AJAY KUMAR GARG ENGINEERING COLLEGE, GHAZIABAD
DEPARTMENT OF CIVIL ENGINEERING
SESSIONAL TEST –2 (Solution)

Course: B.Tech.
Session: 2017-18
Subject: Surveying
Max Marks: 50

Semester: III
Section: CE-1, CE-2
Sub. Code: RCE-302
Time: 2 hour

Section A

Ques 1) a) Define i) Azimuth ii) Level line iii) stadia intercept iv) True meridian

Ans: i) **Azimuth** - It is a angle of a line measured from reference (i.e. North) in clockwise direction.

ii) **Level line** - A line laying in a level surface. Normal to the plumb line at all the points.

iii) **Stadia intercept** - Diaphragm in tacheometry is provided with three stadia hairs (upper, middle & lower) The difference bet^n upper & lower reading gives stadia intercept.

iv) **True meridian** - The true meridian passing through a point on the earth surface is the line in which a plane passing through a given point and the geographical north & south poles, intersects the surface of the earth.

Ques 1b) Define Local attraction. How would you detect the presence of local attraction?

Ans:- Local attraction is the attraction of the magnetic ~~field~~ needle to a local magnetic field other than earth's magnetic field.

- The local attraction at any station is detected by observing the fore & Back Bearing of the line.

$$\boxed{FB - BB = 180^\circ}$$ if it is not the case then - there can be error in FB, BB or Both.

Ques 1 c) Distinguish betn surveyor's & prismatic compass?

Ans:

surveyor's compass	Prismatic compass
1) The needle is of edge bar type.	The needle is a broad needle.
2) It follows quadrantal bearing system	It follows whole circle bearing.
3) The readings are taken directly by seeing through top of the box glass.	The readings are taken with the help of a prism provided at the eye vane
4) The instrument can't be used without tripod.	The instrument can be held in hand while making observations.

Ques 1 d) what are various uses of a contour map?

Ans: contour maps provide valuable information about the topography of the area, whether it is flat, mountainous.

The nature of the ground surface of an area can be understood by studying a contour map.

- To select sites for engineering projects such as roads, canals, railways.
- To find possible route of communication between different places.
- To find the capacity of the reservoir.
- To estimate the quantity of cutting & filling.

Ques 1e) Define magnetic Dip. At which point on earth, the magnetic dip is zero.

Ans:- The vertical angle between the horizontal & the direction shown by perfectly balanced and freely suspended needle is known as the magnetic dip at that place.

Its value is 'zero' at the equator.

Section-B

Ques-2 a) Define contour interval. Write the characteristics of contours.

Ans: contour interval - The vertical distance bet^{n} two consecutive contours is known as a contour interval.

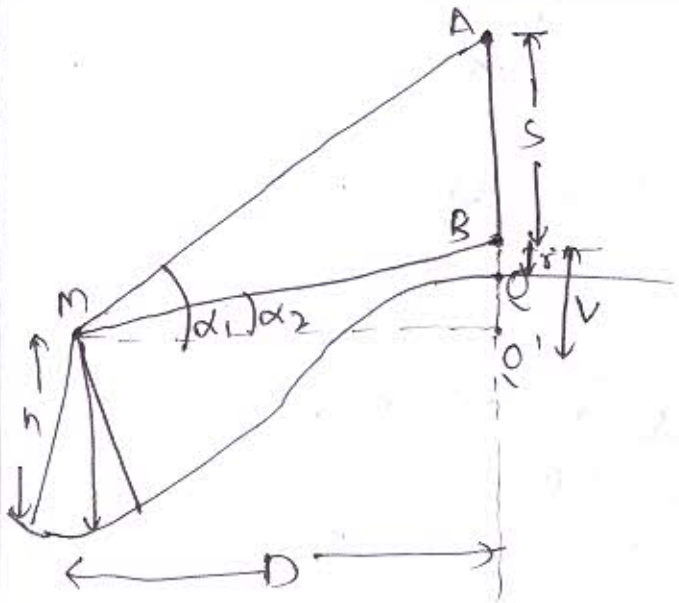
contour interval = 2m in this diagram.

Characteristics of contour-

- Two contour lines do not intersect each other except in the cases of vertical cliff, overhanging cliff.
- A contour line must close onto itself, not necessarily within the limits of a map.
- contour do not have sharp turning.
- close contour represents steep slope & distant contour represents relatively mild area.

Ques 2) b) Derive the formula for distance elevation by tangential method when i) Both angles are angles of elevation ii) one angle of elevation and another is depression.

Ans: - Case-1 Both angles are angles of Elevation



$$V = D \tan\alpha_2 \quad (I)$$

$$V + S = D \tan\alpha_1 \quad (II)$$

(I) - (II)

$$S = D\tan\alpha_1 - D\tan\alpha_2$$

$$D = \frac{S}{\tan\alpha_1 - \tan\alpha_2}$$

$$D = \frac{S\cos\alpha_1\cos\alpha_2}{\sin(\alpha_1 - \alpha_2)}$$

$$V = D\tan\alpha_2 = \frac{S\tan\alpha_2}{\tan\alpha_1 - \tan\alpha_2}$$

$$V = \frac{S\cos\alpha_1\sin\alpha_2}{\sin(\alpha_1 - \alpha_2)}$$

Elevation of O' = (Elevation of station + h) + V - r

Case-2 One angle of elevation & other of depression-

$V = D \tan \alpha_2$ ①

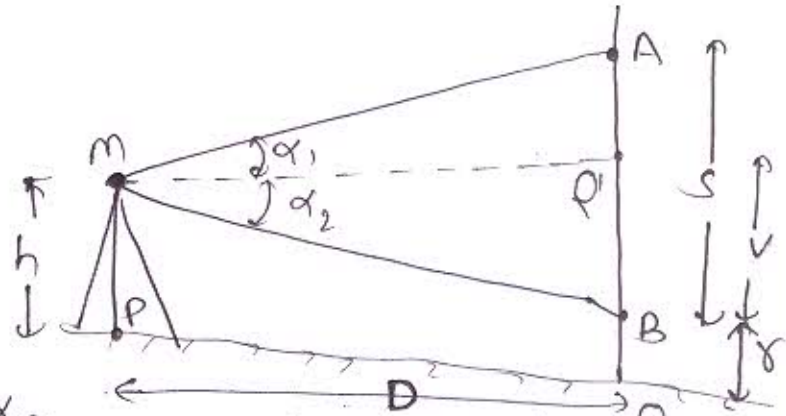
$S - V = D \tan \alpha_1$ ②

① + ②

$S = D \tan \alpha_1 + D \tan \alpha_2$

$D = \frac{S}{\tan \alpha_1 + \tan \alpha_2}$

$D = \frac{S \cos \alpha_1 \cos \alpha_2}{\sin(\alpha_1 + \alpha_2)}$



$V = D \tan \alpha_2 = \frac{S \tan \alpha_2}{\tan \alpha_1 + \tan \alpha_2} = \frac{S \cos \alpha_1 \sin \alpha_2}{\sin(\alpha_1 + \alpha_2)}$

Elevation of Q = Elevation of P + h - V - γ

Ques ⇒ c) Explain refraction & curvature correction. A luminous point object on the top of a hill was just observed by an observer standing at a height of 25m above the mean sea level, from his position on the ship. If the ship is 65 km from the hill find the ht. of the hill.

Ans Curvature Correction -

It is an error in staff reading observation, in which the reading appears to be higher that actual. Its formula is :-

$C_c = \frac{d^2}{2R}$ where,

C_c = Curvature Correction

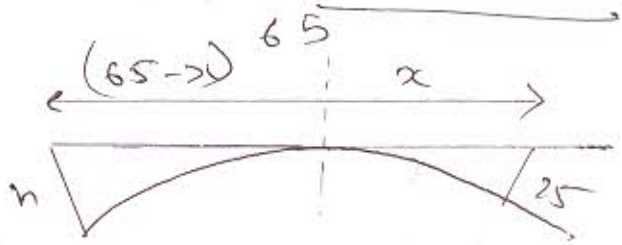
d = Distance in km bw. staff & station

R = Radius of the earth 6370 km.

Refraction Correction :-

It is an error in which the staff reading appears to be lower than actual. It is due to atmospheric phenomenon called refraction, which is the bending away of light when it passes from one medium to another.

$$C_r = \frac{1}{7}\frac{d^2}{2R}$$



Given :- Observer ht = 25m

d = 65 km

h = ht. of light house

$$d_1 = \sqrt{\frac{c}{0.0672h}} = \sqrt{\frac{25}{0.0672\times 8}} = 19.28 \text{ km}$$

$$\therefore d_2 = 65 - 19.28 = 45.72 \text{ km}$$

$$h = d^2(0.0672h) = (45.72)^2(0.0672\times 8)$$

$$= 140.64 \text{ m}$$ Ans

Sec B 2d & 2e @ last page

3a) The following successive staff readings were taken with a level using a 5m levelling staff on a sloping ground at intervals of 20m.

0.385, 1.030, 1.925, 2.825, 3.730, 4.685, 0.625, 2.005, 3.110 & 4.485

The RL of the 1st point = 208.125. Enter staff reading in the table and find gradient.

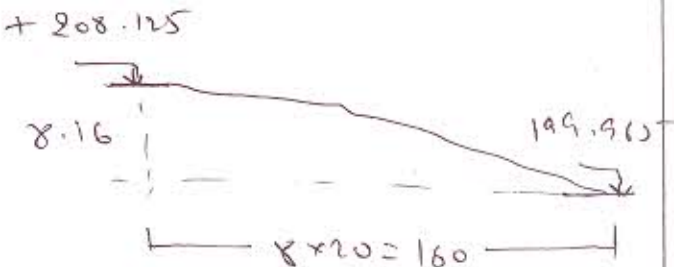
Soln

STATION	BS	IS	FS	HI	RL	REMARKS
A	0.385			208.51	208.125	BM
B		1.030			207.472	
C		1.925			206.585	
D		2.825			205.685	
E		3.730			204.780	
F	0.625		4.685	204.450	203.825	CP1
G		2.005			202.445	
H		3.110			201.340	
I			4.485		199.965	
CHECK	ΣBS = 1.0100		ΣFS = 9.170 ΣBS − ΣFS = 1.040 − 9.170 = −8.130		Last RL − 1st RL = 199.965 − 208.125 = −8.16	

Since $\Sigma BS - \Sigma F$ = Last RL − First RL = −8.16

— OK

Gradient = $\frac{8.16}{160} = \frac{1}{19.607}$

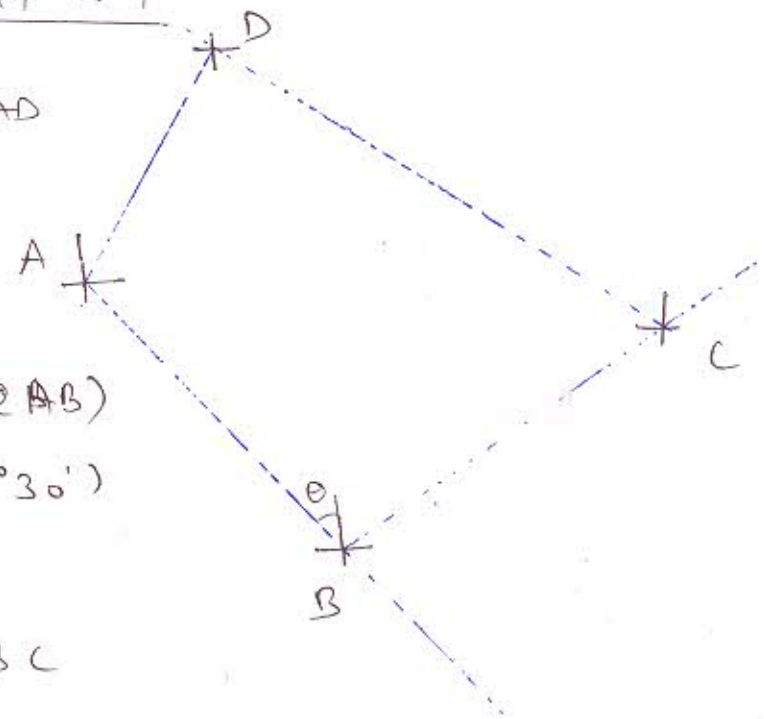


∴ 1 in 19.607

b) The following bearings were observed from a prismatic compass @ a place where local attraction was suspected.

LINE	F B	B B
A B	124°30'	304°30'
B C	68°15'	246°
C D	310°30'	135°15'
D A	200°15'	17°45'

At what stations do you expect local attraction? Find the correct bearing of the lines by using included angles.



For

$\angle A$ = FB @ AB − BB @ AD

= 124°30' − 17°45'

= 106°45'

$\angle B$ = FB @ BC + (360 − BB @ AB)

= 68°15' + (360° − 304°30')

= 123°45'

$\angle C$ = FB @ CD − BB @ BC

= 310°30' − 246°

= 64°30'

$\angle D$ = FB @ DA − BB @ CD

= 200°15' − 135°15'

= 65°

∴ $\sum\theta = \angle A + \angle B + \angle C + \angle D = 360°$ (Hence included angles are correct — Ok)

Reading check :—

FB − BC

		Error
AB =	|124°30' − 304°30'| = 180°	0
BC =	|68°15' − 246°| = 177°45"	−2°15'
CD =	|310°30' − 135°15'| = 175°15'	−4°45'

DA = 200°15' − 17°45' = 182°30' Error = +2°30'

Hence AB will be our reference line.

FB @ AB = 124°30'

BB @ AB = 304°30'

FB @ BC = (360 − BB @ AB) ⟹ (∠B − θ)

= 55°30' ⟹ (123°45' − 55°30') = 68°15'

BB @ BC = 180° + 68°15' = ...°..' 248°15'

FB @ CD = BB @ BC + ∠C = 248°45' + 64°30'

= 312°45'

BB @ CD = 312°45' − 180° = 132°45'

FB @ DA = BB @ CD + ∠D = 132°45' + 65°

= 197°45'

BB @ DA = 197°45' − 180° = 17°45'

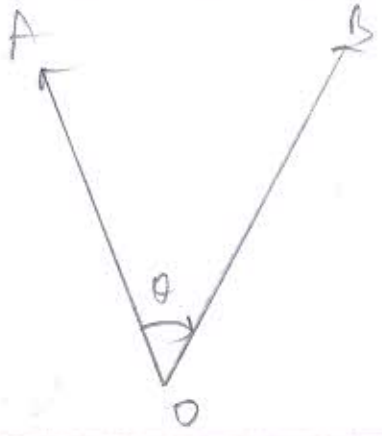
FB @ AB = BB @ DA + ∠A = 17°45' + 106°45'

= 124°30' ——— Ok

Local attraction was suspected on station C & D.

Sec B 2d) Measurement of horizontal angle by repetition method :—

① Set the instrument at point 'O' and perform its centering and levelling.



(1) Let A and B are our two targets whose horizontal angles between them is to be ~~comp~~ determine.

(2) Place a ranging rod at A and B in order to sight the target.

(4) With theodolite, sight target A and set the verniers A and B at zero and 180° respectively.

(5) After setting the zero and 180 @ verniers A & B respectively ~~if~~ clamp the upper and lower plate.

(6) Now, in order to determine angle between A & B sight target B by loosing upper clamp and keeping lower clamp fixed.

(7) When target B is sighted fixed upper clamp and take the readings @ vernier A and B.

(8) Keep upper plate fix - loose lower plate and rotate it so that theodolite ~~and~~ sight target A, fix it.

Now again repeat the process by loosing upper plate and sight target B.

(9) Divide the end result with no. of repetitions.

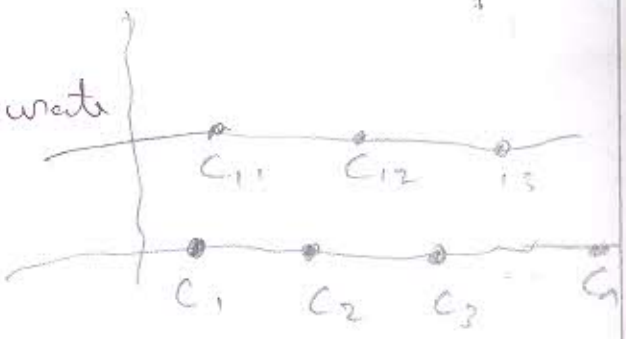
Sec B
Q 2 e) Discuss in detail, the method of direct & Indirect contouring.

Sol DIRECT METHOD :—

- Horizontal Control
- Vertical Control

Horizontal Control :-

- A control point is an accurate point located on a surface whose position is known.



It is located in horizontal direction for contouring

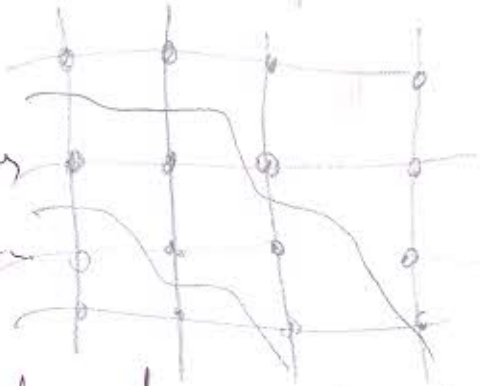
Vertical Control :-

- It is located in vertical direction accurately. It determines contour intervals.

INDIRECT METHOD

- Box method :-

This method is generally used to find volume of excavation. In this method, the elevation of various points are determined at equal intervals and then contour line is plotted.



- Cross Section method :-

It is used in railway lines construction.

- Tachaeometry method :-

In this method the distance (H & V) and elevation is determined by tachaeometry instruments.