AMIRAJ
COLLEGE OF ENGINEERING & TECHNOLOGY

LABORATORY MANUAL

SURVEYING

SUBJECT CODE: 3140601

CIVIL ENGINEERING DEPARTMENT

B.E. 4th SEM

NAME:____

ENROLLMENT NO: ______________________________ BATCH

NO: ____

YEAR: ______________________________________

Amiraj College of Engineering and Technology,

Nr.Tata Nano Plant, Khoraj, Sanand, Ahmedabad.

COLLEGE OF ENGINEERING & TECHNOLOGY

Amiraj College of Engineering and Technology,

Nr.Tata Nano Plant, Khoraj, Sanand, Ahmedabad.

CERTIFICATE

This is to certify that Mr. / Ms. ____

*Of class*____________________ *Enrolment No* ___________________________*has*

Satisfactorily completed the course in ____________________________________*as*

by the Gujarat Technological University for ____ *Year (B.E.) semester*___ *of Civil*

*Engineering in the Academic year*______ ______.

Date of Submission:-

Faculty Name and Signature
(Subject Teacher)

Head of Department
(Civil Department)

AMIRAJ COLLEGE OF ENGINEERING & TECHNOLOGY

CIVIL ENGINEERING DEPARTMENT

B.E. 4th SEM

SUBJECT: SURVEYING

SUBJECT CODE: 3140601

List Of Experiments

Sr. No.	Title	Date of Performance	Date of submission	Sign	Remark
1.	Setting of the plane table and plotting a few objects (points) by radiation method				
2	Plotting building and other features of the Compass by intersection method				
3	Three point problem in plane table				
4	Theodolite traversing and plotting of traverse				
5	Setting out simple circular curve-two theodolite method				
6	Setting out of transition curve				
7	Determination Of Area Of Irregular Figure By Using Planimeter				

Practical: 1

SETTING OF THE PLANE TABLE AND PLOTTING A FEW OBJECTS (POINTS) BY RADIATION METHOD

Experiment No : 1	SETTING OF THE PLANE TABLE AND PLOTTING A FEW OBJECTS (POINTS) BY RADIATION METHOD
Date :	

AIM:

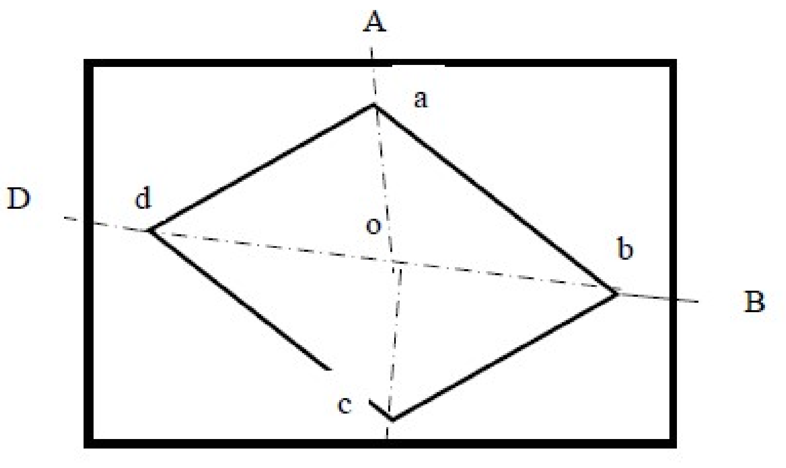
Setting up the plane table and plotting a few objects by radiation method.

INSTRUMENTS:

1) Plane table
2) Tripod
3) Alidade

RADIATION: The plane table is set up over only one station from which the whole traverse can be commanded. It is suitable for survey of small areas.

SKETCH:



PROCEDURE:

1) Select a point "O " so that all points to be located are visible from it.

2) Set up the table at “O”, level it, and do centering.
3) SELECT A POINT “O” on the sheet so that it is exactly over station “O” on the ground.
4) Mark the direction of the magnetic meridian
5) Centering the alidade on “O” BISECT the objects of traverse A, B, C and D.
6) Measure the distances OA, OB, OC and OD and plotted to convenient scale to locate a, b, c and d respectively
7) Join the points a, b, c and d on the paper.

Practical: 2

PLOTTING BUILDING AND OTHER FEATURES OF THE COMPASS BY INTERSECTION METHOD

Experiment No : 2	PLOTTING BUILDING AND OTHER FEATURES OF THE COMPASS BY INTERSECTION METHOD
Date :	

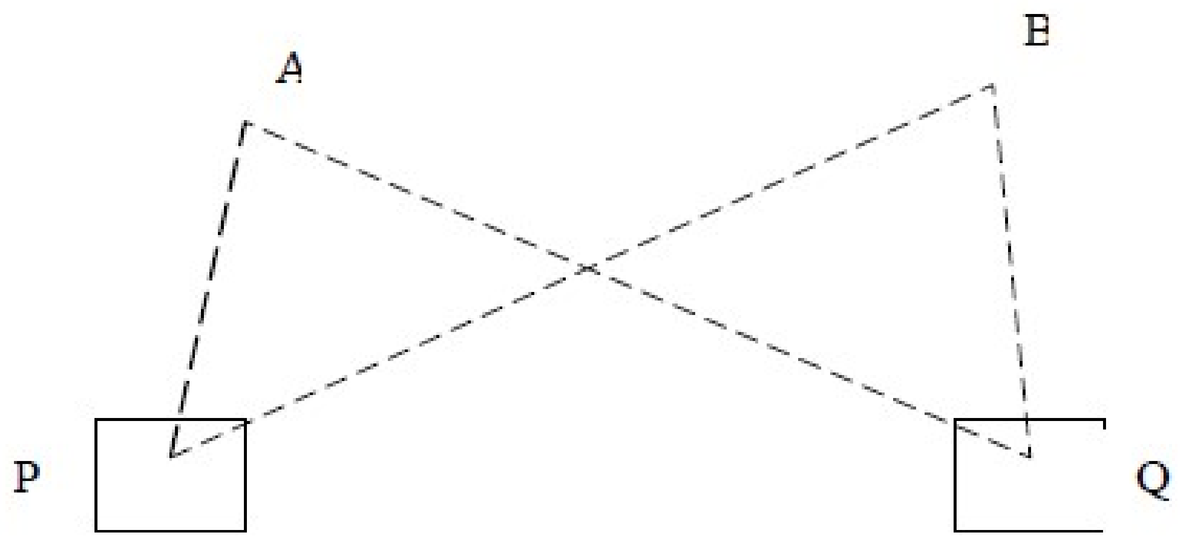
AIM:

Plotting building and other features of the compass by Intersection method.

INSTRUMENTS:

1) Plane table
2) Tripod
3) Alidade

FIGURE:



PROCEDURE:

1) Select two points P and Q such that the points (building corners) to be plotted are visible from their stations.
2) Set the table on P and locate on the sheet.

3) Pivot on P bisect Q draw a ray.
4) Measure the distance PQ and locate Q on the sheet to a convenient scale.
5) Now pq is known as the base line.
6) Pivot ‘p’ bisects the inaccessible objects A and B (building corners) and draw rays.
7) Shift the table to ‘a’ such that q is over Q and do temporary adjustments.
8) Place the alidade along qp and the rotate the table till p is bisected clamp table.
9) Pivot on q bisect the objects A and B and draw rays.
10) The instruction of rays drawn from P and Q will give the points a and b.
11) To check the accuracy measured AB and compare with plotted distance ab.
12) The same procedure is applied for other features of the campus. each point is bisected from two stations.

Practical: 3

THREE POINT PROBLEM IN PLANE TABLE

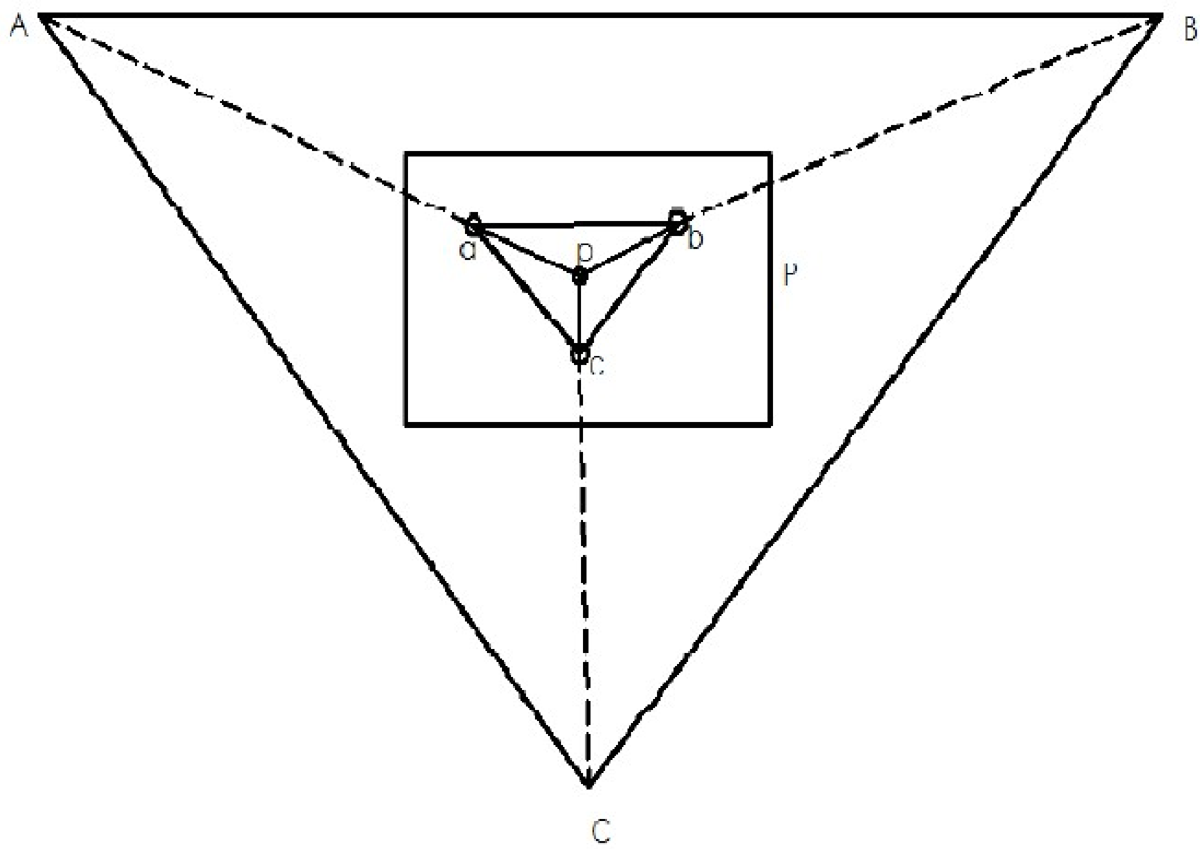
Experiment No : 3	THREE POINT PROBLEM IN PLANE TABLE
Date :	

Aim:

To solve 3-point problem in plane tabling using Bessel's Graphical solution.

Apparatus: Plane table alidade, plumbing fork, plumb bob, ranging rod, drawing sheet etc.

Fig:



Procedure:

- The three point problem consists in locating on the plan the position of the instrument station on the ground by means of observation to three well defined points whose positions have been already plotted on the plan.
- Suppose A, B, &Care the three points which have been plotted as a,
    - b, & c on the plan & the t able is set up at T from which A, B, & C are visible.
- It is required to plot on the plan the position t of the instrument station T.
- The problem may be solved by

1) Mechanically
2) Graphically (Bessel's method) &
3) By trial & error method

Bessel's method: - This method is simplest & most commonly used.

1) After setting & leveling the table, the alidade is placed along the line ca& the boardturned until A is sighted being towards A. the table is then clamped.
2) With the alidadecentered on C, B is sighted & a ray CB is drawn along the edge of the alidade.
3) When the alidade placed along ac, the board is turned until the line of sight bisects c, cbeing towards C & then clamped. With the alidade touching a, B is sighted & a ray aB isdrawn through a; intersecting the ray previously drawn through in the point d.
4) With the alidade along bd, the table is turned until B is bisected & then clamped.
5) Thetable is now oriented & t must lie on db& also on Aa& Cc. with the alidade centered ona, A is bisected & a lay is drawn through a, intersecting the ray bd in t, which representthe instrument station T.
6) To check the orientation, the alidade is pivoted on c &C is bisected. The ray Cc should now pass through t, if the work is correct.

Result: The location of the station on given point is found on sheet.

Observation:

Practical: 4

THEODOLITE TRAVERSING AND PLOTTING OF TRAVERSE

Experiment No : 4	THEODOLITE TRAVERSING AND PLOTTING OF TRAVERSE
Date :	

AIM:

Plotting a traverse with the help of the theodolite.

Equipment: Theodolite, Ranging Rod, Chain or Tap

Procedure:

1) In running traverse ABCD the theodolite is set up over the first station A and bearing of line AB is measured.
2) The angle DAB is then measured by taking a back sight on preceding station and fore sight on forward station B.
3) Turning the telescope clock wise, the mean of two vernier reading gives the required angle DAB.
4) Face left and face right observation should be made to eliminate the instrumental error.
5) The theodolite is moves to each of the successive stations B, C etc, and angles ABC, BCD, CDA are measured.
6) The line AB, BC, CD are measured with chain or tape and offset necessary to locate the details and recorded in field book.

Practical: 5

SETTING OUT SIMPLE CIRCULAR CURVE-TWO THEODOLITE METHOD

Experiment No : 5	SETTING OUT SIMPLE CIRCULAR CURVE- TWO THEODOLITE METHOD
Date :	

AIM:

To set out the simple curve by two theodolite method.

EQUIPMENTS:

Two Theodolites and Ranging rods.

PRINCIPLE:

The angle between the target and the chord is equal to the angle which that chord subtends in opposite segment.

GIVEN:

Chainage of the curve , angle of intersection and Radius of curve (R).

PROCEDURE:

1) Prepare a table of deflection angle for the first sub chord, Normal chord and last sub chord.
2) Set up one theodolite over T_1 and another over T_2 .
3) Direct the instrument at T_1 to the ranging rod at the point of intersection B and bisect it.
4) Direct the instrument at T_2 to the first target point T_1 and bisect it.
5) Set the verniers of both the theodolites to read zero.
6) Set the first deflection angle (□$_1$) on both theodolites so that the telescopes are in the direction of T_1D and T_2D respectively.

7) Move the ranging rod until it is bisected by the cross hairs of both the theodolites to locate the point D on the curve.
8) Set the second value of deflection angle on both the theodolites and repeat the step 7 above to get the location of E.
9) Continue the process for obtaining the locations of other points in a similar manner.

CALCULATION:

Given:

Chainage at B, R, θ

$BT_1 = BT_2 = R \tan \theta/2$

$T_1T_2 = 2R \sin \theta/2$

Length of curve $T_1T_2 = \theta R$

Chainage at T_1 = Chainage at B – T_1B

Chainage at T_2 = Chainage at T_1 + T_1T_2

Divide the length of the curve into normal Chords(30m) and subchord (C_1,C_2)

Deflection angles :

First subchord = 1718.9

Normal chord = 1718.9

Last subchord = 1718.9

RESULT:

The given simple curve is thus set out

Practical: 6

SETTING OUT OF TRANSITION CURVE

Experiment No : 6	SETTING OUT OF TRANSITION CURVE
Date :	

AIM:

To set out a transition curve.

INSTRUMENTS REQUIRED:

Theodoloite, Ranging rods, Arrows.

GENERAL:

A transition or earment curve is a curve of varying radius introduced between a straight and a circular curve or between two branches of a compound curve or reverse curve.

CHARACTERISTICS OF A TRANSITION CURVE:

In the figure,

Tv = Original target

Bv' = the shift tangent parallel to the original tangent

S = BA = shift of the circular curve

L = length of the transition curve

D = end of the transition curve and beginning of the circular curve

DD_1 = tangent to both the transition and the circular curve at D.

DB = extended portion of the circular curve (or the redundant circular curve).

Y = D_2D =offset of the junction point D.

X = TD2 = the coordinate of the junction point D

R = radius of the circular curve

θ_s = the spiral angle

OB = perpendicular to the shift tangent B

A = point of intersection of the perpendicular OB with the original tangent

DE = line perpendicular to OA

Since the tangent DD1 makes an angle $\square_s$ with the original tangenet, $\theta BOD = \theta_s$

Now, $BD = R\theta_s$

$= RL / 2R$ since $\theta_s = L/2R$

$= L/2$

When CD is very nearly equal to BD, CD = L/2

Hence the shift AB bisects the transition curve at C.

Again

$S = BA$

$=FA – EB$

$= Y – (OB-OE)$

$= Y – R(1-\cos\theta_s)$

$= Y – 2R \sin^2 \theta_s/2$

$= Y – 2R \; \theta_s^2/4$

where θ_s is small.

But $EA = DD_2$ $Y =$

PROCEDURE:

1) Calculate the spiral angle θ_s by the equation $\theta_s = L/2R$ radians.
2) Calculate the shift S of the circular cure by the relation $S = L^2 / 24R$
3) Calculate the total length of the tangent depending whether it is a spiral or cubic parabola.

    For the true spiral, the total tangent length = (R + S) tan

    For the cubic spiral, the total tangent length = (R + S) tan

    For the cubic parabola, the total tangent length= (R + S) tan
4) Calculate the length of the circular curve.

5) From the chainage of PI, subtract the length of the tangent to get the chainage of the point T.
6) To the chainage of T_1 add the length of the transition curve to get the chainage of the junction point (D) of the transition curve with the circular curve.
7) Determine the chainage of the other junction point (D') of the circular arc with the transition curve by adding the length of the curve to the chainage of D.
8) Determine the chainage of the point T' by adding the length L of the transition curve to the chainage of D'.
9) If it is required to peg the points on through chainages, calculate the length of the sub-chords and full-chords of the transition curves and the circular curve. The peg internal for the transition curve may be 10 metres, while that for the circular curve, it may be 20 metres.
10) If the curves are to be set out by a theodolite, calculate the deflection angles for the transition curve from the expression $\theta = 573\, l^2 / RL$ minutes and the deflection angles (referred to the tangent at D) for the circular curve from the expression, S = 1719 C/R minutes.
11) The total tangential angles θN for the circular curve must be equal to $\frac{1}{2}(\theta - 2\theta_s)$.

RESULT :

Thus the setting out of transition curve can be done

Practical: 7

DETERMINATION OF AREA OF IRREGULAR FIGURE BY USING PLANIMETER

Experiment No : 7	DETERMINATION OF AREA OF IRREGULAR FIGURE BY USING PLANIMETER
Date :	

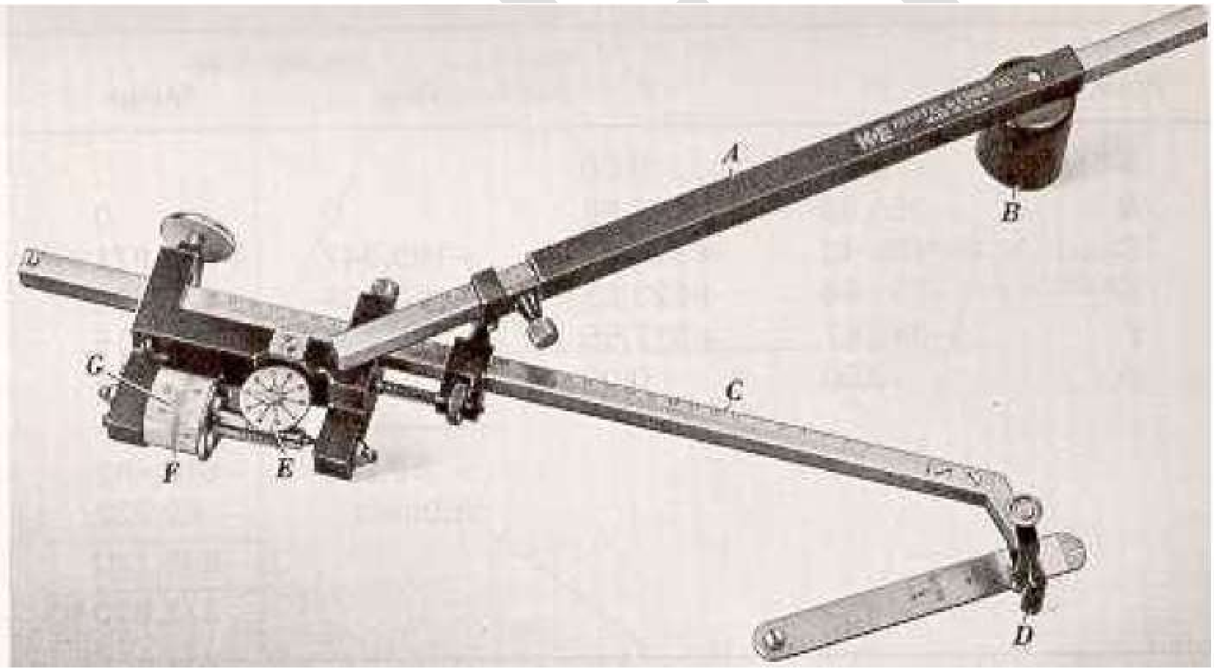
AIM:

Determination of area of irregular figure by using planimeter

EQUIPMENTS:

planimeter

FIGURE:



THEORY:

A Planimeter is a mechanical integrator is used by engineer for measuringarea of figure which is been plotted scale particularly when the boundaries are irregular are curved mathematically it is difficult to find the area of such irregular figures. Planimeter is largely used for finding the areas of contour in determining the capacity of storage server.

PROCEDURE:

The procedure is common for both the above cases.

1) Set out the index arm on the tracing arm (position of measuring unit), to given scaleas per manufactures instruction, exactly by using the clamp and fine motion screw.
2) Stretch the map sheet until it is flat and free from wrinkles.
3) Fix the anchor point firmly in the paper outside or inside the figure according as thefigure is small or large.
4) Mark a point on the boundary of the figure and set the tracing point exactly over it.
5) Now take initial reading (I.R) as described previously, reading the dial, wheel andvernier. It is not necessary to set the dial and wheel to zero.
6) Move the tracing point exactly around the boundary, always in clockwise directionusing one hand to keep the point exactly on the boundary and the other hand to keepthe anchor point from moving, stop exactly at the starting point.
7) While tracing point is moved along the boundary of the figure, note the number oftimes the zero mark in clockwise or anticlockwise direction. Again take the reading ofdial ,wheel and vernier recording it as the final reading (F.R) .The area of the figure isthen calculated by using the following formula.

The calculated area (A) = m (FR-IR +10N+C)

Where,
M=multiplying constant which is different for different scales and supplied in the instruction sheet by the manufacture. It is equal to the area of one revaluation of the wheel i.e unit area.

F.R.= the final reading
I.R= the initial reading

N=number of times the zero of dial passes the fixed index mark use the +ve sign when moves clockwise & -ve sign moves anticlockwise.
C= constant of instrument supplied by manufacture & different for different scales & it is offset when anchor point is kept inside otherwise it is taken zero if it is kept outside.

Area of the zero circles i.e. Mc is defined as the correction circle which is defined as a circle found the circumference at which if the tracing point is moved wheel will slide without rotation in a reading. This is possible when tracing arm is placed in such aposition relative to the anchor of arm that the plane of the roller passes thought theanchored point the multiply constant of Planimeter is equal to the number of unit of area per revolution of the roller.

OBSERVATION TABLE:

Position of anchor point	**Initial Reading**	**Final Reading**	**Value of N**	**Remark**

RESULT:

The area of irregular figure is found to be -------------Sq-m