Name	Nauman Khan
ID	6829
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Exam	Final term.
Submitted to	Engr. Fawad Ahmad
Department	Btech Civil
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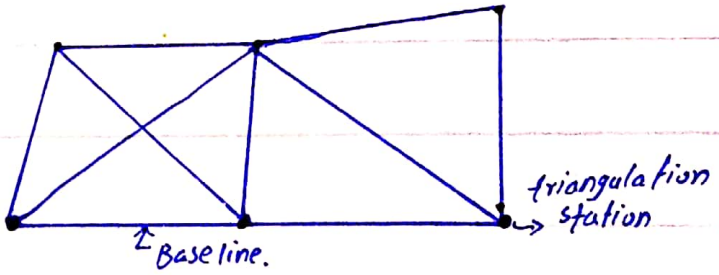
QNo 1)

Ans: Triangulation: Triangulation consist of a number of interconnected triangles in which the length only one base line and the angles of the triangles are measured very precisely which are used to calculate the coordinates of vertices.

The line of a triangulation system from a network that ties together all the triangulation stations at the vertices of the triangles.



Order of triangulation:

(a) Primary or 1st order Triangulation:

. In primary triangulation a very large areas (whole country) are covered & the highest possible accuracy is obtained.

. Well proportional triangles must refined, instrument and method of observation & computation are used.

Average triangle closure = 1 sec

Maximum triangle closure = 3 sec

Length of the base line = 5 to 20 Km

Length of Sides of triangle = 30 to 160 Km

Degree of accuracy = 1 in 500,000

check on the base = 1 in 25,000

(b) Secondary or 2nd Order Triangulation:

- Within the primary triangles other points are fixed at closer interval so as to form a Secondary Series of triangles which are Connected to the primary system at interval.
- Comparatively Small triangles are used; the instrument & methods are not of the same refinement (accuracy)
- In this case

Average triangle closure = 3 sec

Maximum triangle closure = 8 sec

length of the baseline = 2 to 6 Km (1 to 3 mile)

length of Side of triangle = 8 to 70 Km (5 to 40 mile)

Degree of accuracy = 1 in 50,000

check on the base = 1 in 10,000

(C) Tertiary or 3rd order Triangulation:

- Within the Secondary triangles points are established in short intervals to obtain horizontal Control for detail Survey.

Average triangle closure = 6 Sec

Maximam triangle closure = 12 Sec

length of the base line = 1 to 3 Km ($\frac{1}{2}$ to $\frac{3}{2}$ miles)

Length of sides of triangle = 1.5 to 10 Km

Degree of accuracy > 1 in 50,00

check on the base = 1 in 50,00.

QNo2

Given data:

=> Elevation of station A = 1000 feet
=> Elevation of station B = 1100 feet
=> Distance b/w two station = 50 miles
=> Intervening ground assumed an elevation = 850 feet
=> line of sight may not pass near the ground than 15'

Required data:

=> Minimum height of signal required at B = ?

Solution:

Now; Minimum elevation of the line of the sight =

$$850 + 15 = 865 \text{ feet}$$

Assuming as a datum level:

=> Elevation of $A = h_1 = 1000 - 865 = 135$ feet

=> Tangent distance D_1 corresponding to h may be calculated as $\Rightarrow h_1 = 0.574\, D_1^2$

$$\Rightarrow D_1 = \sqrt{\frac{h_1}{0.574}} = \sqrt{\frac{135}{0.574}}$$

$$\Rightarrow \boxed{D_1 = 15.335 \text{ miles}}$$

Now;

$$\Rightarrow D = D_1 + D_2 \longrightarrow (i)$$

Putting values in (i) we get

$\Rightarrow 50 = 15.335 + D_2$

$\Rightarrow \boxed{D_2 = 34.664 \text{ miles}}$

$\Rightarrow h_2 = 0.574 \times D_2^2 = 0.574(34.664)$

$\Rightarrow \boxed{h_2 = 689.714 \text{ feet}}$

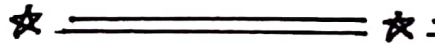
$\Rightarrow$ The line of sight at B = 865 + 689.714 = 1554.714

Now; Ground level at B = 1100 feet

So; Minimum height of signal above the ground

$B = 1554.714 - 1100$

$= 454.714 \approx 455$ feet



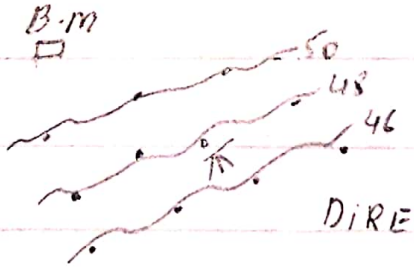
Q03 There are mainly two methods of locating contours:

1) Direct Method:

2) indirect Method:

⇒(1) Direct Method:

In this method the contours to be located are directly traced out in the field by locating and marking a number of points on each contour. These points are then surveyed and plotted on plan and the contours drawn through them.



DIRECT METHD OF CONTOURING

⇒ This method is most accurate but very slow and tedious as a lot of time is wasted in searching points of the same elevation for a contour.

⇒ This is Suitable for Small area and where great accuracy is required.

⇒ Procedure:

⇒ To start with a temporary B.M is established near the area to be surveyed with reference to a permanent B.M by fly Leveling.

⇒ The level is then set up in such a position so that the maximum number of points can be commanded from the instrument station.

⇒ The hight of instrument is determined by taking a back sight on the B.M. and adding it to the R.L. of bench mark.

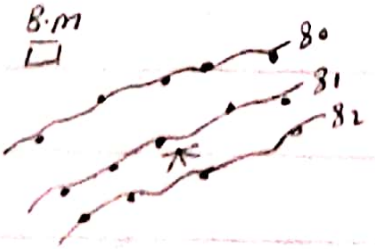
⇒ The staff reading required to fix points on the various contours is determined by subtracting the R.L. of each of the contours from the height of instrument.

⇒ if the hight of instrument is 82.48m. Then the staff readings required to locate 82, 81 and 80m contours are 0.48 1.48 and 2.48m respectively.

⇒ The staff is held on an approximate position of point and then moved up and down the slope unit the desired reading is obtained. The points is marked with a peg.

⇒ Similarly various other points are marked on each contour. The line joining all these points give the required contour.

⇒ Having fixed the contours within the range of the instrument. The level is shifted and set up in a new position.



⇒ Direct method : Example :

⇒ The new hight of instrument

and The required staff readings are Then calculated in a similar manner and The process repeated fill all The contours are located:

⇒ The position of The contour points are located suitably either simultaneous with levelling or afterwards.

⇒ A theodolite, a compass or a plane table traversing is usually ad ob odopted for locking these points.

⇒ the points are Than Plotted on The contours drawn by joing The corresponding points by dotted curved lines:

⇒ Direct method By Radial Lines:

⇒ The temporary bench marks are first established at The centre and near The ends of The radials Lines:

⇒ The contour points are then located and marked on these Lines and

their positions are determind by measuring their distances along the radial lines:

⇒ They are then plotted on the plan and the contours drawn by joining all the corresponing points with the help of a plane table instrument.

⇒ This method is suitable for small areas, where a single point in the centre can command the whole area.

2) Indirect Method:

(1) By Squares:

In this method the ~~station~~ points located and surveyed are not necessary on the contour lines but the spot levels are taken along the series of lines laid out over the area.

⇒ The stop levels of the several

representative points representing hills depression ridge and valley lines and the changes in the slope all over the area to be contoured are also observed.

⇒ Their positions are then plotted on the plan and the contours drawn by interpolation.

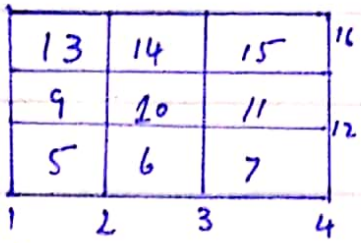
⇒ This method of contouring is also known as contouring by spot levels.

⇒ This method is commonly employed in all kinds of surveys as this is cheaper quicker and less tedious as compared to direct method.

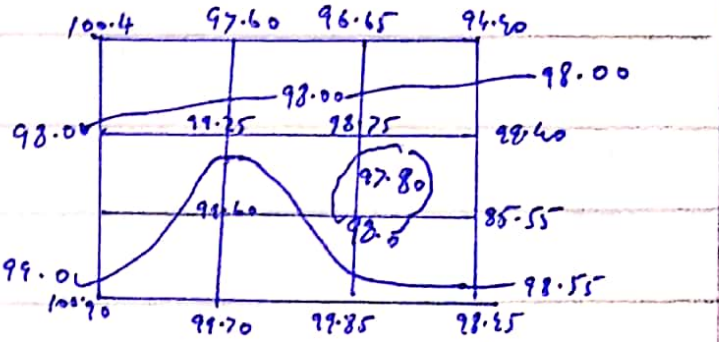
⇒ By Squares:

⇒ In this method the whole area is divided into number of squares the side of which may vary from 5m to 30m squares depending upon the nature of the ground and the contour interval. the square need not be of the same size throughout.

⇒ The corners of the Squares are pegged out and the reduced levels of these points are determined with a level.



Squares laid on ground



Contour interpolated

⇒ Levels are taken at the corners of the square and the intersection of the diagonal

⇒ Levels taken on the intersection of diagonals is used for verification of the interpolation.

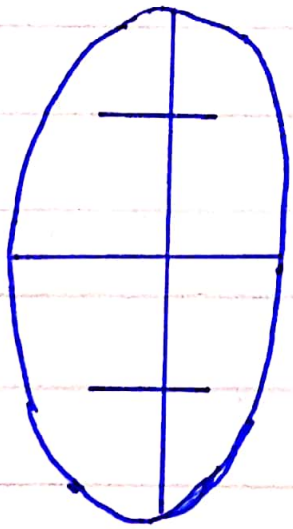
⇒ Countour map is plotted in the office by interpolating points of equal ~~level~~ elevation based on the levels taken on the Corners of the Square.

⇒ A tacheometer is a transit theodolite having a diaphragm fitted with two stadia wires, one above and other below the central wire.

⇒ The horizontal distance between the

instrument and Staff Station which can be Comm determined by multiplying the difference of the staff readings of the upper and lower Stadia wires with the stadia Constant of the instrument, which is usually 100.

⇒ Thus the techeometer is used both the vertical has will has horizontal measurment.



"Stadia wire at Diaphragm"

Q.No4) Method of Locating Soundings:

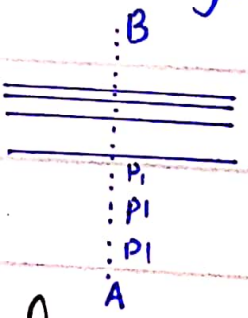
(i) By transit and Stadia:

· In this method a transit is set up at point on the range and the stadia readings are taken on a stadia rod held on the bottom of the boat at that instant the sounding is taken.

· The transit can be set up at any shore line whose position has been previously fixed.

· In shallow water the stadia rod may be dispensed with and the stadia readings are taken on the sounding rod.

· It is unsuitable when the soundings are taken far from shore.



(ii) By range and time interval:

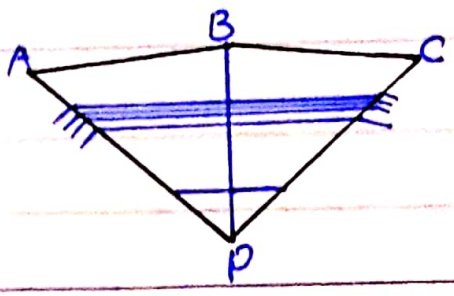
· In this method the sounding boat is rowed at uniform speed along the range and he sounding are taken at regular intervals of time.

· The method is particularly applicable in still water and or short distances and when great accuracy is

not required.
Best used in conjunction with other methods.
In such case the first and last soundings on a line and soundings are located by angular observation from shore.
The intermediate soundings are then located by interpolation according to time intervals.

(iii) Location by two Angle from boat:

In this method the positions of sounding are located by measuring two angles simultaneously with a sextant, from the boat (P) to three shore signals or any points (A, B and C) whose position have been previously known.
The points sighted should be well defined such as chimneys, light houses etc.
In this work it is important that the angles must be measured simultaneously and therefore observation are taken both by the surveyor and the instrument man (angle APB and angle BPC)



(iv) Location by distance along a wire or rope, Stretched across Stream between Stations:

- In this method a wire or rope is stretched between fixed points on opposite banks and is marked by means of cloth or metal tage; at equal intervals along the rope or wire.
- The boat is rowed to these points and Sounding are taken. This is most accurate but most expensive method. It is used when Sounding are to be taken along the Cross-section of a Canal or narrow river.
- It is also used when it is required to determine the quality of material removed by dredging. The soundings are taken between and after dredging work is done.

Q5

Given data:

$\Rightarrow L_p = 30\,cm$; $W_p = 30\,cm$

$\Rightarrow O_l = 0.7$; $O_w = 0.35$

$\Rightarrow S = 150$

Required data:

$\Rightarrow$ Number of photograph = ?

Solution:

Now;

$\Rightarrow$ Ground length covered $= L_g = S L_p (1 - O_l)$

$= 150 \times 30 (1 - 0.7)$

$= 1350\,m = 1.350\,Km$

and

$\Rightarrow$ Ground width covered $= W_g = S W_p (1 - O_w)$

$= 150 \times 30 (1 - 0.35)$

$= 2925\,m = 2.925\,Km$

$\Rightarrow$ Now Net ground area $= L_g \times W_g$

$\Rightarrow A_g = 1.350 \times 2.925$

$\Rightarrow \boxed{A_g = 3.949\ Km^2}$

$\Rightarrow N$ = Number of photograph required $= \frac{200}{3.949}$

$\Rightarrow N = 50.645$

$\Rightarrow \boxed{N \cong 51}$ Answer