ANSWER KEY

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DIPLOMA EXAMINATION IN ENGINEERING/ TECHNOLOGY/MANAGEMENT/COMMERCIAL PRACTICE)

SURVEYING -I

(Maximum marks100) **[Time:3 hours]**

PART –A

(Maximum marks:10)

I) Answer all questions in one or two sentences. Each question carries 2 marks.

1) Define the term ranging of a line?

Ans:-While measuring the length of a survey line , if the length of the survey line is less than the length of the chain, some intermediate points ill have to be established in line with the two terminal points before chaining is started. The process of fixing such intermediate points is known as ranging.

2). List the instruments used in plane table survey?

Ans:Plane Table with Tripod

Ranging rods

Alidade

Pegs

Trough compass

Spirit level

U-Frame with Plumb-Bob

3) Diffrentiate between Agonic lines and Isogonic lines Ans:Agonic Lines are the lines joining the points having zero declination

Isogonic lines ae the lines joining same declination

4) Name the different types of bench marks Temporary Benchmark

Permanent Bench mark

Arbitrary or Assumed bench mark

5) Define countour line?

Ans:- A Countour line is an imaginary line joining the points on earth surface having same elevation or reduced levells (5X2=10 mark)

PART B

(Maximum marks 30)

II) (Answer any five questions from following. Each question carries 6 marks.)

I) what do you mean by reciprocal ranging? Explain with a neat sketch

Reciprocal or Indirect ranging is resorted to when both the ends of survey lines are not intervisible either due to high intervening ground or due to long distance between them.In such cases ranging is done indirectly by selecting two intermediate points M1 and N1, very near to the chain line in such a way that from M1, both N1, and B are visible and from N1, both M1 and A are visible

The person at M1 then directs the person at N1 to move to a new position N2 in line with M1B. The person at N2 then directs the person at M1 to move to anew position with N2A. The process is repeated till the points Mand N are located in such a way that the person at M finds the person at N in line with MB, and the person at N finds the person at M in line with NA. After having established M and N, other points can be fixed by direct ranging.

Figure to be involved

2) List the different methods of orientation in plane table surveying?

1.Orentation by means back sighting

2. Orentation by trough compass

Orentation by means back sighting:- Orentation can be done precisely by sighting the points already plotted on the sheet. Two cases may arise are

1. When it is possible to set the plane table on the point already plotted on the sheet by way of observation from previous station
2. When it is not possible to set the plane table on the point

To orentthe table at the next station , say B , represented on the paper by a point b, plotted by means ofa line ab drawn from a previous stationA, the alidade is kept on the line ba and the table is turned about its vertical axis in such a way that line of sight passes through the ground station A. When this is achieved, the plotted line ab will be coinciding with the ground line AB(provided the centring is perfect) and the table will be oriented. Table is then clamped in position

Sighting the points:-

When once the table has been set, ie, when levelling , centring and orientation has been done, the points to be located are sighted through the alidade. The alidade is kept pivoted about the plotted location of the instrument station and is turned so that the line of sight passes or bisects the signal at the point to be plotted. A ray is then drawn from the instrument station along the edge of the alidade. Similarly, the rays to other points to be sighted are drawn. The points are finally plotted on corresponding rays either by way of intersection or by radiation as described in the following articles.

3) Define Local attraction and and how it can be detected?)Local attraction is a term used to denote any influence,such as magnetic substances, which may prevents the needle from pointing to the magnetic North in a given locality. Some of the sources of local

attration are Magnetite in the ground, Wire carrying electric current, steel structures, rail road rails, under ground iron pipes, keys, steel-bowed spectacles, metal buttons, axes, chains, steel tapes etc.

Detection of local attraction:_ The local attraction at a particular place can be detected by observing the fore and back bearings of each line and finding its difference. If the difference between fore and back bearing is 180° , it may be taken that both the stations are free from local attraction , provided there are no instrumental and observational errors. If the difference is other than 180^{0} the fore bearing is measured again to find out whether the discrepancy is due to avoidable attraction from the articles on persons, chains, tapes etc.If the difference still remains, the local attraction exists at one or both the stations.

4) Tabulate the difference between the prismatic compass and surveyors compass?

Item	Prismatic compass	Surveyor's Compass
1.Magnetic Needle	The needle is of broad needle type. The needle does not act as index	The needle is of edge bar's type. The needle acts as the index
2.Graduated card	i)The graduated card needle is attatched to the needle ii)The graduations are in W.C.B system iii) The graduations are engraved inverted	i)The graduated cared is attatched to the box and not to the needle. The card rotates along with the line of sight ii)The graduations are in Q.B iii) The graduations are engraved erect.
3. Sighting vaes	i) The object vane consists of metal vane with avertical hair ii) The eye vane consists of smaal	i) The object vane consists of a metal vane with vertical hair ii) Ii)The eye vane consists of a metal

	metal vane with slit	vane with fine slit
4.Reading	The reading taken with the help of a prism provided at the eye slit	The reading is taken by direcly seing through the top of the glass
5.Tripod	Tripod may or may not be provided . The instrument can be used even by holding suitably in hand	The instrument can not be used without a tripod

5) Discuss H.I method of booking and reducing the elevation of points from

the observed staff readings?

Ans.:-

1.Height of instrument method:- In this method , The height of instrument is calculated for each setting up of the instrument by adding back sight to the elevation of the benchmark.The elevation of reduced levels of turning point is then calculated by subtracting from H.I.the fore sight.For the next setting up of the instrument , the H.I is obtained by adding the B.S taken on T.P. 1 to its R.L. The process continues till the R.L. of the last point is obtained by subtracting the staff reading from height of the lastsetting of the instrument. The R.L of intermediate points are calculated by subtracting it from the H.I for that setting.

2.Rise and fall method

6) List the various types of levelling staffs anf give a brief explanation ?

The purpose of a levelling staff is to determine the amount by which the station is above or below the line of sight. Levelling staves may be devided in to two classes

(i) Self reading staff:- Is the one which can be read directly by the instrument man through the telescope. There are mainly three forms of self reading staff

(a) Solid staff

(b) Folding staff

(c) Telescopic staff

(ii) Target staff:- Contains moving target against which the reading is taken by staff man. A target staff having sliding targetequipped with vernier. The rod consists of two sliding lengths, the two lower one of approx. 7ft and the upper one 6ft.

7) Discuss the charecteristics of countour? (6X5=30mrks)

1. Two contour lines of different elevation cannot cross each other . If they did, the point of intersection would have two different elevations which is absurd. However, contour lines of different elevations can interest only in the case of an overhanging cliff or a cave

2.Contour lines of different elevations can unite to form one line only in the case of a vertical cliff

3. Contour lines close together indicate steep slope.e a gentle slope if they are far apart. If they are equally spaced, contour represent a plane surface.

4. A contour passing through any point is perpendicular to the line of steepest slope at that point. This agrees with , this agrees with sine the perpendicular distance between contour lines is the shortest distances.

5.A closed contour line with one or more higher ones inside represents a hill . a closed contour line with one or more lower one insideindicates a depression.

6.Contour lines havinf the same elevation cannot unite and continue as one line

7.A contour line must close up on itself

8. Contour line cross water shed or ridge line at right angles

9.Contour lines cross valley lines at right angles

PART C

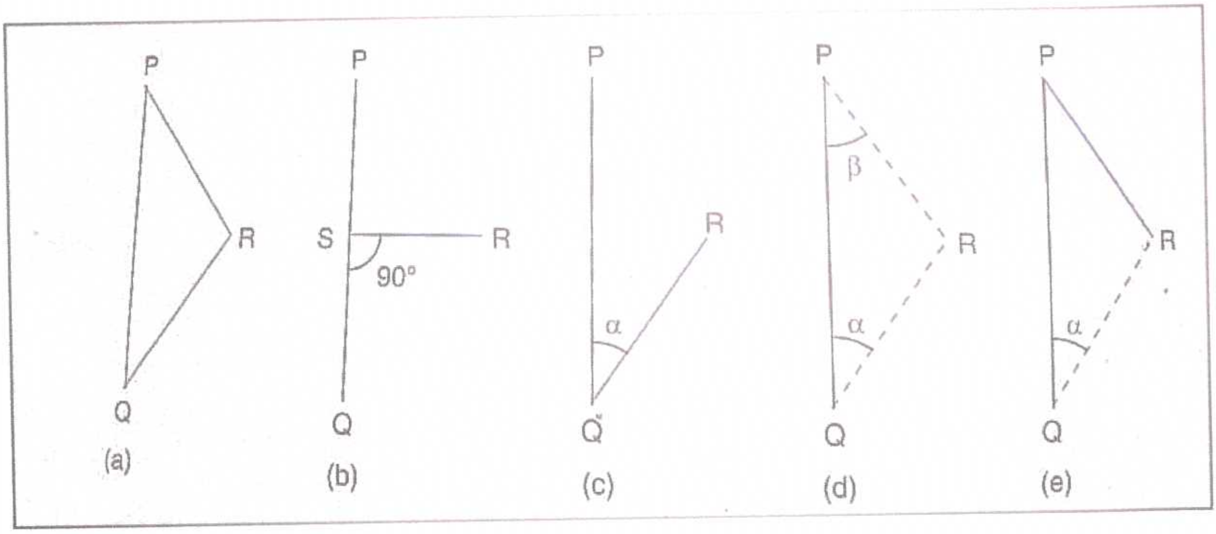
(Anwer one full question from each unit.Each full question carries 15 marks)

UNIT I

III) (a) Discuss the principle on which chain survey is based? (8)

1.Location of a point by measurement from two point of references.:-

The relative positions of points the points to be surveyed should be located by measurement from at least two points of references, the positions of which have already been fixed.



2. Working from whole to part:-

The second ruling principle of surveying , whether plane or geodetic , is to

work from whole to part. It is very essential to establish first a system of control points and to fix them with higher precision. Minor control points are established by less precise methodsand details can be then located.

(b) What factors should be considered in deciding the stations of a chain survey? (7)

1.Survey stations must be mutually visible

2. Survey lines must be as few as possible so that the framework can be plotted conveniently

3.The lines must run through level ground as possible

4.The main lines should form well conditioned triangles.

5.There must be sufficient check lines

6.As far as possible main survey line should not pass through obstacles

7.To avoid trespassing the main survey line should pass with in the boundaries.

OR

IV) (a) Describe the different classifications of survey? **8**

1.Classification based on the nature of field of survey

a. Land survey

b. Marine survey

c. Astronomical survey

2.Classification based on the object of survey

a. Engineering survey

b.Military survey

c. Mine survey

d. Geological survey

e.Archeological survey

3. Classification based on instruments used

a. Chain suvey

b. Theodolite survey

c. traverse survey

d. Triangulation survey

e. Tacheometric survey

f. Plane table survey

h. Photogrametric survey

I.Aerial survey

(b) State the different methods of plane table surveying and write the advantage and disadvantages of plane table surveying? (7)

1.Radiation method

2.Intersection method

3.Traversing method

4.Resection method

Advantages and disadvantages of plane tabling

Advantages:

1. The plan is drawn by the out-dor surveyor himself while the country is before his eyes and there fore , there is no possibility of omitting the necessary measurements.
2. 2. The surveyor can copare the plotted work with the actual features of the area
3. The linear and angular measurements are both to be obtained by graphical means.
4. Notes of measurements are seldom required and possibility in booking is eliminated
5. It is particularly useful in magnetic areas where compass may not be used
6. It is simple and hence cheaper than theodo;ite or any other type of survey
7. Most suitable for snall scale maps
8. No great skill is required

Disadvantages

1.Since notes and neasurements are not recorded , it is a great inconvenience if the map is required to reproduced to some different scales

2.It is not intended for very accurate work

3.It is essentially a tropical instrument

4. It is most inconvenient in rainy season and wet climate

5.Due to heaviness it is inconvenient to transport

6. Since there are so many accessories , there is every likelyhood of these being lost

UNIT II

V (a) Write short notes on

(1) Magnetic declination (2) True bearing (3) Magnetic bearing. (8)

(4) True meridian

(1) Magnetic declination :-Magnetic declination at a place is the horizontal angle between the true meridian and magnetic meridian shown by the needle at the time of observation. If the magnetic meridian is at the right side of the true meridian ,declination is said to be eastern or positive. If it is to the left side , the declination is said to be western or negative

(2) True bearing :-Is the horizontal angle which it makes with the true meridian through one of its extremities of the line .

(3) Magnetic bearing:- The magnetic bearing of a line is the horizontal angle which it makes with the magnetic meridian passing through one of the extremities of the line

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(4) True meridian:- True meridian through a point is the line in which a plane passing that point and the north and south poles, intersects with the surface of the earth.It passes through the true north and south poles.It can be established by astronomical bservations

(b)The following bearings were observed in running a closed traverse (7)

b) For the following given bearings, at what stations do you suspect local attraction? Determine the correct magnetic bearings if the declination was $5°10'$ E, What are the true bearings?

Line	F.B	B.B
AB	$75^{\circ}5'$	$254^{\circ}20'$
BC	$115^{\circ}20'$	$296^{\circ}35'$
CD	$165^{\circ}35'$	$345^{\circ}35'$
DE	$224^{\circ}50'$	$44^{\circ}5'$
EA	$304^{\circ}50'$	$125^{\circ}5'$

Ans:-

Line	Observed bearing	correction	Corrected bearing	True bearing	Remarks
AB	$75^{\circ}5'$	+30'AT a	$75^{\circ}35'$	$80^{\circ}45'$	Stations A,B,and E are affected by local attraction
BA	$254^{\circ}20'$	$+1^{\circ}15'$AT**B**	$255^{\circ}35'$	$260^{\circ}45'$	
BC	$115^{\circ}20'$	$+1^{\circ}15'$AT**B**	$116^{\circ}35'$	$121^{\circ}45'$	
CB	$296^{\circ}35'$	0 at C	$296^{\circ}35'$	$301^{\circ}45$	
CD	$165^{\circ}35'$	0 at C	$165^{\circ}35$	$170^{\circ}45'$	
DC	$345^{\circ}35'$	0 at D	$345^{\circ}35$	$350^{\circ}45'$	Stations A,B,and E are affected by local attraction
DE	$224^{\circ}50'$	0 at D	$224^{\circ}50'$	$230^{\circ}0'$	
ED	$44^{\circ}5'$	+45'at E	$44^{\circ}50'$	$50^{\circ}0'$	
EA	$304^{\circ}50'$	+45'at E	$305^{\circ}35'$	$310^{\circ}45'$	
AE	$125^{\circ}5'$	45'at E	$125^{\circ}35'$	$130^{\circ}5'$	

OR

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VI (a) The following bearings were observed in running a closed traverse

Line	Fore bearing	Back bearing
AB	$71^{0}05'$	$250^{0}20'$
BC	$110^{0}20'$	$292^{0}35'$
CD	$161^{0}35'$	$341^{0}45'$
DE	$220^{0}50'$	$40^{0}05'$
EA	$300^{0}50'$	$121^{0}10'$

Determine the corrected included angles. 2.1.8p128

Ans:- There is no line whose F.B and B.B. differ exactly by 180°. However the F.B and B.B of line CD differ by 180°10'. The difference being only +10', Hence the correct F.B of CD is obtained by adding half the difference

Corrected F>B of CD= 161°35'+5'=161°40'

Corrected B.B of CD=341°45'-5'=341°40', The difference =180°0'

Angle ABC=250°20'-110°20'=140°0'

Angle BCD=292°35'-1610°35'=131°0'

Angle CDE=341°45'-220°50'=120°55'

Angle DEA=300°50'-40°05'=260°55'(Exterior),99°15'(Interior)

Angle EAB=121°10'-71°5'=50°5'

....

Sum=541°15'

Theretical Sum=(2N-4)90° =540°, Error =1°15', Correction for each angle=-15'

Hence the corrected angles are

Angle ABC=140°0'-15'=139°45'

Angle BCD=131°0'-15'=130°45'

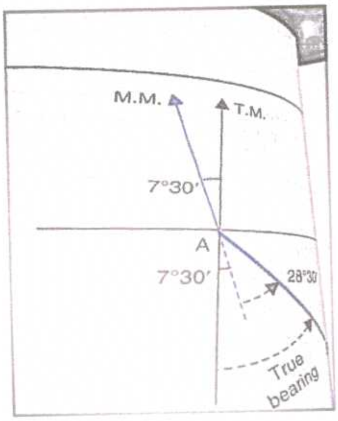
Angle CDE=120°55'-15'=120°40'

Angle DEA=99o15'-15'=99°00'

Angle EAB=50°5'-15'=49°50'

Sum=540°00'

(b)The magnetic declination of a line AB is S 28°30' E. Calculate the true bearing of a line if the declination is 7°30' W 2.1.9p122



True bearing= S28°30'E+7°30'

=S36°00'E

UNIT III

VII) (a) Briefly explain the temporary adjustment of a leveling instrument 3.1.7p207

The temporary adjustment of a level consist of

1. setting up the level
2. Levelling up
3. Elevation of parallax(Detailed explanation needed)

ANSWER KEY

(b)The following consecutive readings were taken with a level and 5 meter leveling staff on continuously sloping ground at a common interval of 20 metres. 0.385,1.030;1.925;2.825;3.730;4.685;0.625;2.005;3.001;4.485.. The reduced levels of the first point waas208.125m.Rule out a level field book form and enter the readings. Calculate the reduced levels of the points by rise and fall method.

stations	B.S	I.S	F.S	Rise	Fall	R.L	Remarks
1	0.385					208.125	
2		1.030			0.645	207.480	
3		1.925			0.895	206.585	
4		2.825			0.900	205.685	
5		3.730			0.905	204.780	
6	0.625		4.685		0.955	203.325	
7		2.005			1.380	202.445	
8		3.110			1.105	201.340	
9			4.485		1.375	199.965	
check	1.010		9.170	0.000	8.160	208.125	
			1.010		199.965	208.125	
			8.060	fall	8.160	8.160	

OR

VIII (a) List the important axis of leveling instrument and their relations? (8)

(b) Explain rise and fall method and Height of instrument method and compare the two methods (7)

HI method

In this method, the height of the instrument is calculated for each setting of the instrument by adding back sight (Plus sight) to the elevation of the B.M. The elevation of reduced levels of the turning point is then calculated by subtracting from HI to the fore sight. For the next setting of the instrument the HI is obtained by adding the backsight taken on TP1.to its RL.The process continues till the RL of the last point is obtained by subtracting the staff reading from height of the last setting of the instrument.If there are some intermediate points, the R.L of these points is calculated by subtracting the intermediate sight (minus sight) from the height of the instrument for that setting.

Arithmetic check

Sum of all B.S-Sum of all F.S= Last Rl-First RL

Rise and fall method

In rise and fall method , the height of instrument is not at all calculated but the difference of level between consecutive points is found by comparing the staff readings on the two points for the same setting of the instrument. The difference between their staff readings indicate a rise or fall according as the staff reading at the point is smaller as greater than that at the proceeding poit. The figuresfor rise and fall worked out thus for all the points give the vertical distance of each point above or below the preceding one, and if the level of any one point is known the level of the next will be obtained by adding its rise or subtracting its fall, as the case may be.

Arithmetic check

Sum of all B.S-Sum of all F.S= Last Rl-First RL=Sum of rise –Sum of fall

Comparison

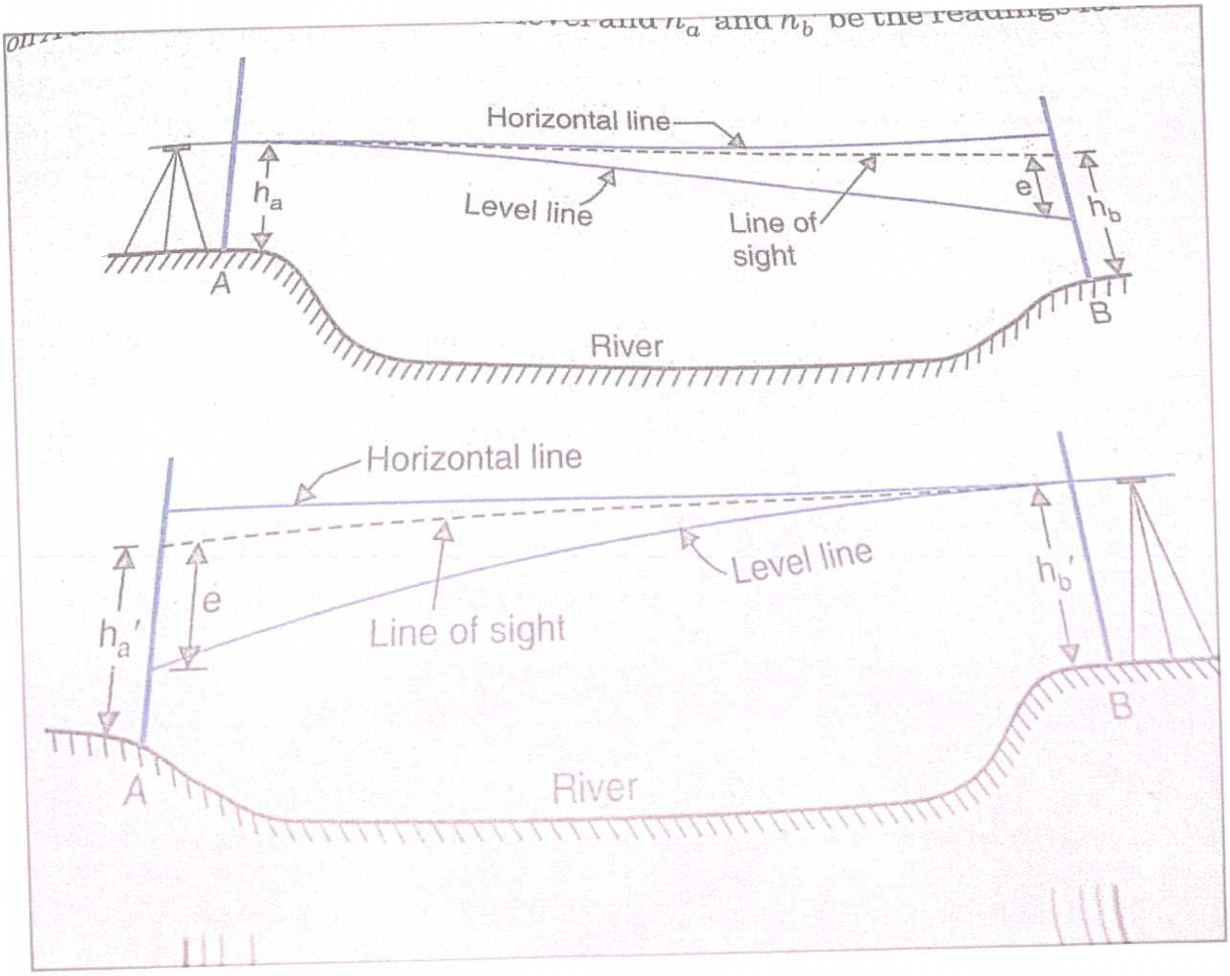
1. H.I method is more rapid, less tedious and simple since the check on Intermediate sights are not possible , so the mistakes are unnoticed in I.S
2. Though the rise and fall method are more tedious , provides a full check on calculations for all sights.
3. The height of instrument method is suitable for ,in case where it is required it is required to take a number of readings from the same instrument settings.

UNIT IV

IX) (a) Briefly discuss about reciprocal leveling (8)

When it is required to carry levelling across a river , or any obstacles requiring a long sight between two points so suited that no place for the level can be found from which the length of foresight and back sight will be even approximately equal , reciprocal levelling is used

1. to eliminate the error in instrument adjustment
2. to eliminate the combined effect of curvature and refraction



For the first set of level, the correct staff readings will be

On A:ha; ; On B: hb-e

The true difference in elevation =H=ha-(hb-e)

Similarly for the second set, the correct staff readings will be

On A: ha’-e; On B hb’

True difference in elevation is =H=(ha’-e)-hb’

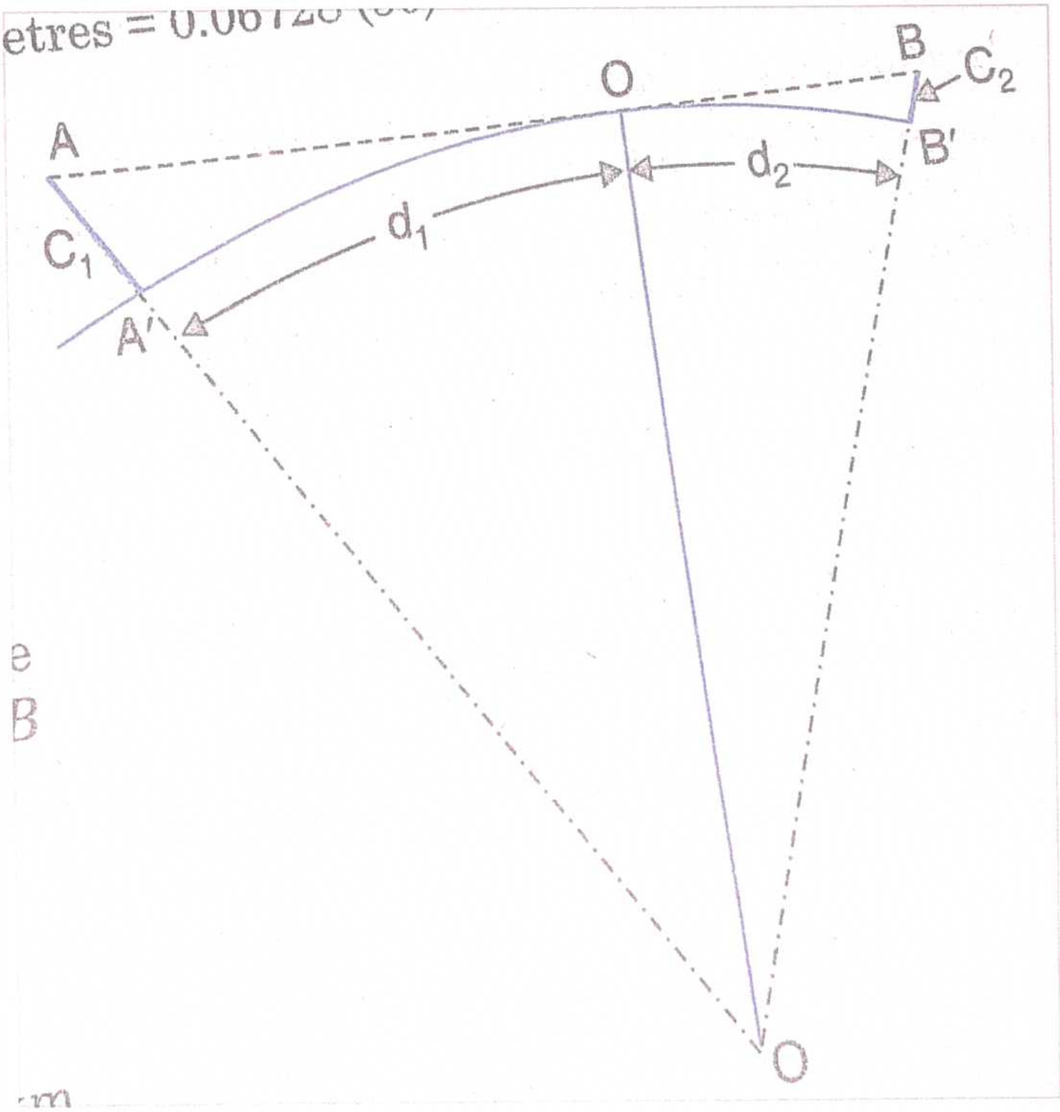
Taking the average of the two true difference in elevation, we get,

H= ½[(ha-hb)+(ha’-hb’)]

The difference in elevation is equal to the mean of the two apparent difference in elevations, obtaines by reciprocal observations

(b) An observer standing on the deck of a ship just sees a light house. The top of the light house is 32 meters above the sea level and the height of the observer is 8 meters above the sea level. Find the distance of the observer from the light house (7)

ANSWER KEY



Let A be the position of top of light house and B be the position of observers eye. Let AB be tangential to water surface at O.

The distance d1 and d2 are given by

D1= 3.8553*root C1km

=3.8553xroot 32=21.8088km

D2= 3.8553xroot 8=10.90

Distance between A and B =d1+d2

=21.808+10.90 = 32.708km

OR

X)(a) Define (1) contour (2) contour interval, and (3) Horizontal equivalent(4)Factors affecting selection of contour interval

Countour:- A countour is a imaginary line on the ground joining the points of equal elevation . It is a line in which the surface of ground is intersected bya level surface. A countour line is a line on the map representing a countour.

Contour interval:-The vertical distance between any two consecutive countours is called countour interval. The countour interval is kept constant for a countour plan.

(3) Horizontal equivalent:-The horizontal **distance between two points on two consecutive countours is known as horizontal equivalent and depends on steepness of the ground**

4)Factors affecting selection of contour interval

1. The nature of the ground

2.The scale of the map

3. Purpose and extent of survey

4. Time and expense of field and office work

The vertical distance between any two consecutive countour is called countour interval

b) Briefly explain the uses of contouring? (8)

Ans:- 1. Drawing of sections

3. Determination of intervisibility between two points

4. Tracing of countour gradient and location of route

ANSWER KEY

5. Measurement of drainage areas
6. Calculation of reservoir capacity (need brief explanation)