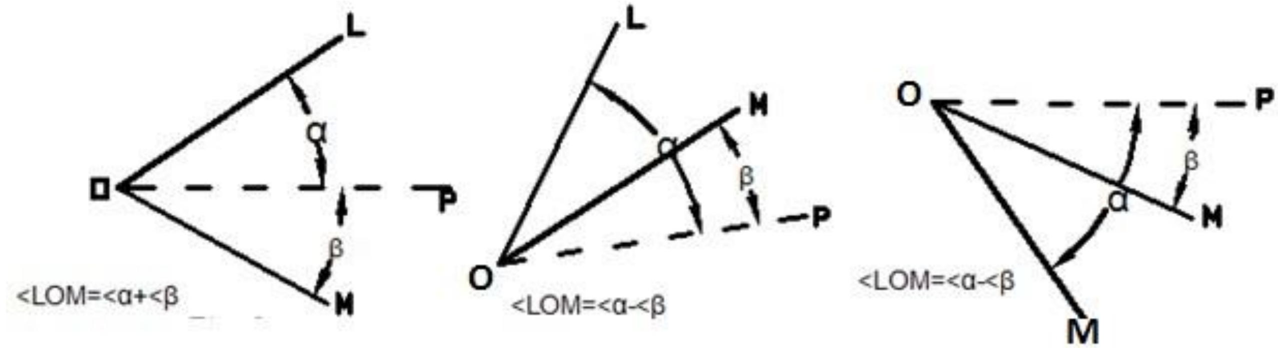
Figure 2: Measurement of vertical angle

Sometimes it is required to measure vertical angle between two points L and M . There can be three possibilities.

(a) One point is above the line of sight and the other is below the line of sight then angle LOM as shown in fig will be equal to ($<\alpha + <\beta$) (Refer Fig. a)

(b) Both the points are above the line of sight. Then the angle LOM= $<\alpha - <\beta$ (Refer Fig b)

(c) Both the points are below the line of sight, then the angle LOM= $<\alpha - <\beta$ (Refer Fig c)



(a) **(b)** **(c)**

Figure 3: Measurement of compound vertical angle

OBSERVATION TABLE:

(a) For horizontal angle:

S. N	Instrument Station	Sighted to	Face Left readings			Face Right readings			Remarks
			Vernier A X^0 Y' Z''	Vernier B X^0 Y' Z''	Mean X^0 Y' Z''	Vernier A X^0 Y' Z''	Vernier B X^0 Y' Z''	Mean X^0 Y' Z''	
1	O	P	0^0 0' 0''	0^0 0' 0''	0^0 0' 0''	0^0 0' 0''	0^0 0' 0''	0^0 0' 0''	
2									
3									
4									

(b) For vertical angle:

S. N	Instrument Station	Sighted to	Face Left readings			Face Right readings			Remarks
			Vernier C X^0 Y' Z''	Vernier D X^0 Y' Z''	Mean X^0 Y' Z''	Vernier C X^0 Y' Z''	Vernier D X^0 Y' Z''	Mean X^0 Y' Z''	
1	O	P	0^0 0' 0''	0^0 0' 0''	0^0 0' 0''	0^0 0' 0''	0^0 0' 0''	0^0 0' 0''	
2	(+v e)	L							
3	(-v e)	M							
4									

EXPERIMENT NO – 3

Aim: - **Measurement of Tachometric constants.**

Apparatus: A tachometer with tripod, tape, leveling staff, wooden pegs, ranging rods etc.

THEORY: Tachometry is a branch of angular surveying in which horizontal and vertical distance of point are obtained by optical instrumental observation. Tachometer is a transit theodolite having a stadia telescope i.e. telescope fitted with stadia diaphragm. A leveling staff can be used for sighting purpose up to 100m distance. The stadia method is based on the principle that the ratio of perpendicular to the base is constant in similar isosceles triangles.

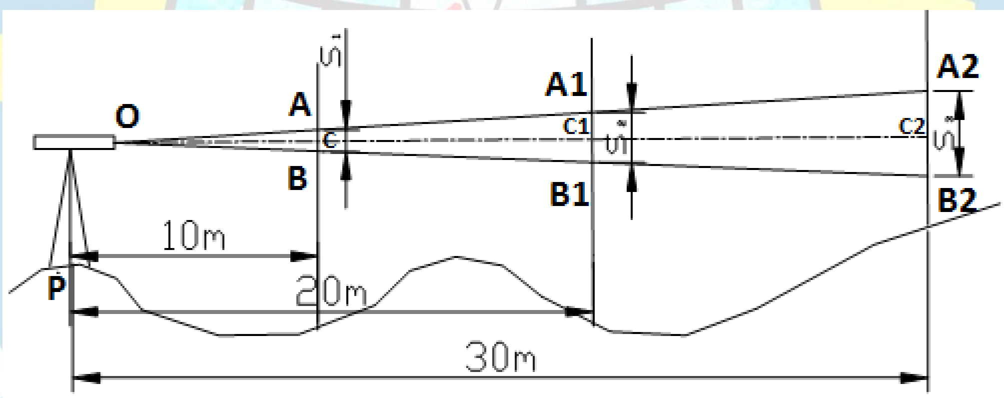


Figure:

In fig let two rays OA and OB be equally inclined to the central ray OC. Let A2B2, A1B1 and AB be staff intercepts. Evidently

$OC_2/A_2B_2 = OC_1/A_1B_1 = OC/AB$ = constant k.

Formulae:

When the line of sight is horizontal, then

$D = f/I\ s + (f + d)$ .... (1)

Equation (1) is known as the distance equation. In order to get the horizontal distance, therefore, the staff intercepts is to be found by subtracting the staff reading corresponding to the top and bottom stadia hairs.

D = Ks + C .... (2)

Where, D = Horizontal distance between instrument station and staff station, K = f /i is known as the multiplying constant or stadia interval factor and the constant (f + d) = C is known as the additive stadia of the tachometer, S = Staff intersect i.e. difference between top and bottom stadia hair

PROCEDURE

The values of the multiplying constant K and the additive constant C can be computed from field observations by the following methods:

Steps:

- Select an instrument station P on a fairly leveled ground and fix a peg.
- Do the temporary adjustment on tachometer over P.
- Measure a line, about 30 m long on fairly level ground and drive pegs at some intervals, say 10 meters.
- Keep the staff on the pegs and observe the corresponding staff intercepts with horizontal sight.
- With vertical circle to the left of the observer and reading $00^0$00’00” bisect staff held at 10m, 20m, and 30m from P along straight line.
- Note down the staff reading against top and bottom stadia hair on staff held at 10m, 20, 30m from P.
- Determine the staff intercepts, S_1, S_2, S_3 etc., can be measured corresponding to distance D_1, D_2, D_3 etc.
- In case of inclined line of sight the same procedure as stated above is followed step by step with a vertical angle of $05^0$00’00” in the vertical circle of the theodolite. In this case, the vertical circle is held to the left of the observer and with the reading $05^0$00’00” in the circle the staff is bisected at 10m, 20m, and 30m from A along straight but inclination line of collimation.

OBSERVATION TABLE:

Instrument	Staff	Distance	Vertical		Remarks

Station	Station		Angle	Top	Bottom	Intercept	
P	D1	10 m					
	D2	20 m					
	D3	30 m					

CALCULATION:

Knowing the values of D and S for different points, a number of simultaneous equations can be formed by substituting the their values in equation 2. The simultaneous solution of successive pairs of equations will give the values of K and C, and the average of these can be found.

We have, $D_1 = KS_1 + C_1$------------------------------(3)

$D_2 = KS_2 + C_2$ ------------------------------ (4)

$D_3 = KS_3 + C_3$------------------------------ (5)

Solving the different pair of equation from the above three equations, the average values K and C can be determined.

RESULT:

- The additive constant 'C' for a given tachometer is found out to be-………
- 2) The multiplying constant 'K' for a given tachometer is found to be -………

PRECAUTION:

- Ground selected should be failry level
- The staff should be kept vertical and it should not be inclined

EXPERIMENT NO –4

Aim: - **Calculating horizontal distance and elevations using tachometer.**

Apparatus: A tachometer with tripod, tape, leveling staff, wooden pegs, ranging rods etc.

THEORY: Tachometer is an instrument which is generally used to determine the horizontal as well as vertical distance. it can also be used to determine the elevation of various points which cannot be determine by ordinary leveling. When one of the sight is horizontal and staff held vertical then the RLs of staff station can be determined as we determine in ordinary leveling .But if the staff station is below or above the line of collimation then the elevation or depression of such point can be determined by calculating vertical distances from instrument axis to the central hair reading and taking the angle of elevation or depression made by line of sight to the instrument made by line of sight to the instrument axis.

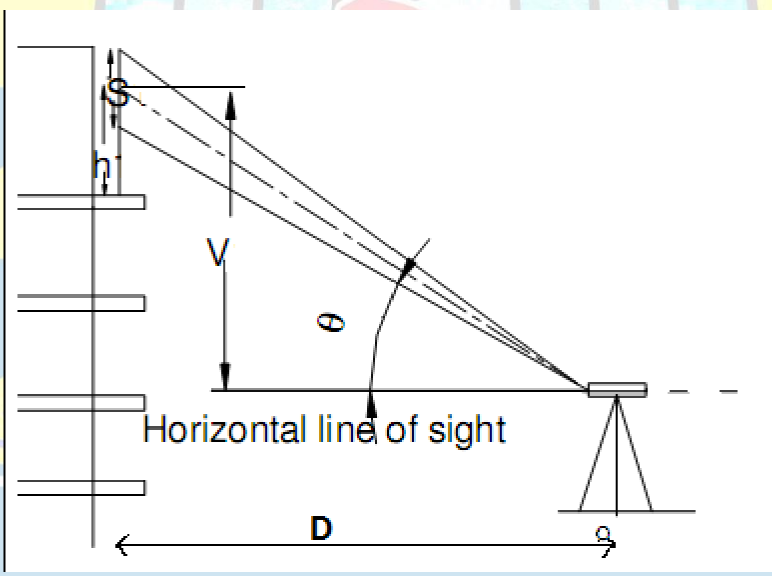


Figure: Determination elevation using tachometer

FORMULAE:

When line of sight is inclined and staff vertical then:

$$V = KS \frac{Sin \ 2\theta}{2} + c \sin \theta$$ ……………………….(1)

$$D = KSCos^2\theta + CSin\theta \quad ....(2)$$

Where, K= Multiplying constant =100 or as computed in the previous experiment
C= Additive constant (value derived in the previous experiment)
S= Staff intercept.
V =Vertical distance measured from horizontal line of straight to central stadia hair reading on staff.
h = Central stadia hair reading on staff.
θ = vertical angle

PROCEDURE:

1) Set up the instrument in such a way that all the point two point whose horizontal distance in to be determined were visible from the instrument station.
2) Carryout the temporary adjustment and set venire zero reading making line of sight horizontal.
3) The height of the instrument was determined by holding the staff vertically on any selected BM and the R.L. of B.M. was taken as 100.00.
4) Then sight the telescope towards the staff station who's R.Ls is to be calculated. Measure the angle on vernier if line of sight is inclined upward or downward and also note the three crosshair readings.
5) Determine the R.Ls of various points by calculating the vertical distance.
6) Then repeat the procedure same as above at least three times.

OBSERVATION:

Instrument Station	Staff Station	Vertical Angle				Remarks
			Top	Bottom	Intercept	
P	BM	$00^0 00'00''$				RL=100m
	Building Floor					

CALCULATION:

The horizontal distance can be determined putting the observation value in equation 2.

The RL of the building = R.L. of B.M. + back sight on B.M. + V -h

RESULTS:

The RL of the building is found to be……………………..

The horizontal distance between instrument station and staff position is found to be ………………..

EXPERIMENT NO –5

Aim: - Exercise of triangulation including base line measurement.

APPARATUS: Three standardized tapes, Straining Device, marking tripod, supporting tripod, 4 thermometers, spring balance, theodolite, ranging road and staff.

THEORY:

The measurement of base line is the most important steps of triangulation. It should be measured very accurately as the accuracy of the computed sides of triangulation system depends on it. The length of base line depends upon the grade of triangulation. According to the grades of triangulation, length of base line varies from a fraction of (0.5) km to 10 km. Conventionally, steel tapes; wires are used to measure the base line. Jaderine method is mostly used for base line computation because of its simplicity, inexpensiveness and speedy progress. In this method the tripod is align and set at a distance approximate equal to length of tape. The end of tape are attached spring balance is used to measure tension.

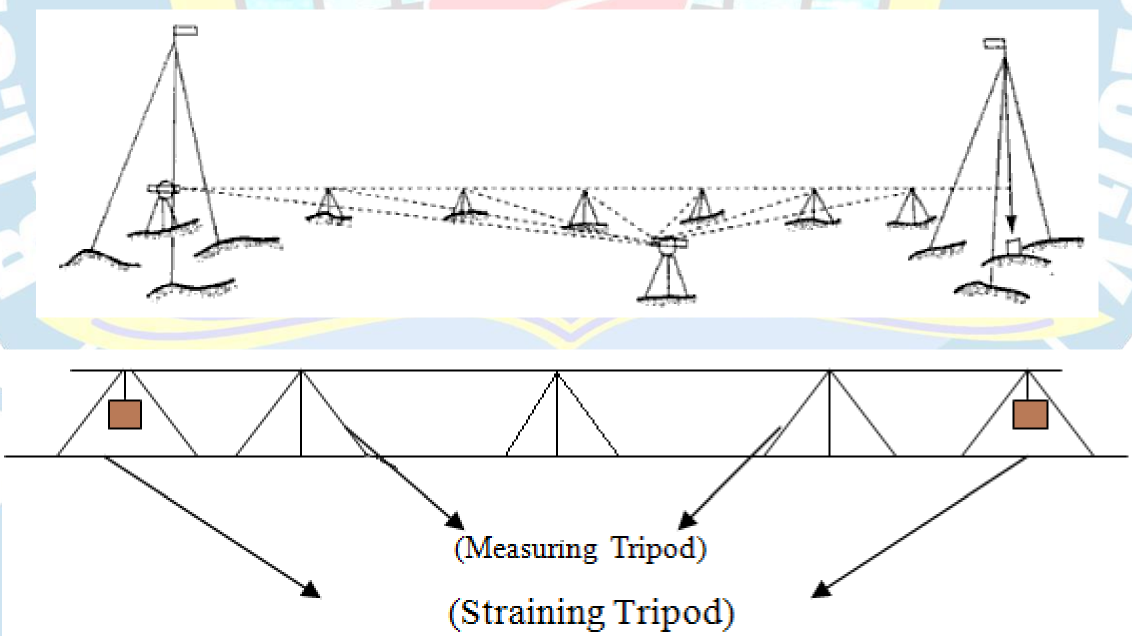


Figure: Jaderin's method of base line measurement

PROCEDURE:

- A plumb bob is suspended on one of the two stations.

- At another station, a theodolite is set up through centering and leveling to provide a line ofsight.
- Supporting tripods are placed at equal interval along the established line of sight through ranging. The spacing between supporting tripods can vary from 5m to the full tape length depending upon the length of base line.
- Another theodolite is placed somewhere in the field and is used to keep the heads of supporting tripod at the same level or the RL of the heads are determined. This is generally used for required slope correction for the tape.
- One end of steel tape is placed at one stations/supporting tripod and the other end of thetape is placed at another supporting tripod/station.
- A pull of 8kg is applied to the steel tapes with the help of spring balance and length of tapesis measured.
- Simultaneously, the temperature of the tape is also noted down using thermometers.
- The distances between two consecutive supporting tripods are measured.
- The total length of base line is obtained by adding the individual length measure betweenthe tripods and the distance between first and last tripods from the stations.
- The exact length of the base line is obtained by applying the necessary tapes corrections.

CORRECTION:

Following tape correction have to be applied to measured length to get the correct length of baseline

1) Correction for absolute length (C_a)

C_a=L.c/l

L = Measured length, C= Correction for tape, L= designed for tape, Cn & C have same sign.

2) Connection for temperature (Ct)

Ct= α (Tm-To) l

α = coefficient of thermal expansion, Tm= mean temperature in the field during measurement, To=mean temperature during standardization of tape.

3) Connection for tension or pull (Cp):

Cp= $(P-P_o)$ L/AE

P= Pull applied during measurement, Po= standard pull, A= Cross-section area of tape, E= young's modulus of elasticity (N/cm^2).

4) Connection for sag (Cs):

$Cs = Lw^2/24\ P^2$

Cs= tape correction per tape length

w= is the weight of the tape per unit length; kilogram per meters; L = the length between two tripods; meters; P = tension or pull applied to the tape; kilogram

5) Connection for slope (C_{sl}):.

$C_{sl} = - h^2/ 2L$

h= difference in elevation between two consecutive tripods, L = distance or length of uniform slope.

Sometimes another correction i.e. reduction to mean sea level, is also applied for all geodetic observation.

RESULTS:

The length of the base line after correction was found to be ………………..

PRECAUTIONS:

- The site should be fairly level.
- There should be no obstruction throughout the length.
- The extremities of base should be inter-visible.
- The tape should not be tearing off.

EXPERIMENT NO – 6

Aim: - **Setting out simple circular curves by deflection angle method.**

APPARATUS: Chain, tapes, arrows, ranging rod

THEORY:

This is the best method for setting out a long curve by linear method and is usually employed for highway curves when a theodolite in not available. This method has the advantage that not all the land between T1 and T2 need to be accessible. However, to have reasonable accuracy the length of the chord chosen should not exceed R/20. The method has a drawback that error in locating is carried forward to other points. The method is based on the premise that for small chords, the chord length is small and approximately equal to the arc length

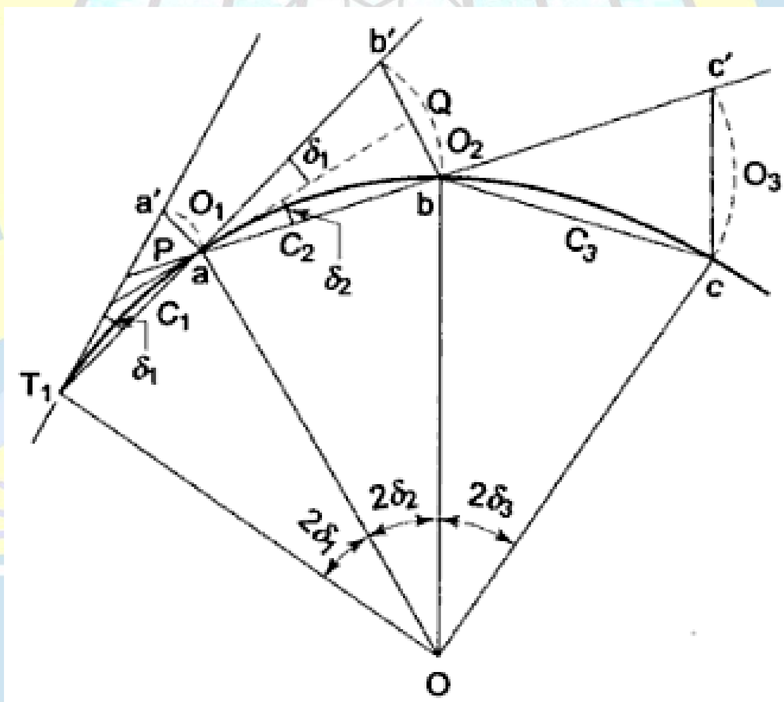


Figure: Offset from the chord produced

CALCULATION:

The length of the tangents (T_1I or T_2I) can be computed using following relation:

$IT_1 = IT_2 \quad = R \tan(\Delta/2)$ .... (1)

The length of first chord (c_1), which is a subchord, can be obtained by substracting thechange of T_1 from the next full chain station

The offset for the first subchord (O_1) can be computed asO_1 =

$(c_1)^2 /2R$ ....(1)

The subsequent chords (2nd to n-1) are all full chords (correspond to full chain either 20 m or 30 m). The total number of full chords required is determined by caluculating thelegth of the curve and by dividing it by length of chain.

Curve length = $\pi R\Delta/180$… .... (2)

The length of offset for all full chords (2nd onwards) can be computed asO_n =

$C_n (C_{n-1} + C_n)/2R = C^2/R$ .... (3)

The final chord may be sub-chord and its length (c_2) can be determined as the remainder left from the curve length after obtaining possible number of full chords. The offset forthe final subchord can be determined as

$O_2 = c_2 (C_n + c_2)/2R$

FIELD PROCEDURE:

- Before setting out the curve in the field, locate the point of intersection, PI
- With the help of a theodolite or plane tabling determine the deflection angle, Δ.
- Determine the length of $IT_1 = IT_2 = R \tan(\Delta/2)$
- Locate the point T_1 (P.C) and T_2 (P.T.) by subtracting and adding the length of thetangent, respectively, to the chainage of I.
- Calculate the length of the initial sub-chord so that the first peg is a full station.
- Calculate the length of the curve and find the length of the last sub-chord.
- Calculate all the offsets from O_1 to O_n.
- Put the zero mark of the chain (or tape) along the tangent T_1I, take a length T_1a' (length of first sub-chord) and swing the chain such that the arc a' a= O_1. The first point ***a*** on thecurve is thus fixed.
- Pull the chain along T_1a produced to the point b', so that ab' = C_2 (normal chord). Put the zero end of the chain at ***a***, and swing the chain with radius ab' (C_2). Cut off b' equal to second offset O_2. The second point ***b*** is thus fixed.

- Pull the chain along ab to the point c' till, as discussed in step 6, the point of tangency T_2 isreached.

RESULTS:

By offsets from chord produced method a simple circular curve was plotted on the ground.

PRECAUTION:

- The last point obtained on the curve using offset from the chord produced must coincide with T_2.
- If last point does not coincide with T_2 and the closing error is more (> 2 m), the curve is required toreset.
- If the closing error is less, it should be distributed among all the points by shifting them by an amountproportional to the square of the distance from the P.C., T_1.

EXPERIMENT NO - 7

Aim: - Study the various parts of a total station.

RESOURCES:

Sl.No.	Name of the equipment	Range		Quantity
1	Total station			1
2	Prism			1
3	Tripod			1
4	Pegs			

PERCAUTIONS

- Temporary adjustment for total station
- Leveling and centering
- Focusing adjustment

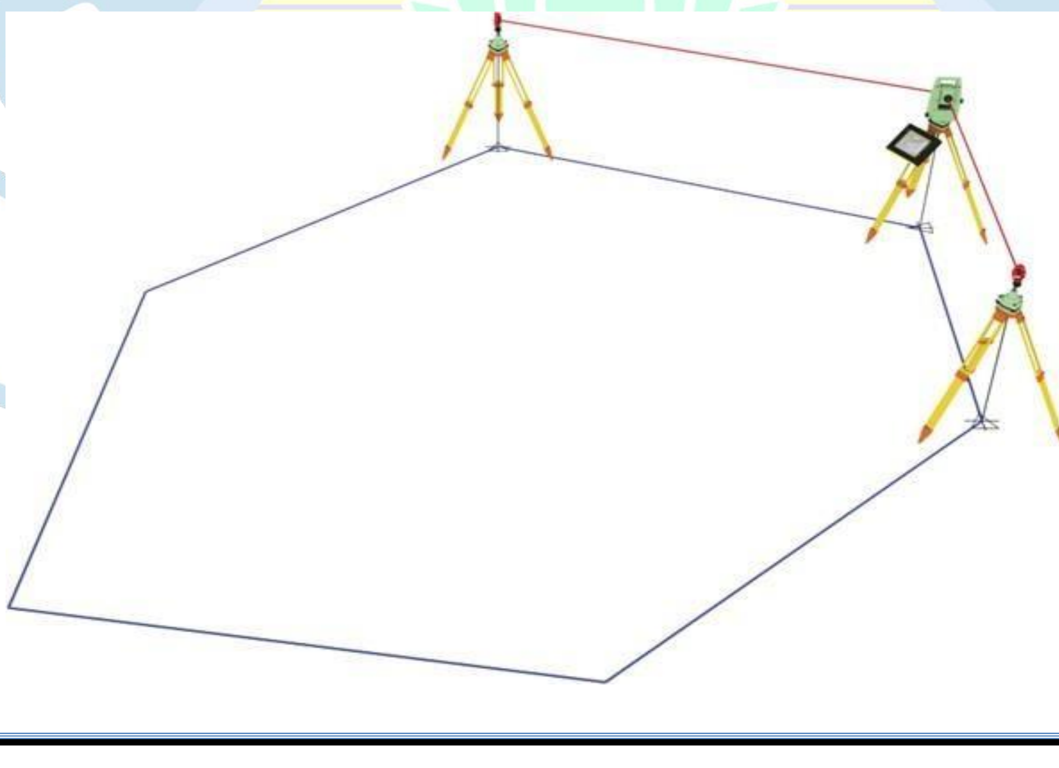
PROCEDURE

- Fix the total station over a station and level it
- Press the power button to switch on the instrument.
- Select MODE B -------> S function------->file management------>create(enter a name)------->accept
- Then press ESC to go to the starting page
- Then set zero by double clicking on 0 set(F3)
- Then go to S function ------> measure-----> rectangular co-ordinate---->station >press enter.
- Here enter the point number or name, instrument height and prism code.

PN ....
E...
N...

- Then press accept (Fs)
- Keep the reflecting prism on the first point and turn the total station to the prism, focus it and bisect it exactly using horizontal and vertical clamps.
- Then select MEAS and the display panel will show the point specification
- Now select edit and re-enter the point number or name point code and enter the prism height thatwe have set.
- Then press MEAS/SAVE (F3) so that the measurement to the first point will automatically be saved and the display panel will show the second point.
- Then turn the total station to second point and do the same procedure.
- Repeat the steps to the rest of the stations and close the traverse
- Now go to S function----> view/edit graphical view.
- It will show the graphical view of the traverse.
- Select S function---> calculation---> 2D surface----> All > accept
- This will give the area of the closed traverse.

DIAGRAM:



Calculation :

Select S function---> calculation---> 2D surface----> All > accept

RESULTS

Select S function---> calculation---> 2D surface----> All > accept

This will give the area of the. Area of the is calculated.

PRE LAB QUESTIONS:

What is the temporary adjustment for total station?
What is the instrument used for ranging

EXPERIMENT NO – 8

Aim: - **Measurements of distance, elevation, coordinate with total station.**

OBJECTIVE:

To find the Distance, gradient, diff, height between two inaccessible points using Total Station.

RESOURCES:

S.no	Name of the equipment	Rage	Type	Quantity
1	Total station			1
2	Prism			1
3	Tripod			1
4	Pegs			

PERCAUTIONS

Temporary adjustment for total stationLeveling and centering
Focusing adjustment

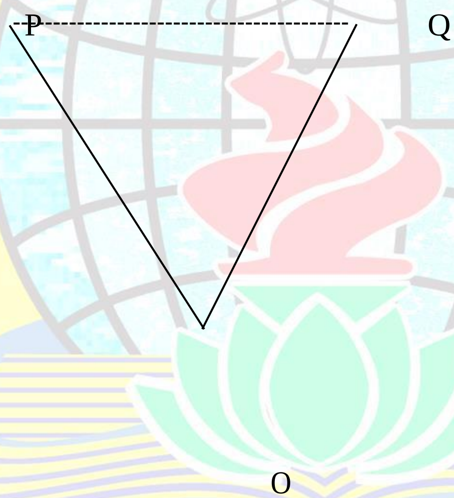
PROCEDURE

- Fix the total station over a station “O” and level it
- Press the power button to switch on the instrument.
- Select MODE B -------> S function------->file management------>create(enter a name)-------
- >accept
- Press ESC to go to the starting page
- Then set zero by double clicking on 0 set (F3)
- Then go to S function ------> measure-----> rectangular co-ordinate---->station ----- >press

enter.

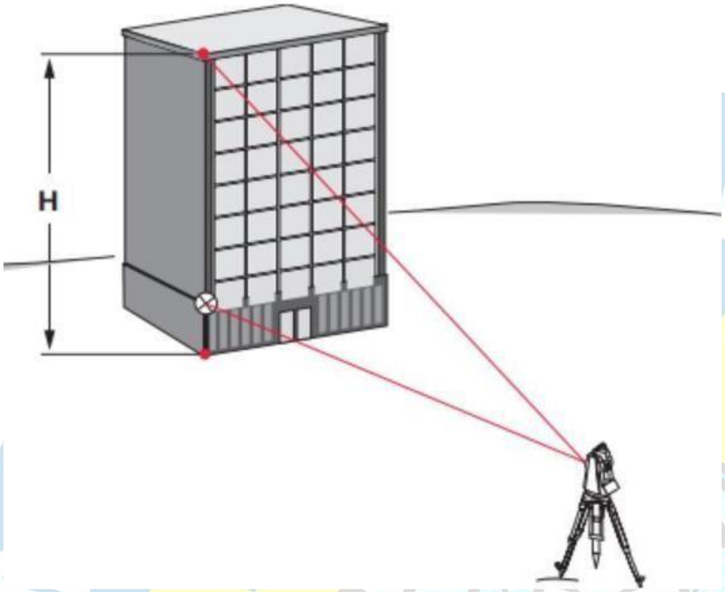
- Here enter the point number or name, instrument height and prism code.

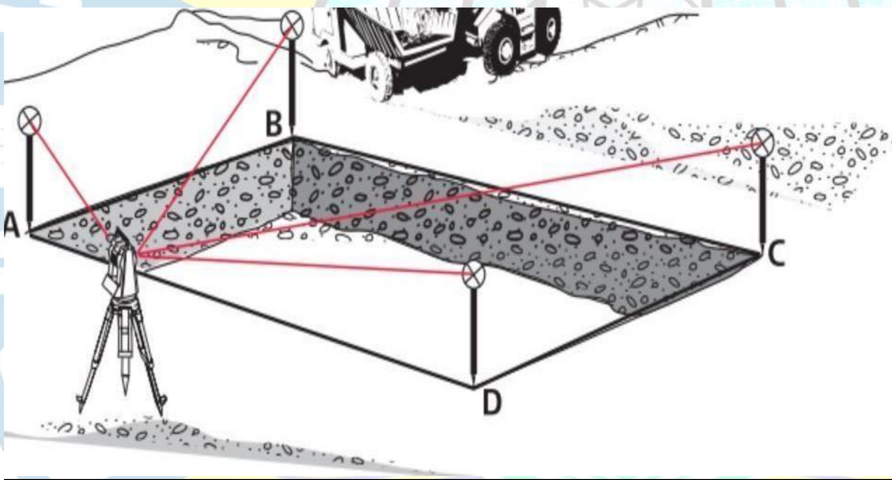
- Select two inaccessible points “P” and “Q” between which the distance, difference in heightand gradient is to be measured.
- Position a reflector pole on point “P” and enter the instrument height i and the target height t1(prism).
- Target the center of the prism and measure the distance.
- Rotate the total station towards the other point “Q”, measure the distance between totalstation and point, measure the horizontal angle between two station points.
- Enter the target height t2 (prism) for second point.



$$\text{Gradient of line PQ} = \frac{\text{Level difference between P and Q}}{\text{Horizontal distance PQ}}$$

DIAGRAM:





Calculation :

Select S function---> calculation---> 2D surface----> All------> accept

RESULTS

Select S function---> calculation---> 2D surface----> All------> accept

Distance, gradient, diff, height between two inaccessible points using Total Station is calculated.

PRE LAB QUESTIONS:

What is the temporary adjustment for total station?

What is the instrument used for ranging

How to find out the Height of the Tower by using Total Station

LAB ASSGNMENT

To find a specific point in the field using Total Station

POST LAB QUESTIONS:

Distance, gradient, diff, height between two inaccessible points using Total Station is calculated.

1. Total station operations
2. What is the advantage of stake point
3. Commends for linear measurement

EXPERIMENT NO – 9

Object:- **• Special problems with total station.**

OBJECTIVE: Counter plan of given area (One full size drawing sheet) using total station.

RESOURCES:

Sl.No.	Name of the equipment	Rage	Type	Quantity
1	Total station			1
2	Prism			1
3	Tripod			1
4	Pegs			

PERCAUTIONS

Temporary adjustment for total station
Leveling and centering
Focusing adjustment

PROCEDURE

The elevation and depression and the undulations of the surface of the ground are shown as map by interaction of level surface with by means of contour line. A contour may be defined as the line of intersection of a level surface with the surface of the ground.

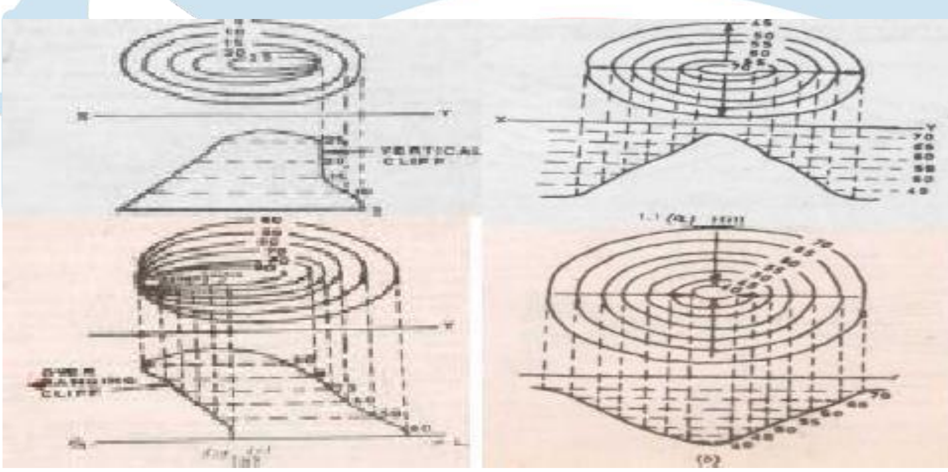
- Fix the total station over a station and level it
- Press the power button to switch on the instrument.

Select MODE B -------> S function------->file management------>create (enter a name)------->accept

- Then press ESC to go to the starting page
- Then set zero by double clicking on 0 set (F3)
- Then go to S function ------> measure-----> rectangular co-ordinate---->station ->press enter.
- Here enter the point number or name, instrument height and prism code.

- Then press accept (Fs)
- Adopt Cross section method for establishing the major grid around the study area.
- Project suitably spaced cross sections on either side of the centre line of the area.
- Choose several points at reasonable distances on either side.
- Keep the reflecting prism on the first point and turn the total station to the prism, focus it andbisect it exactly using horizontal and vertical clamps.
- Then select MEAS and the display panel will show the point specification
- Now select edit and re-enter the point number or name point code and enter the prism height thatwe have set.
- Then press MEAS/SAVE (F3) so that the measurement to the first point will automatically besaved and the display panel will show the second point.
- Then turn the total station to second point and do the same procedure.
- Repeat the steps to the rest of the stations and get all point details.
- Plot cross section lines to scale and enter spot levels.
- The points on the chosen contours are interpolated assuming uniform slope between adjacentpoints and join them by a smooth line.

DIAGRAM:



Calculation :

Select S function---> calculation---> 2D surface----> All -----> accept

RESULTS

Select S function---> calculation---> 2D surface----> All -----> accept

. The contour of given land is drawn in the sheet.

PRE LAB QUESTIONS:

a) What is the Counter Plan?

b) What is the temporary adjustment for total station?

c) What is the instrument used for ranging