Department Of Civil Engg

SURVEY FIELD WORK LAB MANUAL

(SCTE & VT, BPUT)

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DEPARTMENT OF CIVIL ENGINEERING

VISION OF THE DEPARTMENT:

To produce eminent, competitive and dedicated civil engineers by imparting latest technical skills and ethical values to empower the students to play a key role in the planning and execution of infrastructural & developmental activities of the nation.

MISSION OF THE DEPARTMENT:

To provide exceptional education in civil engineering through quality teaching, state-of- the-art facilities and dynamic guidance to produce civil engineering graduates, who are professionally excellent to face complex technical challenges with creativity, leadership, ethics and social consciousness.

DEPARTMENT OF CIVIL ENGINEERING

PROGRAMS: BACHELOR OF TECHNOLOGY (B. TECH)

DIPLOMA IN ENGINEERING

PROGRAM OUTCOMES

PO-1	**Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO-2	**Problem analysis:** Identify, formulate, review research literature, and analyse complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
PO-3	**Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
PO-4	**Conduct investigations of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
PO-5	**Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.
PO-6	**The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
PO-7	**Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
PO-8	**Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO-9	**Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO-10	**Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
PO-11	**Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
PO-12	**Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

DEPARTMENT OF CIVIL ENGINEERING

PROGRAMS: BACHELOR OF TECHNOLOGY (B. TECH)

DIPLOMA IN ENGINEERING

The Program Specific outcomes (PSO‟s) listed below were developed specifically to meet the Program Educational Objectives (PEO‟s). The focus of these PSO's is consistent with the set of required POs' identified in the NBA accreditation guidelines.

The Civil Engineering PSO's requires that graduates receiving a Bachelor of Technology in Civil Engineering degree from PKAGI demonstrate the following.

PROGRAM SPECIFIC OUTCOMES	
PSO-1	**ENGINEERING KNOWLEDGE**: Graduates shall demonstrate sound knowledge in analysis, design, laboratory investigations and construction aspects of civil engineering infrastructure, along with good foundation in mathematics, basic sciences and technical communication
PSO-2	**BROADNESS AND DIVERSITY:** Graduates will have a broad understanding of economic, environmental, societal, health and safety factors involved in infrastructural development, and shall demonstrate ability to function within multidisciplinary teams with competence in modern tool usage.
PSO-3	**SELF-LEARNING AND SERVICE:** Graduates will be motivated for continuous self-learning in engineering practice and/or pursue research in advanced areas of civil engineering in order to offer engineering services to the society, ethically and responsibly.

SYLLABUS

EXPT-1	CHAIN TRAVERSAL
EXPT-2	CLOSED TRAVERSING BY PRISMATICS COMPASS
EXPT-3	FLY LEVELLING USING DUMPY LEVEL
EXPT-4	LONGITUDNAL AND CROSS-SECTIONAL PLOTTING BY LEVELLING
EXPT-5	CONTOUR PLAN OF A GIVEN AREA
EXPT-6	MEASUREMENT OF DISTANCE, VERTICAL AND HORIZONTAL ANGLES
EXPT-7	TRAVERSAL BY THEODOLITE
EXPT-8	MEASUREMENT OF HORIZONTAL AND VERTICAL ANGLES BY TOTAL STATION
EXPT-9	CONTOURING BY TOTAL STATION

ATTAINMENT OF PROGRAM OUTCOMES (PO's) & PROGRAM SPECIFIC OUTCOMES

EXP NO.	NAME OF THE EXPERIMENT	PO's	PSO's
EXPT-1	CHAIN TRAVERSAL	1,5,9	1,2
EXPT-2	CLOSED TRAVERSING BY PRISMATICS COMPASS	1,5,9	1,2
EXPT-3	FLY LEVELLING USING DUMPY LEVEL	1,5,9	1,2
EXPT-4	LONGITUDNAL AND CROSS-SECTIONAL PLOTTING BY LEVELLING	1,5,9	1,2
EXPT-5	CONTOUR PLAN OF A GIVEN AREA	1,5,9	1,2
EXPT-6	MEASUREMENT OF DISTANCE, VERTICAL AND HORIZONTAL ANGLES	1,5,9	1,2
EXPT-7	TRAVERSAL BY THEODOLITE	1,3,4,6,9,10	1,2
EXPT-8	MEASUREMENT OF HORIZONTAL AND VERTICAL ANGLES BY TOTAL STATION	1,3,4,6,9,10	1,2,3
EXPT-9	CONTOURING BY TOTAL STATION	1,3,4,6,9,10	1,2

TABLE OF CONTENT

Experiment No: 1

SURVEY OF AN AREA BY CHAIN SURVEY (CLOSED TRAVERSE)

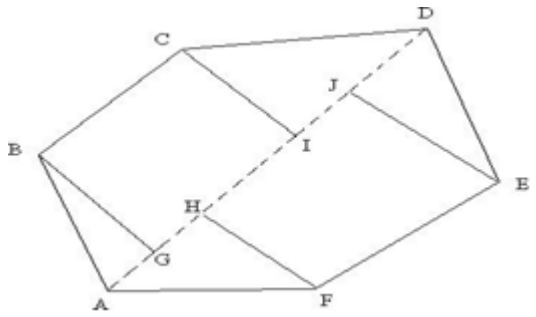
OBJECTIVE:

To survey an open field by chain survey in order to calculate an area of the field

RESOURCES:

S. No.	Name of the Equipment	Type	Range	Quantity
1	Chain	Metric chain	20m or 30m	1
2	Tape	Linen Tape	20m	1
3	Ranging Rods		3m or 2m	5
4	Arrows			5
5	Cross Staff			1

FIGURE:



Survey of an Open Field (Closed Traverse)

PROCEDURE:

Ranging a line:

It is the process of establishing a number of intermediate points on a survey line joining two stations in the field, so that all the points on the line are in alignment and the length between stations may be measured accurately.

Two ranging rods are erected vertically at the end stations by two surveyors who are standing behind ranging rods. One of the surveyors from one of the end stations directs the assistant to hold the ranging rod vertically to establish an intermediate point and move the rod either to the left or right until the ranging rod is in alignment with the end stations. Finally, when the ranging is correct, the assistant is directed to fix the ranging rod at that point.

Taking offsets:

The perpendicular distance measured right or left of the chain line to locate the details like corners, boundaries, culverts, etc is known as offset.

Offsets can be taken by two ways: 1. By Tape and 2. By Cross-Staff.

By Tape:

The leader holds the zero end of the tape at the point where the offset is to be taken and the follower swings off the tape in an arc across the chain line to left and right. The minimum reading of tape on the chain line gives the position of the foot of the perpendicular from the required point.

By Cross-Staff:

The Cross-Staff is held vertically on the chain line approximately near the point where the offset is likely to fall. The Cross-Staff is turned until the signal at one end of the chain line is viewed through one pair of slits. The surveyor then takes a round and views through the other pair of silts. If the point to which the offset is to be taken is seen, the point below the instrument is the required foot of the offset. On the other hand, if the point is not seen, the surveyor moves along the chain line, without twisting the Cross-Staff, till the point appears.

Procedure for surveying the given open field (Closed Traverse):

I. ABCDEF is the required closed traverse open field to be surveyed for calculating the area as shown in Fig 1. 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.
II. 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, H respectively.
III. All the offset lengths GB, HF, IC and JE are measured either by chain or tape depending on the length of offsets. The distances between all the points AG, GH, HI, IJ and JD are also measured along the chain line.

AREA CALCULATIONS:

Area No.	Base (m)	Height (m)	Area (m^2)

RESULT:

The total Area of the given Open Field by Chain Survey = ...sqm

Experiment No: 2

SURVEYING OF A GIVEN AREA BY PRISMATIC COMPASS (CLOSED TRAVERSE)

OBJECTIVE:

To survey an area (Closed Traverse) by Compass Survey and to plot the area after adjustment

RESOURCES:

S. No.	Name of the Equipment	Type	Range	Quantity
1	Tape	Linen Tape	20m	1
2	Ranging Rods		3m or 2m height	3
3	Arrows			5
4	Compass	Prismatic		1
5	Tripod	Compass Tripod		1

FIGURE:

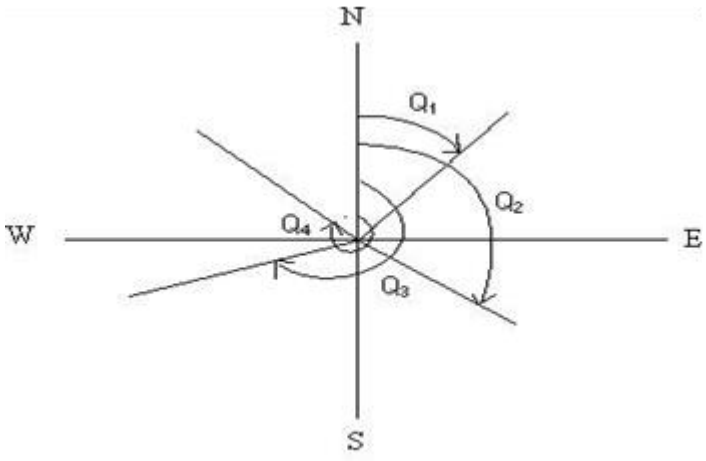


Fig 1

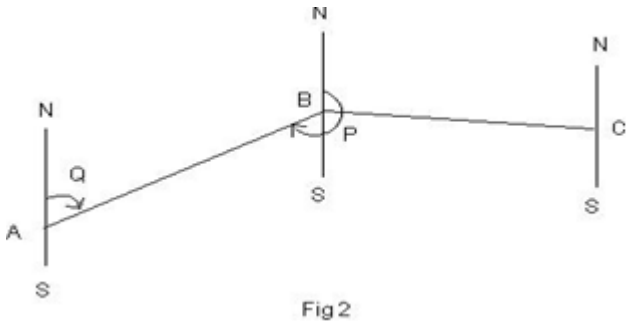


Fig 2

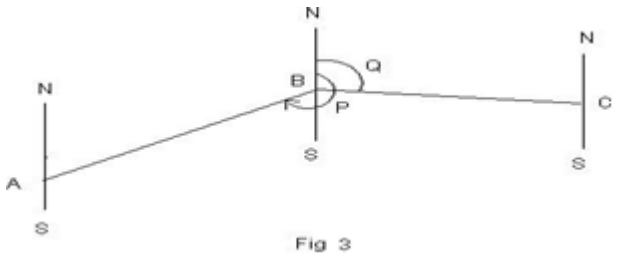


Fig 3

PROCEDURE:

Whole Circle Bearing (WCB):

The bearing of line that is always measured clockwise from the north point of the reference meridian towards the line right round the circle is known as Whole Circle Bearing (WCB). WCB will have values between 0^0 and 360^0. Q_1, Q_2, Q_3, etc in Fig 1 represent WCBs.

Fore or Forward Bearing (FB) (WCB System):

The bearing of line in the direction of progress of the survey is called Fore or Forward Bearing.

Back or Reverse Bearing (BB) (WCB System):

The bearing of a line in the opposite direction of progress of the survey is known as Back or Reverse Bearing.

The bearing of a line is indicated in the order in which the line is lettered. Thus, the bearing from A to B (Fig 2) is the fore bearing Q of the line AB, whereas the bearing of line AB in the direction B to A is its back-bearing P.

Calculation of Included Angles from Fore Bearing and Back Bearing:

Included angle is an angle between two lines. Included angles may be exterior or interior.

Included angle between two lines is obtained by the following formula,

Included Angle = Fore Bearing of Next Line – Back Bearing of previous Line

In Fig 3 the included angle between line AB and line BC is,

= FB of line BC – BB of line AB

If the calculated included angle comes out as a negative value, 360^0 is added to it.

Since traversing in this case is done in clockwise direction, the included angles will be exterior only.

Taking Fore Bearing and Back Bearing of a line with Prismatic Compass:

While taking Fore Bearing of a line, the compass is kept over the starting point of line while running from clockwise direction in the traverse. The line of sight is kept along N – S direction such that the bearing under the prism should read 00. Now the compass is turned in clockwise direction only until the line of sight coincides with the ranging rod placed at the end point of line. While taking Back Bearing of a line, the compass is shifted to the end point of line and same procedure is followed as it is followed while taking Fore Bearing. The Fore Bearing and Back Bearing of all lines of closed traverse (Fig 4) are measured by a Prismatic Compass. The distances of all lines of closed traverse are measured with a chain. All the values are tabulated as below.

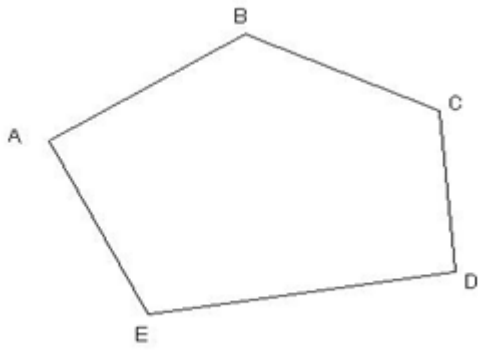


Fig 4

Theoretical sum of included angles can be calculated by,

$$(2n + 4) \times 90^0$$

Where n=Number of sides of closed traverse.

The Error in the actual included angles can be calculated by,

Error = (Theoretical Sum of Included Angles – Total Actual Included Angles) / n

Where n= Number of sides of closed traverse.

If the Error is positive, add this error to each actual included angle and if the Error is negative, deduct this error from each actual included angle.

Therefore,

Corrected Included Angle =

Actual Included Angle + Error, if positive.

Actual Included Angle – Error, if negative.

Calculation of internal included angles:

Internal Included Angle between two lines can be calculated by,

Internal Included Angle = 360^0 – External Included Angle

CALCULATIONS:

LINE	OBSERVED BEARING		DIFFERENCE (FB-BB)	INCLUDED ANGLE	THEORITICAL SUM OF INCLUDED ANGLE	ERROR	CORRECTED INCLUDED ANGLE	DISTANCE	REMARKS
	FB	BB							
AB									
BC									
CD									
DE									
EA									
TOTAL									

RESULT:

Distances:

AB =_____m

BC =_____m

CD =_____m

DE =_____m

EA =_____m

Included Angles:

Angle A =

Angle B =

Angle C =

Angle D =

Angle E =

Experiment No: 3

FLY LEVELLING USING DUMPY LEVEL

OBJECTIVE:

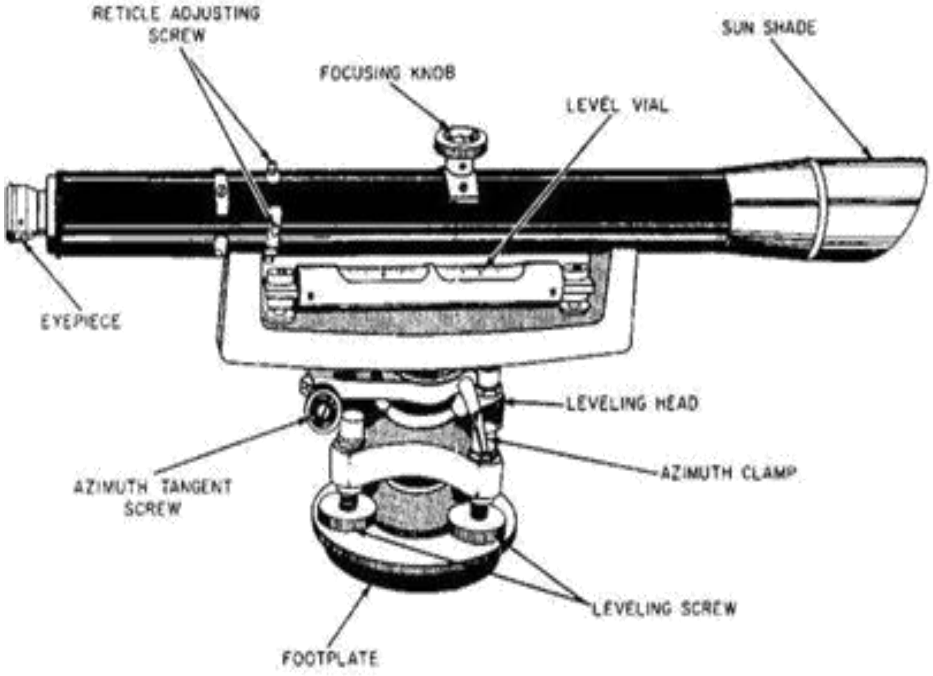
To ascertain the difference of elevation between any two points.

RESOURCES:

S. No.	Name of the Equipment	Type	Range	Quantity
1	Dumpy level			1
2	Ranging Rods		3m or 2m height	3
3	Arrows			5
4	levelling staff	Folding	4m	1
5	Tripod	Dumpy level Tripod		1

FIGURE:

A dumpy level, builder's auto level, levelling instrument, or automatic level is an optical instrument used to establish or check points in the same horizontal plane. It is used in surveying and building with a vertical staff to measure height differences and so transfer, measure and set heights. A Dumpy level is shown in figure below.



PROCEDURE:

1. Differential levelling is the method of direct levelling the object of which is .To determine Difference in elevations of two points regardless of horizontal position of point with respect to each Other, when points are apart it may be necessary to setup the instrument several times. This type of Levelling is also known as “FLY LEVELLING”.

2. Instrument level is setup at convenient positions near first point (say A).

3. Temporary adjustments should be done, (setting up, levelling up, elimination of a par-allot) are Performed.

4. First sight of B.M (point of known elevation) is taken and reading is entered in back Sight column.

5. If distance is large instrument is shifted, the instrument becomes turning point (or) changing point.

6. After setting up instrument at new position, performing temporary adjustment and Take back sight as turning point.

7. Thus, turning point will have both back sight and fore sight readings.

8. Link wise the process is repeated till last point (say B) is reached.

9. Readings are entered in a tabular form is given Below and Reduced levels are calculated either by height of instrument method (or) rise and fall method.

CALCULATIONS:

STATION POINT	BACK SIGHT	INTERMIDEATE SIGHT	FORESIGHT	HEIGHT OF INSTRUMENT	REDUCED LEVEL	REMARKS

ARITHMETIC CHECK: - Σ B.S - ΣF. S= ΣRISE - ΣFALL= LAST RL - FIRST R.L

RESULT:

Difference Between points =_____m.

PRECAUTIONS:

1. Staff must be vertical while taking reading.
2. Levelling must be done carefully.
3. Readings must be taken with full accuracy
4. Temporary adjustments must be done carefully.

Experiment No: 4

LONGITUDNAL AND CROSS SECTIIONAL PLOTTING BY DUMPY LEVEL

OBJECTIVE:

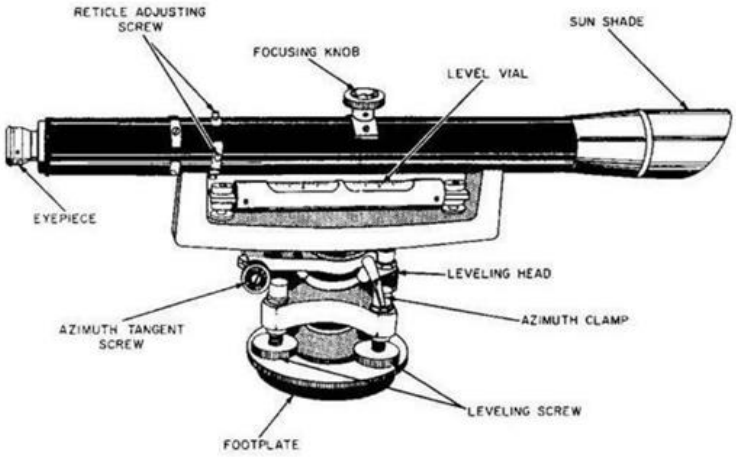
Determining the elevation at various points on ground at regular interval

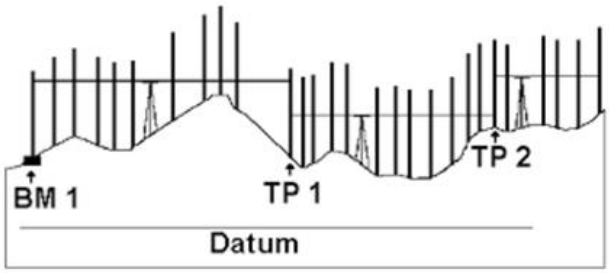
RESOURCES:

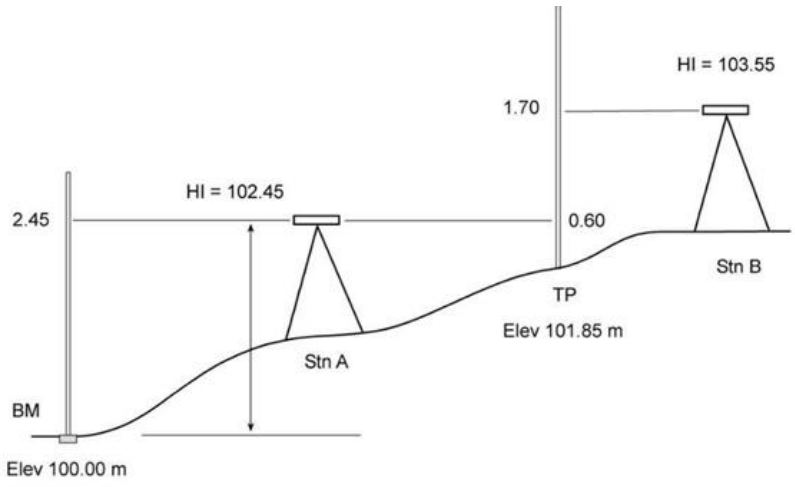
S. No.	Name of the Equipment	Type	Range	Quantity
1	Dumpy level			1
2	Ranging Rods		3m or 2m height	3
3	Arrows			5
4	levelling staff	Folding	4m	1
5	Tripod	Dumpy level Tripod		1

FIGURE:

A dumpy level, builder's auto level, levelling instrument, or automatic level is an optical instrument used to establish or check points in the same horizontal plane. It is used in surveying and building with a vertical staff to measure height differences and so transfer, measure and set heights. A Dumpy level is shown in figure below.


RETICLE ADJUSTING SCREW
FOCUSING KNOB
LEVEL VIAL
SUN SHADE
EYEPIECE
LEVELING HEAD
AZIMUTH TANGENT SCREW
AZIMUTH CLAMP
LEVELING SCREW
FOOTPLATE


BM 1
TP 1
TP 2
Datum


HI = 103.55
1.70
HI = 102.45
2.45
0.60
Stn B
TP
Elev 101.85 m
Stn A
BM
Elev 100.00 m

PROCEDURE:

1. Profile levelling is a method of surveying that has been carried out along the central line of a track of land on which a linear engineering work is to be constructed/ laid. The operations involved in determining the elevation of ground surface at small spatial interval along a line is called profile levelling.

2. Divide the proposed centre line of a given work at regular intervals.

3. Fix the level and do station adjustments.

4. Take Back Sight on Bench Mark.

5. Take Intermediate Sight on intermediate points.

6. Take Fore Sight on Change points and End point.

7. Record the values in field book in respective columns

CALCULATIONS:

ST NO.	LEFT	CENTER	RIGHT	BS	IS	FS	HI	RL	REMARKS

ARITHMETIC CHECK: -

Σ B.S – ΣF. S = Last R.L – First R.L.

RESULT:

The longitudinal and cross-sectional profile of a given area is plotted on graph.

Experiment No: 5

CONTOUR PLAN OF A GIVEN AREA

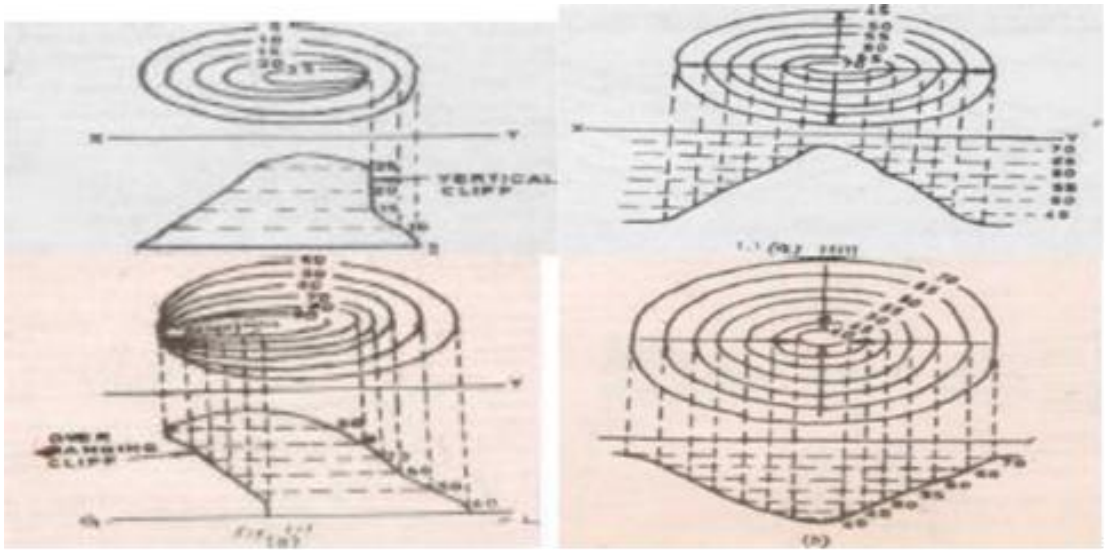
OBJECTIVE:

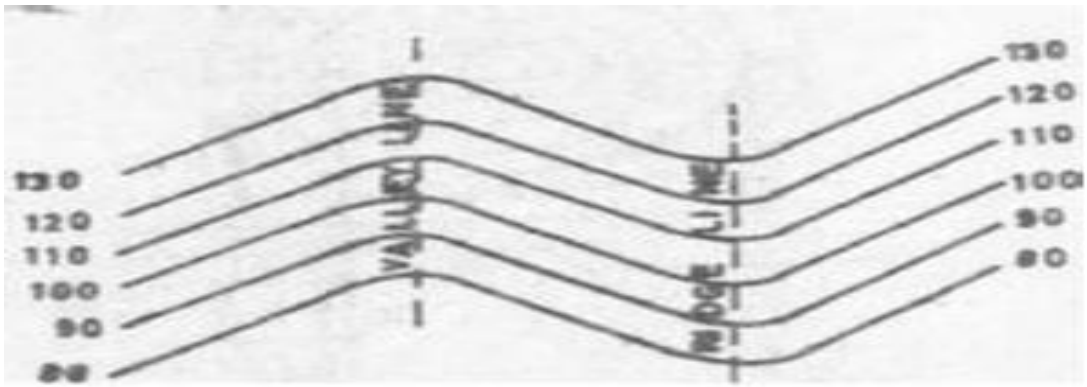
Contour plan of given area (One full size drawing sheet).

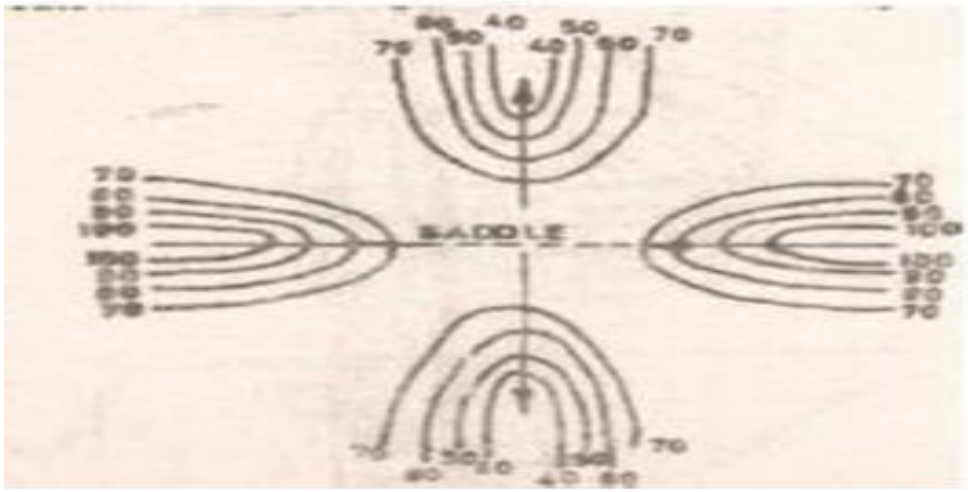
RESOURCES:

S. No.	Name of the Equipment	Type	Range	Quantity
1	Dumpy level			1
2	Ranging Rods		3m or 2m height	3
3	Arrows			5
4	levelling staff	Folding	4m	1
5	Tripod	Dumpy level		1
6	prismatic compass			1
7	chain		20m	1
8	Tape		20m	1

FIGURE:


VERTICAL CLIFF
OVER HANGING CLIFF


VALLEY
RIDGE
130
120
110
100
90
80


SADDLE

PROCEDURE:

Cross-section method: This method is commonly used in rough survey, cross sections are run traverse to the contour line of road, and railway as canal and the point of change of slope (representations) are located. The cross-section line may be inclined at any angle to the centreline if necessary. The spacing of the cross sections depends upon the characteristics of the ground. By interpolation of contour is meant the process of spacing the contour proportioning between the plotted ground points. Contour may be interpolated by

1. Estimation
2. Arithmetical calculations
3. Graphical method.

In all these methods it is assumed that the slope of the ground between any two random points is uniform.

RESULT:

The contour of given land is drawn in the sheet.

Experiment No: 6

MEASUREMENTS BY THEODOLITE

OBJECTIVE:

Measurement of measurement of horizontal and vertical angles by theodolite.

RESOURCES:

S. No.	Name of the Equipment	Type	Range	Quantity
1	Theodolite	Transit		1
2	Tape	Linen Tape	20m	1
3	Ranging Rods		3m or 2m	5
4	Arrows			5

PROCEDURE:

Measurement of horizontal angles:

By Reiteration Method:

Reiteration is a method of measuring horizontal angles with high precision. It is less tedious and is generally preferred when there are several angles to be measured at a station. Several angles are measured successively and finally the horizon is closed. Closing the horizon is the process of measuring the angles around a point to obtain a check on their sum which should be equal to 360^0.

I. Select a station point O.

II. Set the theodolite at O and do the temporary adjustments. The telescope is adjusted for right face right swing.

III. Set the Vernier A to zero using upper clamp. Loosen the lower clamp, direct the telescope to the station point A and bisect A exactly by using the lower clamp and lower tangent screw.

IV. Note the Vernier readings (A and B).

V. Loosen the upper clamp and turn the telescope clockwise until the point B is exactly bisected.

VI. Note the Vernier readings (A and B).

VII. The mean of the two Vernier readings gives the value of <AOB.

VIII. Bisect all the points successively and note the readings of both Vernier's at each bisection.

IX. Finally close the horizon by sighting the station point A. The 'A 'Vernier should be 3600. If not, note the closing error.

X. Adjust the telescope for left face left swing.

XI. Repeat the whole process by turning the telescope in anticlockwise direction.

XII. Distribute the closing error proportionately the several observed angles.

XIII. Take the average of face left and face right observations to give the corresponding horizontal angles.

Observation:

Face left Swing right						Face right swing left				
Instrument at	Sighted to	A	B	Mean	Horizontal Angle	A	B	Mean	Horizontal Angle	Average Horizontal Angle

By Repetition Method:

The method of repetition is used to measure a horizontal angle to a finer degree of accuracy. By this method, an angle is measured two or more times by allowing the Vernier to remain clamped each time at the end of each measurement instead of setting it back at zero when sighting at the previous station. Thus an angle reading is mechanically added several times depending upon the number of repetitions. The average horizontal angle is then obtained by dividing the final reading by the number of repetitions. For very accurate work the method of repetition is used.

I. Select a station point O.

II. Set the theodolite at O and do the temporary adjustments. The telescope is adjusted for right face right swing.

III. Set the Vernier A to zero using upper clamp. Loosen the lower clamp, direct the telescope to the station point A and bisect A exactly by using the lower clamp and lower tangent screw.

IV. Note the Vernier readings (A and B).

V. Loosen the upper clamp and turn the telescope clockwise until the point B is exactly bisected.

VI. Note the Vernier readings (A and B).

VII. The mean of the two Vernier readings gives the value of <AOB.

VIII. Loosen the lower clamp and turn the telescope to station point A and bisected A by using the lower clamp and lower tangent screw.

IX. Loosen the upper clamp and turn the telescope clockwise until the point B is exactly bisected. Now the Vernier reading is twice the value of the angle.

X. Repeat the process for the required number of times (usually 3).

XI. The correct value of the angle AOB is obtained by dividing the final reading by the number of repetitions.

XII. Adjust the telescope for left face left swing.

Observation:

Face left Swing right						Face right swing left				
Reading on the target	Sighted to the	A	B	Mean	Horizontal Angle	A	B	Mean	Horizontal Angle	Average Horizontal Angle

Measurement of vertical angle:

I. Set up the instrument over station O and level it carefully with respect to altitude bubble.

II. By means of vertical circle clamp and tangent screw, set 0 of the vertical circle exactly to 0 of the circle.

III. Bring the bubble of the altitude level to the centre of its run by means of foot &clip screw.

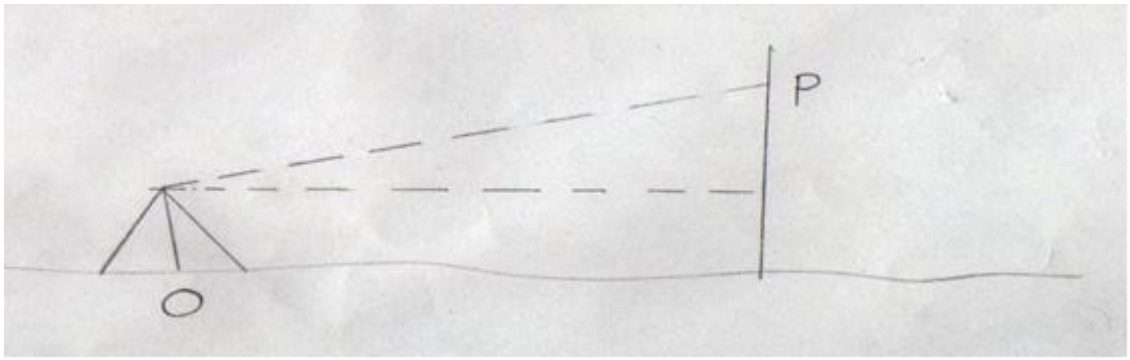
IV. The line of sight is thus made horizontal.

V. Loose the vertical circle clamp and direct the telescope in vertical plane towards the object P, and bisect exactly using vertical tangent screw.

VI. Read both the Vernier C and D, the mean of two readings gives angle for that face.

VII. Change the face and repeat the above process, and get the face reading.

VIII. The average of two face values gives exact value of required vertical angle



Observation Table:

Station	Object	Face	Reading		Reading		Mean Vernier A	Mean Vernier B	Mean Face angle
			Vernier A		Vernier B				
			Initial	Final	Initial	Final			

RESULT:

Plot the observed data into the record

Experiment No: 7

TRAVERSAL BY THEODOLITE

OBJECTIVE:

Plot a closed traverse forming a closed polygon using theodolite.

RESOURCES:

S. No.	Name of the Equipment	Type	Range	Quantity
1	Theodolite	Transit		1
2	Tape	Linen Tape	20m	1
3	Ranging Rods		3m or 2m	5
4	Arrows			5

PROCEDURE:

Methods for closed traverse

- Included angle method
- Fast angle (or magnetic bearing method)

Included Angle method:

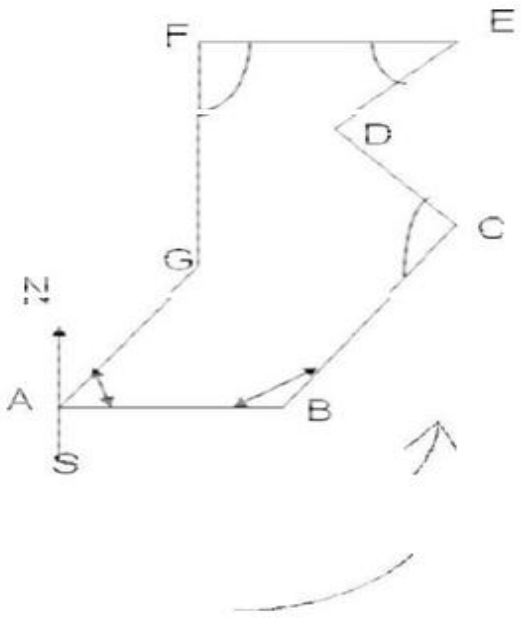
I. For running the traverse ABCDEFG Set up the theodolite at 1ST station A and observed the bearing of the line AB.

II. Then measure the angle GAB. Shift the instrument to each of the successive station B, C etc. and measure the angles ABC, BCD etc.

III. Measure the line AB, BC, CD etc. and take offset to locate the required detail after this check is applied for interiors angles it is (2n-4) x90^0,

IV. And for exterior angles it is (2n+4) x90^0

n = number of sides of the traverse



Magnetics Bearing Method:

I. Set up and level the theodolite at station P of the traverse PQRSTP, a closed traverse.

II. Using the upper clamp and upper tangent screw, set Vernier A to read zero.

III. Loosen the magnetic needle. Release the lower clamp and point the telescope in the direction of the magnetic meridian till the magnetic needle comes to rest at the zero-position using the lower tangent screw the north end of the magnetic needle to read exactly zero.

IV. Release the upper plate and swing the instrument to bisect the signal at Q. With the upper tangent screw, bisect the station mark exactly. Read Vernier A, this gives the bearing of the line PQ.

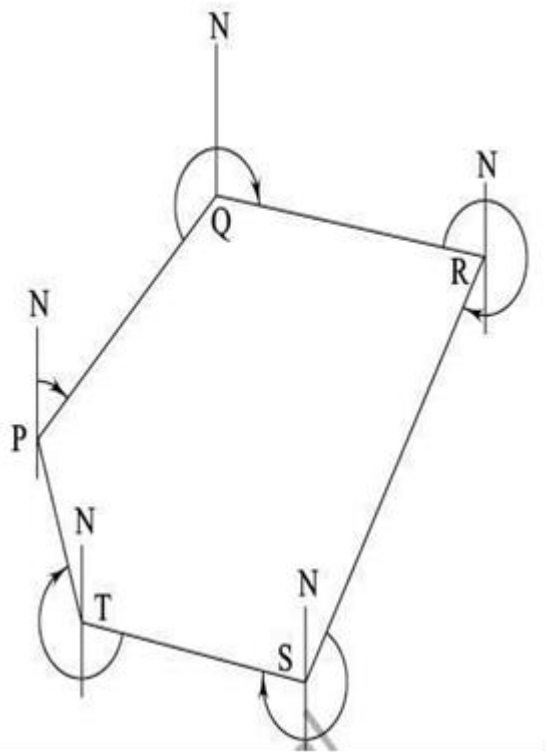
V. Keeping both the clamps tight, shift the instrument to Q. Set up and level the instrument.

VI. Check the reading on Vernier A. It should be the same as the magnetic

VII. bearing of the line PQ (if not, this can be corrected and the bearing value noted earlier be set on Vernier A).

VIII. Release the upper clamp. Swings the instrument clockwise to bisect the station mark at R. Using upper tangent screw bisect mark R exactly. Read the Vernier at A and note down the reading.

IX. With both clamps tight, shift the instrument to R and repeat the procedure. The work is continued at all stations in a similar manner.


N
N
Q
R
N
P
N
T
N
S

Observation Table Magnetic Bearing Method:

Inst Station	observation	Vernier		line	length	Bearing
		A	B			

Observation Table Included Angle Method:

INSRT ST	OBJECT	FACE	ANGLE	READING ON VERNIER		ANGLE ON VERNIER		MEAN ANGLE OF VERNIER	MEAN ANGLE OF OBSERVATIONS	LENGTH	WCB
				A	B	A	B				
A	E	L	A								
	B	R									
A	E	L	A								
	B	R									
B	A	L	B								
	C	R									
B	A	L	B								
	C	R									
C	B	L	C								
	D	R									
C	B	L	C								
	D	R									
D	C	L	D								
	E	R									
D	C	L	D								
	E	R									
E	D	L	E								
	A	R									
E	D	L	E								
	A	R									

Experiment No: 8

MEASUREMENTS USING TOTAL STATION

OBJECTIVE:

Measurement of distance, vertical and horizontal measurement using total station

RESOURCES:

S. No.	Name of the Equipment	Type	Range	Quantity
1	Total station			1
2	Prismatic Staff			1
3	Tripod	Total station tripod		1

TOTAL STATION

A total station is an electronic/optical instrument used in modern surveying.

The total station is an electronic theodolite (transit) integrated with an electronic distance meter (EDM) to read slope distances from the instrument to a particular point. It records all the data digitally and it used later to prepare survey map or plan. It is also used to set out the works.

PROCEDURE:

I. Fix the total station over a station “O” and level it

II. Press the power button to switch on the instrument.

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

IV. >accept

V. Press ESC to go to the starting page

VI. Then set zero by double clicking on 0 set (F3)

VII. Then go to S function ------> measure-----> rectangular co-ordinate---->station ---->press enter.

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

IX. Select two inaccessible points “P” and “Q” between which the distance, difference in height and gradient is to be measured.

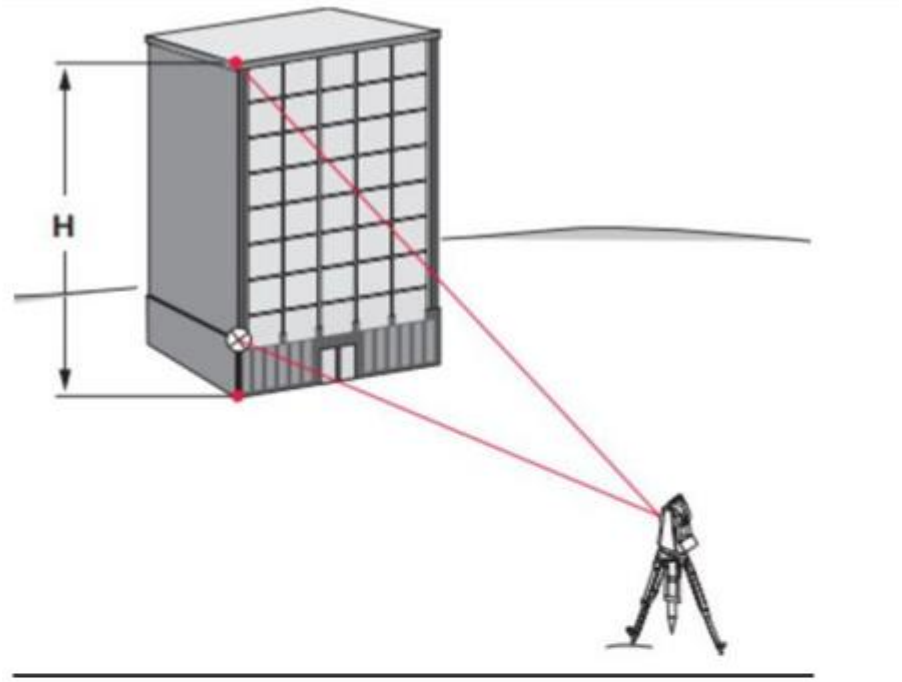
X. Position a reflector pole on point “P” and enter the instrument height i and the target height t1 (prism).

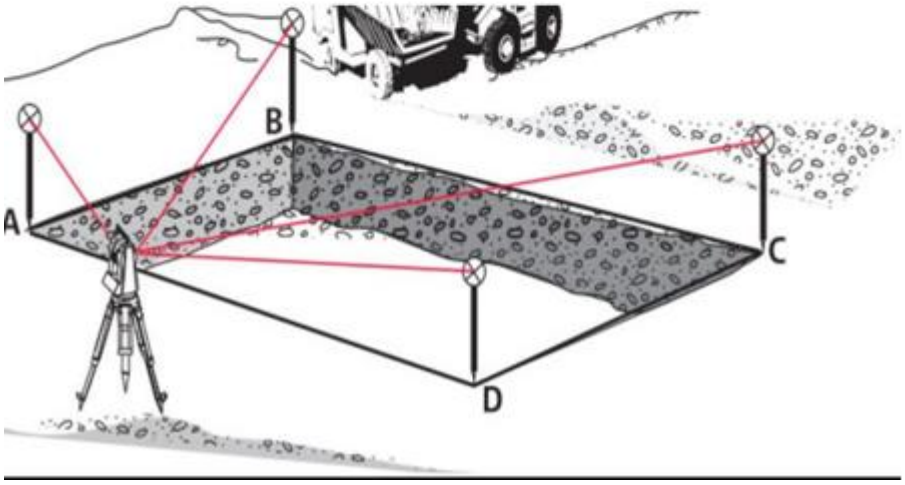
XI. Target the centre of the prism and measure the distance.

XII. Rotate the total station towards the other point “Q”, measure the distance between total station and point, measure the horizontal angle between two station points.

XIII. Enter the target height t2 (prism) for second point.

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





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.

Experiment No: 9

CONTOURING USING TOTAL STATION

OBJECTIVE:

Contour plan of given area (One full size drawing sheet) using total station.

RESOURCES:

Sl. No.	Name of the equipment	Type	Quantity
1	Total station		1
2	Prism		1
3	Tripod	TS-Tripod	1
4	Pegs		8

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.

I. Fix the total station over a station and level it

II. Press the power button to switch on the instrument.

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

IV. Then press ESC to go to the starting page

V. Then set zero by double clicking on 0 set (F3)

VI. Then go to S function ------> measure-----> rectangular co-ordinate---->station --->press enter.

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

VIII. Then press accept (Fs)

IX. Adopt Cross section method for establishing the major grid around the study area.

X. Project suitably spaced cross sections on either side of the centre line of the area.

XI. Choose several points at reasonable distances on either side.

XII. 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.

XIII. Then select MEAS and the display panel will show the point specification

XIV. Now select edit and re-enter the point number or name point code and enter the prism height that we have set.

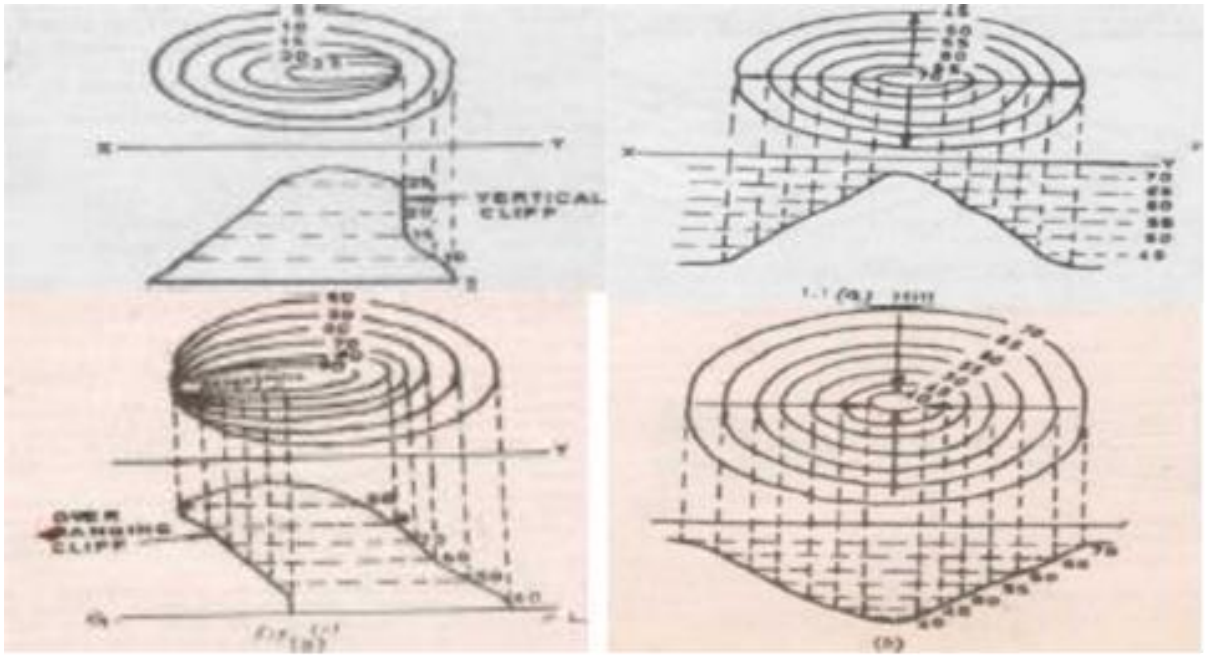
XV. Then press MEAS/SAVE (F3) so that the measurement to the first point will automatically be saved and the display panel will show the second point.

XVI. Then turn the total station to second point and do the same procedure.

XVII. Repeat the steps to the rest of the stations and get all point details.

XVIII. Plot cross section lines to scale and enter spot levels.

XIX. The points on the chosen contours are interpolated assuming uniform slope between adjacent points and join them by a smooth line.



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.