MAHARASHTRA STATE BOARD OF TECHNICAL EDUCATION

(Autonomous)

(ISO/IEC-270001 – 2005 certified)

SUMMER -13 EXAMINATION

Subject code: 12039 **Model Answer** Page No:1/19Nos

Important Instructions to examiners:

1) The answer should be examined by keywords and not as word-to-word as given in the model answer scheme.
2) The model answer and the answer written by candidate may vary but the examiner may try to assess the understanding level of the candidate.
3) The language error such as grammatical, spelling errors should not be given more importance. (Not applicable for subject English and communication skill).
4) While assessing figures, examiner may give credit for principal components indicated in the figure. The figure drawn by candidate and model answer may vary. The examiner may give credit for any equivalent figure drawn.
5) Credits may be given step wise for numerical problems. In the some cases, the assumed constants values may vary and there may be some difference in the candidates answer and model answer.
6) In case of some questions credit may be given by judgment on part of examiner of relevant answer based on candidates understanding.

Q1)a)State the principles of surveying.	2
Following are the principles of surveying 01. To work from the whole to the part. 02. To fix the position of new station by at least two independent processes, both linear, both angular, one linear & one angular.	 1 1
Q1)b)State two reasons of local attraction in compass surveying.	2
1) Magnetic substances on the field i.e. iron or steel object, iron ore, electricity current, chain, arrows, steel tape ranging rod etc. 2) Magnetic substances with the observer i.e. bunch of keys, iron rings in cap, wrist watch , Spectacles etc. **(Note-Any four ½ mark each)*	*

Q1)c)Define level surface and datum surface.	2
Level surface:A surface parallel to the mean spheroidal surface of the earth is known as level surface . **Datum surface: A**n arbitrary level surface from which elevations of point may be referred is known as datum surface.	1 1
Q1)d)Define: i)Turning point ii)Line of collimation.	2
i) Turning point :-A point on which fore sight and back sight readings are taken is known as Turning point OR A point about which level instrument is shifted from one position to other position in leveling operation is known as Turning point. **ii) Line of collimation:-**A line joining the intersection of the cross hairs of diaphragm to the optical center of the object glass and its continuation is known as Line of collimation**.**	1 1
Q1e)Define the term "reciprocal leveling".	2
c) Reciprocal leveling :- A leveling procedure is adopted when it is required to find difference in level between two points accurately which are too apart and it is not possible to set up the level in between the two points, eg. river or pond is known as reciprocal leveling	2
Q1)f)Define magnetic declination and deep of needle.	2
Magnetic Declination:- The horizontal angle made by the magnetic meridian with true meridian is called as magnetic declination **Dip of needle: -** The inclination of the needle with the horizontal is called as magnetic dip of the needle.	1 1
Q1)g)Write all components parts polar planimeter.	2
The following are the component parts of polar planimeter Tracing points, tracing arm, anchor arm, hinge, anchor points , wheel , anchor weight ,dial(disc), verneir , clamp, slow motion screw, index mark . **(Note-any four ½ mark each)*	*
Q1)h) State difference between counter interval and horizontal equivalent.	2

Contour interval	Horizontal equivalent
1) The vertical distance between two successive contour	The horizontal distance between any two consecutive contour
2) The difference between two RL's	Horizontal distance is measured on top

*

	of two contour is a contour interval	of map and is then converted with the help of scale used in map
	3) Contour interval is same throughout the survey	Horizontal distance depends on steepness or slope of the ground.

**(Note-Any two 1 mark for each)*

Q1)i)Define term "Zero circle" used in planimeter. — 2

c) Zero circle:- The zero circle is defined as , the circle round the circumference of which if the tracing point is moved , no rotation of the wheel cause but the wheel simply slide on the paper without any change in reading. — 2

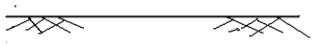
Q1)j State the use of counter maps. — 2

d) The following are the uses of contour maps — *

1) From the contour map we find the nature of ground , slope
2) It is used for location of highway , railway , canals , pipelines
3) For location of structures such as building, bridges etc.
4) For determination of most economical site for dams and reservoirs , maximum flood line
5) For determining the inter visibility of two points
6) For determining the storage capacity of reservoir.

**(Note-any two 1 each)*

Q1)k)Difference between plain and geodetic survey. — 2

Plane survey	Geodetic survey
1) In plane surveying the effect of curvature of earth is not considered	1) In geodetic survey the effect of curvature of earth is considered
2) 	2) 
3) Line connecting any two points is considered as straight line	3) Line connecting any two points is considered as curved line.

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4) It is carried out for small area up to 250 km sq.	4) It is carried out for large area more than 250 km sq.	
5) Angles of polygon are plain angle, triangles are plain triangle.	5)Angles of polygon are spherical angle, triangles are spherical triangle.	
6) Degree of accuracy is low. Carried out by PWD, Irrigation dept .	Degree of accuracy is high. Carried out by survey of India dept.	

**(Note-Any two 1 mark each)*

Q1)l)What is secondary survey ? 2

Secondary survey:- The secondary survey means the survey which is based on the *

a) Instrument ,b) Methods , c) Object, d) Nature of field

** (Note-1/2 mark each point)*

Q2)a)Describe how the chaining can be continued:

i) When a river crosses a chain line 4

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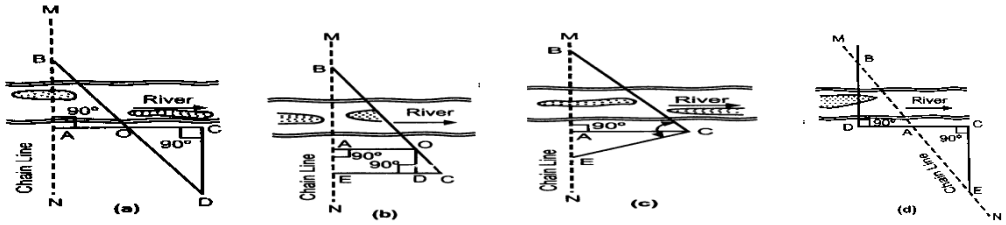


Fig (a) -A and B are the two points on opposite bank of river as shown in figure (a) Obstructed length is AB. On chain line MN, set AC perpendicular to AB and bisect at O. Erect perpendicular at C and mark a Point D in line with BO. Measure the Length CD. From the similar triangle ABO and CDO, AB=CD.

Figure (b) -A and B are the two points on chain line. AB is the obstructed width.

Select, another point E on the chain line set out a perpendicular AO and EC in such way that BO and C are in straight line.

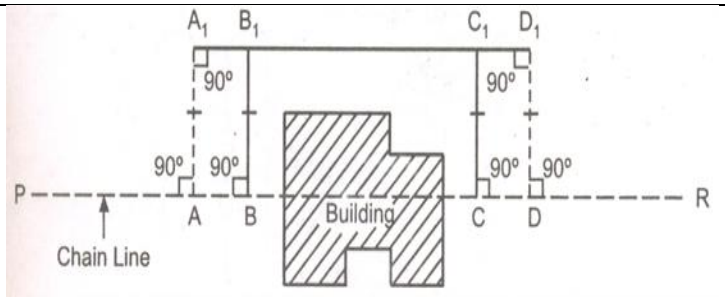
Measure length AO,EC, and AE erect perpendicular OD

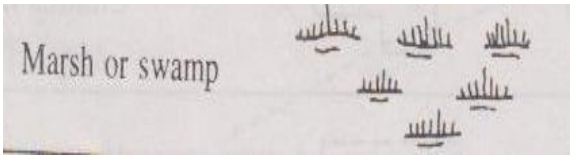
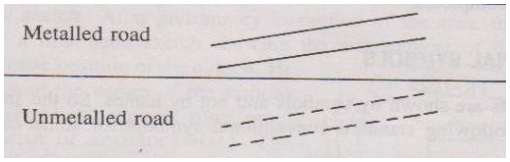
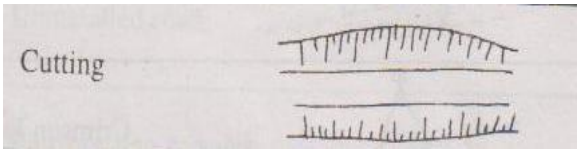
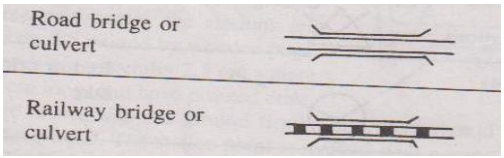
Meeting D on EC

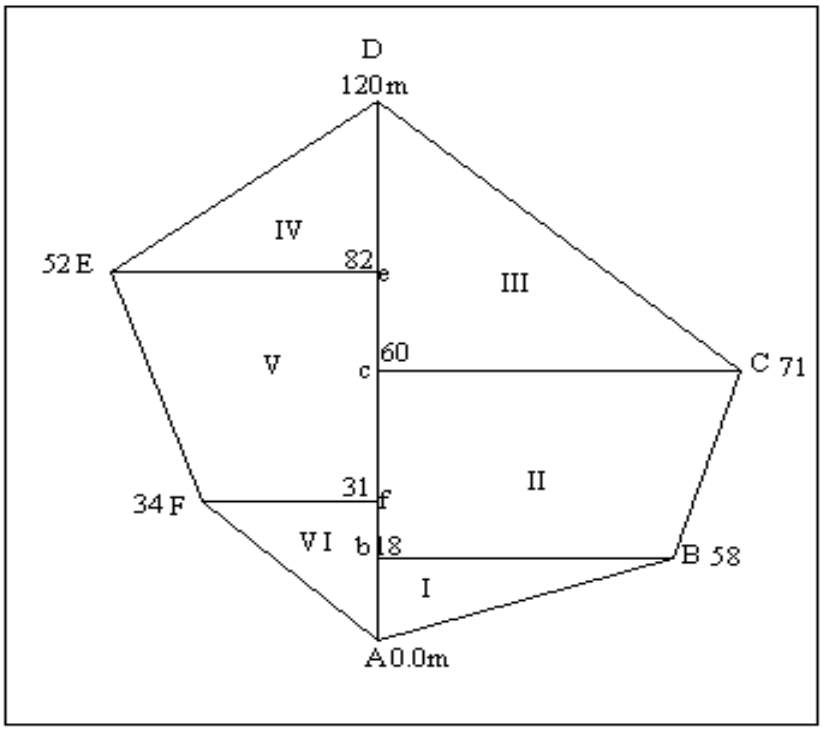
Then, DC= EC-ED , = EC-AO and AE = OD

Triangles AOB and ODC are similar.

(AB/AO)= (OD/DC) or AB = ((OD x AO)/DC)

Figure. (c)- A and B are two points on either side of the river. Set out perpendicular AC at A of sufficient length. Erect Perpendicular CE at C. Measure length of AC and AE Triangles ABC and ACE are similar. $(AB/AC)= (AC/AE)$ or $AB = ((AC)^2/AE)$ Triangles ABC and ACE are similar. $(AB/AC)= (AC/AE)$ or $AB = ((AC)^2/AE)$ Figure (d)- The chain line crosses the river obliquely. Let A and B be the two Points on the chain line and on opposite bank of the river. Set out AD right angle to BD by optical square . Produce DA to C such as AD = AC. Erect perpendicular CE at C so that E lies on line BA produced. Triangle ABD and AEC are congruent AB = AE **(Note-Any one fig, 2 marks for fig and explanation of it 2 marks)*	
Q2)a)ii)When a small building on a chain line	4
 Let PR be the survey line. The obstruction of building prevents chaining from P to R select points A and B at convenient distance apart. Measure the length of AB . Set out perpendicular AA_1 and BB_1 of equal length such that points A and B overcome the obstacle. Join A_1B_1 abd prolong the line A_1B_1. Select two points C_1 and D_1 in line A_1B_1 produced. Set out perpendicular at C_1 and D_1 as CC_1 abd DD_1 of equal length to AA_1 Now $AA_1 = BB_1 = CC_1 = DD_1$ Measure B_1C_1 which is equal to obstructed length BC. The right should be set out accurately. **(Note-for-fig.2 marks explaination 2 marks)*	*
Q2)b)i)A 30m chain was found to be 12 cm too long after chaining a distance of 17500 meters. It was found to be 23 cm too long at the end of days' work, after chaining a total distance of	4

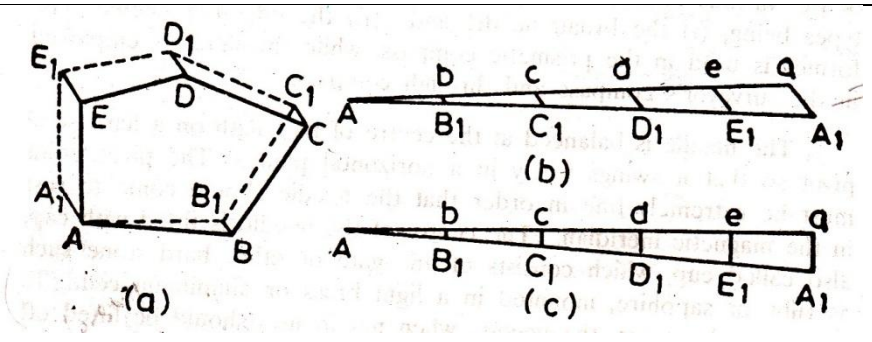
3600 m .Find the true distance if the chain was correct before the commencement of work.	
For First 1750 m Length **True Distance = (L^1/L) x Measured Length** Average Error = (0+12)/2 = 6 cm Length of standard chain = L = 30 m Length of chain during measurement = L^1 = 30 + 0.06 = **30.06 m** **True Distance = (30.06/30) x 1750 = 1753.50 m** Remaining distance of (3600 – 1750) = 1850 m Average Error = (12+23)/2 = 17.5 cm Length of standard chain = L = 30 m Length of chain during measurement = L^1 = 30 + 0.175 = **30.175 m** **True Distance = (30.175/30) x 1850 = 1860.792 m** **Total true Distance = 1753.50 + 1860.792 = 3614.292 m**	1 1 1 1
Q2)b)ii)Draw convention sign for i)Marshy land ii) Road iii) Cutting iv) Bridge.	4
 Marshy land  Road(Any one)  Cutting  Bridge(Any one) *(Note-for each fig1 marks)*	*
Q2)c)Plot the following cross staff closed traverse survey and find the area of field ABCDEFA.(All dimensions are in meter) 120 Station D E52 82 60 71 C E34 31 18 58 B Station A00	



Sr.No.	Fig.	Chaining		Base	Offset		Mean Offset	Area (Sq.m)
		From	To		No.1	No.2		
1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**(5x8)**
I	ΔABb	0	18	**18**	0	58	**29**	**522**
II	[] bBCc	18	60	**42**	58	71	**64.5**	**2709**
III	ΔcCD	60	120	**60**	71	0	**35.5**	**2130**
IV	ΔEeD	82	120	**38**	52	0	**26**	**988**
V	[] EefF	31	82	**51**	52	34	**43**	**2193**
VI	ΔFfA	0	31	**31**	34	0	**17**	**527**
Total								**9069 Sq.m**

**(Note-for Table 1 mark, Each fig.area 1 mark ,final answer 1 mark)*

Q3)a)Describe the temporary adjustment of a level	04
Temporary adjustments- The adjustments made at every setup of level before the staff readings are taken are known as temporary adjustments. The following are the different steps to be followed in temporary adjustments. Setting Up : 1) Selection of suitable level inst. Station/	01 01

2) Fixing level on the tripod stand 3) Approximate leveling by leg adjustments Levelling Up: Perfect leveling by foot screws Focusing: 1) Focussing of Eye piece 2) Focussing of object glass - 3) Removal of parallax	01 01
Q3)b)Define a) Base line b)Check line c)Tie line d)perpendicular offset.	4
a) Base line-The line on which the framework of survey is built or the longest survey line running roughly through the middle of the area is known as base line. b) Check line-A line joining the apex of a triangle to some fixed point on the opposite side or its base is known as check line. c) Tie line- A line joining tie station (Fixed points) or stations on the main survey line or any other survey line known as tie line. d) Perpendicular offset- When the lateral measurements or offset taken perpendicular or right angle to the chain line is known as perpendicular offset.	1 1 1 1
Q3)c)State the different types of Bench marks .Explain permanent bench mark.	4
(i)GTS (ii)permanent (iii)temporary (iv) Arbitrary *(1/2 mark each type)* Permanent bench mark-Fixed point or marks established by different government department like PWD, Railway, Irrigation etc. The RLs of these points are determined with reference to GTS bench mark are known as permanent bench mark .These bench marks are established on plinth of a buildings , parapet of bridges, culverts , km stone etc. **(Note: For each type BM ½ mark ,2 mark for explaination)*	*
Q3)d)Explain how do you adjust the closing error graphically for closed traverse.	4
 	2

Graphical adjustment of closing error

Procedure-

i) Draw horizontal line equal to perimeter of traverse

ii) Set the distance of each line on it i.e. AB_1,BC_1,CD_1 etc. equal to the length of the line to any convenient scale.

iii) At A_1 draws a line A_1a parallel or perpendicular and equal to the closing error AA_1, joint A_1a. (Fig b or c ,consider any one)

iv) Draw line B_1b, C_1c etc. parallel to A_1a as shown in figure. The intercept B_1b,C_1c etc. are corresponding error both magnitude and direction through which $A_1B_1C_1D_1E_1$ have to be shifted to new points.

v) Draw short lines parallel to closing error AA_1 through the stations $B_1C_1D_1E_1$ and mark the corresponding error at each point on each line, joint new points in the traverse i.e. A. B, C, D and E . This gives the new corrected traverse.

2

Q3)e)Find the included angle between following lines

1) N 57^0 30' E and S 78^0 00' E
2) 80^0 30' and $291^0$45'

4

1) $180-(57^0 30' + 78^0 00') = 44^0 30'$ *(Note-Calculation 1 mark, Ans1 mark)* 2

2) $291^0 45' - 80^0 30' = 211^0 15'$ *(Note-Calculation 1 mark, Ans1 mark)* 2

Q4)a)The following is the page of level field book. Fill the missing reading and calculate the R.L.'s of all points .Apply usual check. 8

Sr . No.	B.S.	I.S.	F.S.	Rise	Fall	R.L.	Remarks
1	xx					150.020	BM1
2		2.295			Xx	148.835	
3	xx		1.04	1.255		150.090	CP
4		2.815		0.395		150.485	
5		xx			0.760	149.725	
6	2.15		0.875	2.700		Xx	
7		3.67			Xx	150.905	BM2
8		1.99		1.680		152.585	
9			xx		1.68	xx	

Sr . No.	B.S.	I.S.	F.S.	Rise	Fall	R.L.	Remarks
1	**1.110**					150.020	BM1
2		2.295			**1.185**	148.835	
3	**3.210**		1.04	1.255		150.090	CP
4		2.815		0.395		150.485	
5		**3.575**			0.760	149.725	
6	2.15		0.875	2.700		**152.425**	
7		3.67			**1.520**	150.905	BM2
8		1.99		1.680		152.585	
9			**3.670**		1.68	**150.905**	

*

150.020-148.835=1.185(fall)

2.295-1.185=1.110

2.815+0.395=3.210

2.815+0.760=3.575

149.725+2.70=152.425

1.990+1.680=3670

152.585-1.680=150.905

2.150-3.670=1.520 (fall)

∑BS - ∑FS = ∑Rise - ∑ fall = Last RL - First RL

6.470 - 5.585 = 6.030 - 5.145 = 150.905 - 150.020

0.885 = 0.885 = 0 .885

**(Note-Each missing reading ½ mark, Arithmetic check 2 mark ,Calculation 2 marks)*

Q4)b)i)Difference between height of collimation method and rise and fall method of calculation of reduced level. 4

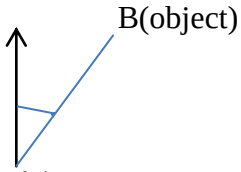
Height of collimation method	Rise and fall method
1)It is more rapid	1)It is slow
2)It involves less calculations	2)It involves more calculations
3)It is simple	3)It is little difficult
4)It involves two arithmetic check ∑BS - ∑FS =Last RL-First RL	4)It involves three arithmetic check ∑BS - ∑FS =∑Rise -∑ fall =Last RL-First RL
5)In this no check on RL of IS hence mistake made remains unchecked	5) In this complete check on RL of IS .
6)Error in RL calculation of any point is	6) Error in RL calculation of any point

*

not carried forward.	is carried forward.
7)It is used for profile leveling i.e. for canal, road, longitudinal leveling and where more no of IS .	7)It is used for fly ,check leveling i.e. for transpiring TBM ,BM, Alignment of structure etc.

* *(Note-Any four 1 mark each)*

Q4)b)ii)Explain with neat sketch the procedure of measurement of magnetic bearing of line. 4



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Procedure:-let us measure bearing of line AB

1) Set up the prismatic compass at station A and carry out all temporary adjustment(i.e. centering ,leveling , focusing of prism)
2) Turn the compass box until the ranging rod at station B is bisected by horse hair seen through vertical slit above the prism .
3) When the needle comes to rest bisect the ranging rod at B exactly and note the reading .It gives the magnetic bearing of the line AB as shown in fig.

**(Note-Sketch 1 mark , explaination 3 marks)*

Q4)c)i)Explain the method of chaining on sloping ground by method of stepping . 4

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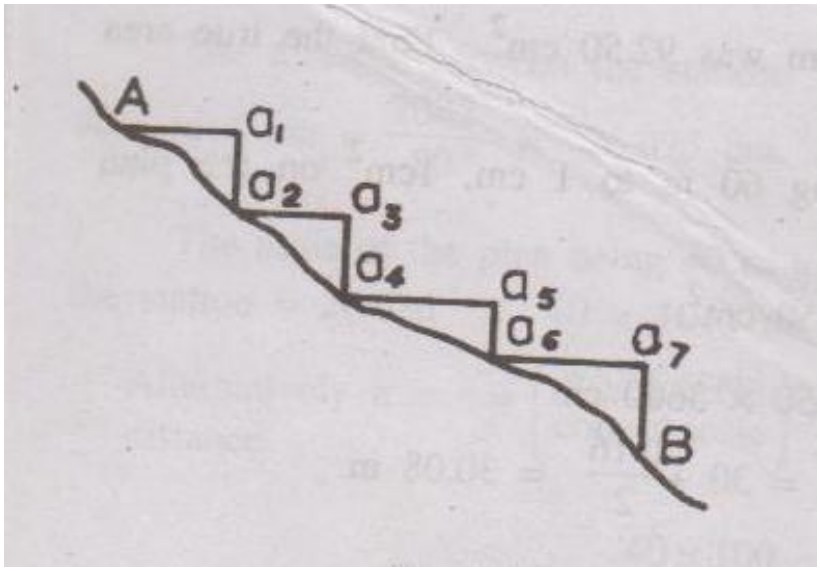


Method of stepping

Suppose it is required to measure horizontal distance between A and B as shown in fig. The follower holds the zero end of the chain or tape at A on the ground, while the leader holds it at suitable length (Aa1) and stretch it horizontally .The follower then ranges the leader in line with B. The leader then transfers his end (a1)to the ground by means of plumb bob and marks the point (a2) with an arrow. The follower then moves to the point (a2) and holds the zero end of the chain at a2. The leader, holding the chain at the same or different length(Aa2),stretches it horizontally. The follower then directs the leader into true alignment when the leader marks the point a4 on the ground vertically below his end a3 by plumb bob. Similarly other points are marked. The distance AB is then equal to sum of the length of the steps as shown in figure(Distance AB =Aa1 + a2a3 + a4a5 +a6a7)

* *(Note:- Figure 2 Marks,Expaination 2 Marks)*

Q4)c)ii) Define fundamental axis of a dumpy level and give their relationship.

(Note:- If student tried to define the fundamental axis also give 2 mark.) *

Fundamental axis of dumpy level are as follows

1) Axis of line of collimation 2)Vertical axis 3) Axis of telescope 4) Axis of bubble tube or bubble axis.
2) Relationship between fundamental axis are as follows (Any two)
   i)The line of collimation should be parallel to the bubble axis
   ii)The line of collimation and axis of telescope should coincide with one another
   iii)The bubble axis should be perpendicular to the vertical axis

(Note:- ½ Mark for each fundamental axis and 1 mark for each relation)

Q5) a)The following bearing were observed in traverse survey conducted with prismatic compass at the place where local attraction was suspected. 8

Line	For Bearing	Back Bearing
PQ	$191^{o}45'$	$13^{o}00'$
QP	$39^{o}30'$	$222^{o}30'$
RS	$22^{o}15'$	$200^{o}30'$
ST	$242^{o}45'$	$62^{o}45'$
TP	$330^{o}15'$	$147^{o}45'$

At which station do you suspect local attraction ?

Find: 1) Corrected bearing of lines. 2) Included angle between them.

Line	For Bearing	Back Bearing	Local Attraction (At)	Corrected	
				FB	BB
PQ	$191^o45'$	$13^o00'$	$P=2^030'$	$194^015'$	$14^015'$
QP	$39^o30'$	$222^o30'$	$Q=1^015'$	$40^045'$	$220^045'$
RS	$22^o15'$	$200^o30'$	$R=-1^045'$	$20^030'$	$200^030'$
ST	$242^o45'$	$62^o45'$	S=0	$242^045'$	$62^045'$
TP	$330^o15'$	$147^o45'$	T=0	$330^015'$	$150^015'$

*

Local attraction is suspected at stations P, Q and R because difference between fore bearing and back bearing of lines PQ , QR , RS ,and TP is not equal to 180^0.

Calculations for local attraction correction and corrected FB and BB:-

FB and BB of line ST are correct therefore station S and T are free from LA. Hence the FB of line TP and BB of line RS are correct .

Corrected BB of line TP=$330^015'-180^000'=150^015'$

Local attraction at P=$150^015'-147^045'= 2^030'$

Corrected FB of line PQ=$2^030'+191^045'=194^015'$

Corrected BB of line PQ=$194^015'-180^000'=14^015'$

Local attraction at Q=$14^015'-13^00'=1^015'$

Corrected FB of line QR=$1^015'+39^030'=40^045'$

Corrected BB of line QR=$40^045'+ 180^000'=220^045'$

Corrected FB of line RS=$-1^045'+22^015'=20^030'$

Local attraction at R=$220^045'-222^030'= -1^045'$

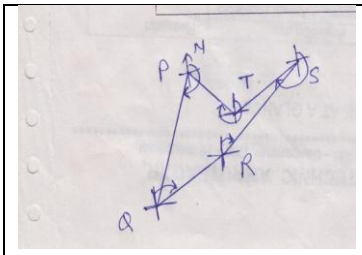
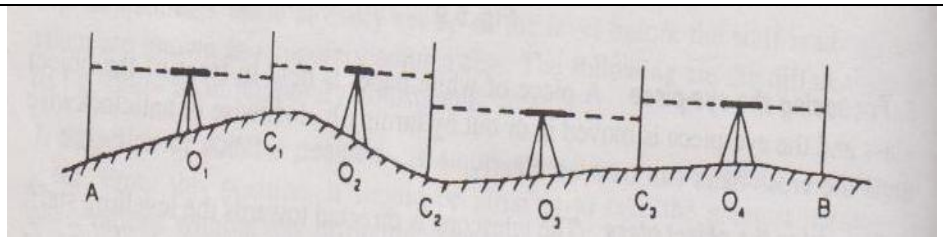
Corrected BB of line RS=$20^030' + 180^000'=200^030'$ Which is equal to observed BB of line RS. Therefore check OK.

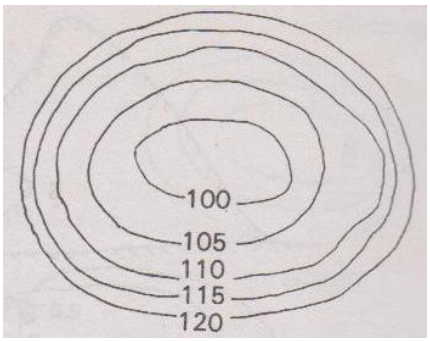
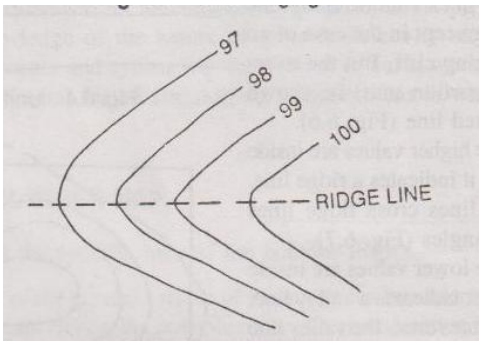
Calculation for include angles:-

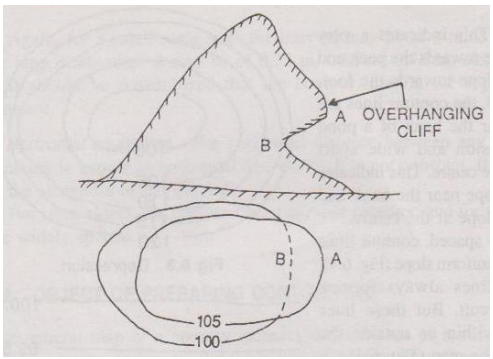
- $\angle$ Q=40045'-$14^015'=26^030'$
- $\angle$R=$220^045'-20^030'=200^015'-360^0=159^045'$
- $\angle$ S=$242^045'-200^030'=42^015'$
- $\angle$ T=$330^015;- 62^045'=267^030'$
- $\angle$ P=$194^015'-150^015'=44^000'$

Sum of all angles = $540^000'=(2n - 4)90^0$

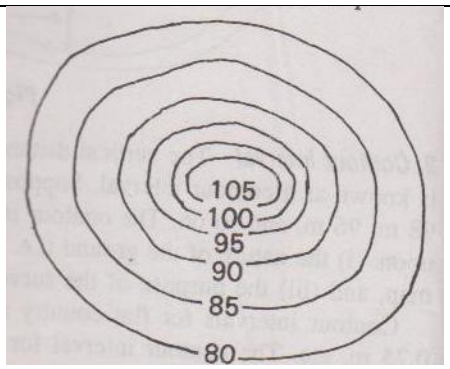
Where n=no of angle

 *(Note-1 mark for sketch, Local attraction stations 1 mark ,included angle 2 marks, corrected FB BB 2 Marks, Calculation 2 marks)*	
Q5)b)i) What is meant by interpolation of contour ? State the methods of interpolation.	4
Interpolation of contour-The process of spacing or locating the contours proportionately between the ground points(plotted points with spot levels) is known as interpolation of contour. Methods of interpolation:- 1) By estimation 2)By arithmetical calculations 3)By graphical method *(*Note -any two 1mark for each method)*	*
Q5)b)ii) Explain procedure of differential leveling with neat sketch.	4
 Differential Leveling Procedure-Suppose it is required to know the difference between station A and B. The level is set up at points O1,O2,O3 etc. After temporary adjustment staff readings are taken at every setup . The points C1,C2,C3 are known as change point calculate RLs of all points and find difference between A and B. *(Note-sketch 2 marks, procedure 2 marks)*	*
Q5)c)i)State any four component parts of prismatic compass and give their uses.	4
i) Compass box-To accommodate all component parts assembly ii) Pivot –To support magnetic needle and graduated ring. iii) Graduated ring- To measure bearings. iv) Object vane- To bisect object v) Lifting pin and lifting leaver-To prevent undue wear of pivot point ,agate cap and to release needle freely. vi) Spring break and knob- To stop oscillation of ring	*

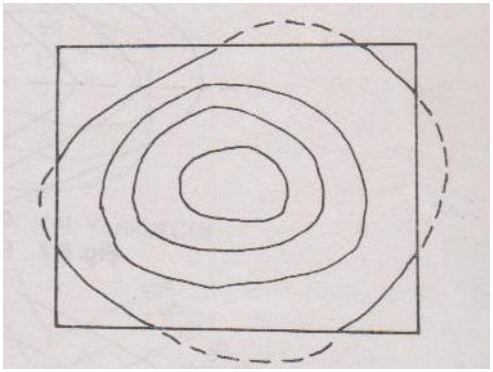
vii) Prism-To see graduation erect and magnified viii) Glass cover-To get ring visible , to see graduations. ix) Hinged sunglasses- To sight sun and luminous object. x) Metal cover- To cover the glass cover when compass is not in use. xi) Agate cap-Suspend the needle and ring freely on pivot **(Note-Any four 1 mark each)*	
Q5)c)ii)Explain the characteristics of contours with neat sketch.	4
1) All points on the same contour have same elevation or heights. 2) Two contour lines of different elevation can not cross or merge one another on the map except in case of overhanging cliff, vertical cliff and dam. 3) Contour lines close together indicates steep slope. 4) Contour lines far apart indicate gentle slopes. 5) Contour lines equally space indicates uniform slope 6) Straight parallel contour line indicate plane surface. 7) Irregular contour lines indicates rough surface. 8) Ridge lines and valley lines cross contours at right angles.+ 9) A closed contour line with one or more, higher one inside it indicate hill. 10) A closed contour line with one or more, lower one inside it indicates valley or depression. 11) Contour lines cannot have an end within limit of the map and must close on itself.  Valley  Ridge Line	*



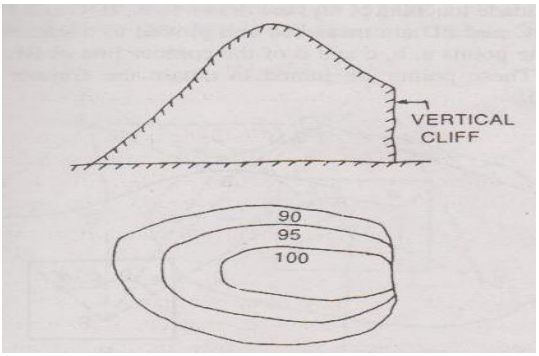
Overhanging cliff



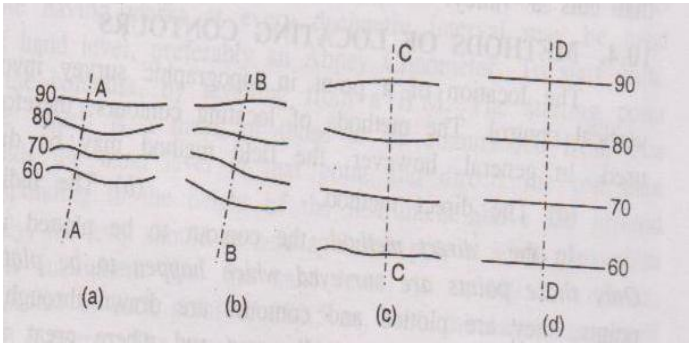
Hill



Closing and ending of contours on map



Vertical cliff



Slopes-Steep,Gentel,Uniform

**(Note –Any fourcharacteristic , ½ mark for each skech and 1/2 mark for meaning)*

Q6)a)i)State the trapezoidal and prismoidal formulae for volume computation .Also state the application of each with examples.	4
Trapezoidal formula:P V=$\frac{D}{2}$(A1 +An+2 (A2 +A3 + …..+An-1)) prismoidal formula: V==$\frac{D}{3}$(A1 + An + 4(A2+A4+An-1)+2(A3+A5+…..+An-2) prismoidal formula is applicable for sections with odd nos and Trapezoidal formula is	*

applicable for sections with even nos.

**s(Note- Trapezoidal formula 1 ½ mark, prismoidal formula 1 ½ mark ,application 1 mark)*

Q6)a)ii) Calculate the area of figure traversed clockwise with anchor point inside and with tracing arm set to give M, the multiplying constant =100 sq.cm and additive constant C=20,initial reading =3.436,Final reading=8.945 — 4

The Zero mark of dial passed the fixed index mark once in the negative (Reverse) direction of a planimeter.

A=M(FR - IR ± 10N + C) — 2

A=100(8.945-3.436- (10 x 1) + 20) — 1

A=1550.9m^2 — 1

Q6)b)The following consecutive reading were taken with a dumpy level : — 8

0.565, 0.854, 0.940, 1.005, 0.640, 0.660, 0.785, 0.800 ,0.635, 1.135 and 1.420.The level was shifted after the fourth and seventh reading. The first reading was taken on the bench mark R.L.100.00.Calculate the reduced levels of the change point, and the difference of level between the first and last points. Apply usual check. Check tabulation.

Sr.No	BS	IS	FS	HI	RL	Remark
1	0.565			100.565	100.00	B.M.
2		0..854			99.711	
3		0.940			99.625	
4	0.640		1.005	100.200	99.560	CP1
5		0.660			99.540	
6	0.800		0.785	100.215	99.415	CP2
7		0.635			99.580	
8		1.135			99.080	
9			1.420		98.795	

*

HI=Benchmark RL + BS=100.00 + 0.565= 100.565

RL=HI – IS or FS, 100.565- 0.854=99.711

100.565-0.940=99.625

100.665-1.005=99.560

99.560 + 0.640=100.200

100.200-0.660=99.540

100.200-0.785=99.415

99.415+0.800=100.215 100.215-0.625=99.580 100.215-1.135=99.080 100.215-1.420=98.795 Arithmetic check: ∑BS - ∑FS = Last RL - First RL 2.005- 3.210 = 98.795 - 100.00 -1.205 = -1.205 **(Note-Table preparation 1 mark, correct reading entry 2 marks, RL calculations 2 marks, Arithmetic check 2 marks, difference in level 1 mark)*	
Q6) c)i)Define the term: 1) Whole circle bearing 2) Parallax 3) Height of collimation 4) Magnetic bearing	4
1) Whole circle bearing-The bearing of line measured clockwise from the north direction towards the line , 0 to 360^o is known as Whole circle bearing of that line 2) Parallax- The apparent movement of the image relative to the cross hair is known as parallax. 3) Height of collimation-When the leveling instrument is properly leveled, the RL of the line of collimation is known as height of collimation. 4) Magnetic bearing- The angle between magnetic meridian and survey line is known as magnetic bearing.	1 1 1 1
Q6) c)ii)Enlist four instrument errors and four observational errors in compass surveying.	4
Instrumental Error s– 1) The needle not being perfectly magnetized and not pointing the correct meridian 2) The pivot being bend and not in the center 3) The pivot being dull and not sharp 4) The needle not being perfectly straight 5) Needle and graduated ring not being horizontal 6) The object vane not being in plumb 7) loose horse hair, Horse hair not being straight 8) Graduation of the ring not being correct and uniform	*

**(Note_Any Four ½ mark each)* Observational Errors:- 1) In accurate centering of compass over the station 2) In accurate leveling of the compass 3) In accurate bisection of the ranging rod or object 4) Carelessness in booking of the reading 5) Carelessness in taking the reading 6) Observer may carry magnetic substances **(Note_Any Four ½ mark each)*	*

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