

DIPLOMA EXAMINATION IN ENGINEERING/TECHNOLOGY/
MANAGEMENT/COMMERCIAL PRACTICE — OCTOBER, 2018

SURVEYING - I

[Time : 3 hours

(Maximum marks : 100)

PART — A

(Maximum marks : 10)

Marks

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

1. List the accessories of chain survey.
2. Define the term bearing of a line.
3. Differentiate between back sight and fore sight.
4. List the names of different bench marks.
5. Write any two uses of contour map.

(5×2 = 10)

PART — B

(Maximum marks : 30)

II Answer any *five* of the following questions. Each question carries 6 marks.

1. The area of a field measured with a chain which was 0.8% too short was found to be 35hectars. What is the true area ?
2. Explain the intersection method of plain table surveying.
3. The fore bearing of the sides of a closed traverse ABC are AB-45°, BC-116° and CA-275°. Calculate the included angles and apply the check.
4. List and explain the different errors that may occur in compass surveying.
5. Explain about the rise and fall system of reduction of levels.
6. With the Aid of a neat sketch, explain reciprocal levelling.
7. Determine the combined correction for curvature and refraction for a distance of
(a) 4.5km and (b) 7200m

(5×6 = 30)

PART — C

Marks

(Maximum marks : 60)

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

UNIT — I

- III (a) Define the term orientation. What are the methods ? Explain. 7
- (b) Plott the following cross staff survey of a field and calculate the area.

	96	D
E 90	70	
	40	40 C
F 50	24	
	12	40 B
	0	A

8

OR

- IV (a) A chain line AB is obstructed by a pond and the point A and B are on either side of the pond. At A a line DAC was ranged out. The distance AD = 320m, AC = 280m, DB = 530m and CB = 485m. Find the distance AB. 7
- (b) Find the area in square meter from the following field book entries.

	700	E
	600	180 D
F 150	400	
	280	130 C
G 110	130	
	100	40 B
	0	A

8

UNIT — II

- V (a) Explain the procedure for the adjustment of closing error of a compass traverse by graphical method. 7
- (b) The following bearings were observed for a closed traverse ABCDEA which are suspected for local attraction. Determine the corrected bearing of the lines.

Line	FB	BB
AB	150° - 20'	328° - 40'
BC	76° - 00'	255° - 30'
CD	42° - 30'	223° - 45'
DE	313° - 15'	134° - 15'
EA	220° - 15'	40° - 15'

8

OR

- VI (a) List the usual methods of plotting a compass traverse. Explain. 7
- (b) A chain line PQR crosses a river. Points Q and R are located on the near and the distant banks respectively. The length of line PQ = 80m. A line QS 160m is set at right angles to the chain line at Q. The WCB of R and P taken at S are 310° and 220° respectively. Find the width of the river. 8

UNIT — III

- VII (a) Describe the temporary adjustment of levelling. 7
- (b) The following consecutive readings were observed with a dumpy level in a continuously sloping ground at 20m interval. 0.735 at A, 1.225, 1.575, 1.920, 2.560, 0.950, 1.235, 1.850, 2.750, 0.875, 1.325, 2.000 on B. The reduced level of starting point A is 120.00. Determine the gradient of the line AB. 8

OR

- VIII (a) Define the terms. 7
- (i) Height of instrument (ii) Change point (iii) Back sight and fore sight
- (b) The following staff readings were observed successively with a level. The instrument was shifted after the third, sixth and eighth reading. Determine the level difference between the first and last stations using rise and fall method. The first reading were taken on a staff held on BM 100.00.
- 3.865, 3.345, 2.930, 1.950, 0.855, 3.795, 2.640, 1.54, 1.935, 0.865 and 0.665. 8

UNIT — IV

- IX (a) Explain profile levelling. 7
- (b) The observer standing on the deck of a ship just sees the top of a light house which is 50m above sea level. If the height of the observers eye is 10m above sea level, determine the distance of the observer from the light house. 8

OR

- X (a) Explain indirect methods of locating contours. 7
- (b) List the characteristics of contours. Explain. 8

12

SCHEME OF VALUATION

Code: 2011 (15)

1

Revision - 2015

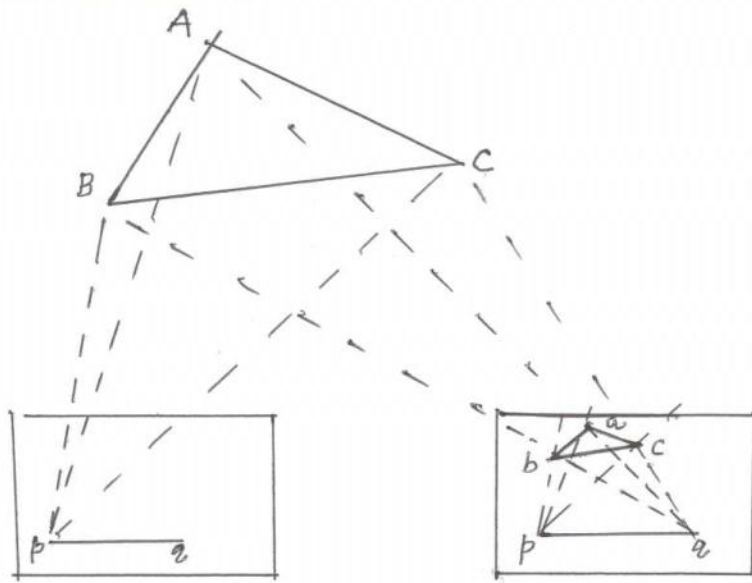
Course Cod - TED(15) 2011.

Course title - Surveying I.

Qst No:	Scoring indicators.	Split up marks	Sub total	Total
	<u>PART-A</u>			
I	1: chain, cross staff, arrows, offset rod, ranging rod, tape	4x1/2	2	
	2: the bearing of a line is the angle the line makes with the meridian.	2	2	
	3: The first reading taken in a set up is Back sight and the last reading before shifting the level is the foresight.	2	2	
	4: GTS Bench mark, Permanent B.M, Temporary B.M and Arbitrary B.M (4x1/2)	2	2	
	5: ① For alignment of road, railway or canal and ② for estimation of Reservoir Capacity	2	2	
	<u>PART-B</u>			
II	(1) Let true length of chain = L. Actual length of chain = $L - \frac{0.8}{100} \times L$ Measured area = 35 hectares. True area = $\left[\frac{\text{Actual length}}{\text{True length}} \right]^2 \times \text{Measured area}$ $= \left[L - \frac{0.8}{100} \times L \right]^2 \times 35 = \frac{99.2^2}{100^2} \times 35 = \underline{\underline{34.44 \text{ Hect}}}$	2	6	

II

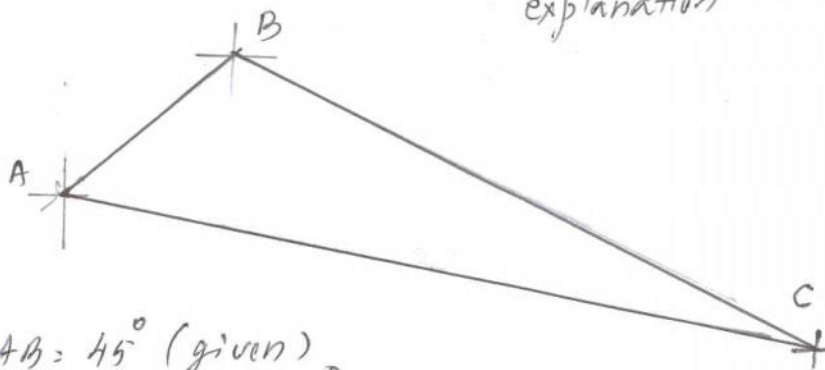
2)



explanation

II

3)



F.B of AB = 45° (given)
 B.M of AB = $180 + 45^\circ = 225^\circ$
 Deduct F.B of BC $\rightarrow 116^\circ$
 included angle B = $\underline{109^\circ}$ — Answer (1)

B.M of BC = $116^\circ + 180^\circ = 296^\circ$
 Deduct F.B of CA $\rightarrow 275^\circ$
 included angle C = $\underline{21^\circ}$ — Answer (2)

B.M of CA = $275^\circ - 180^\circ = 95^\circ$
 deduct F.B of AB $\rightarrow 45^\circ$
 included angle A = $\underline{50^\circ}$ — Answer (3)

check sum of included angle of a triangle
 $109^\circ + 21^\circ + 50^\circ = 180^\circ$ — (OK)

II

- A) (a) Errors due to Perimetric Compass + explanation 2
- (b) Errors of manipulation and sighting + explanation 2
- (c) Errors due to external influences + explanation 2

4

6

2

2

1

1

1

1

6

6

II (5)

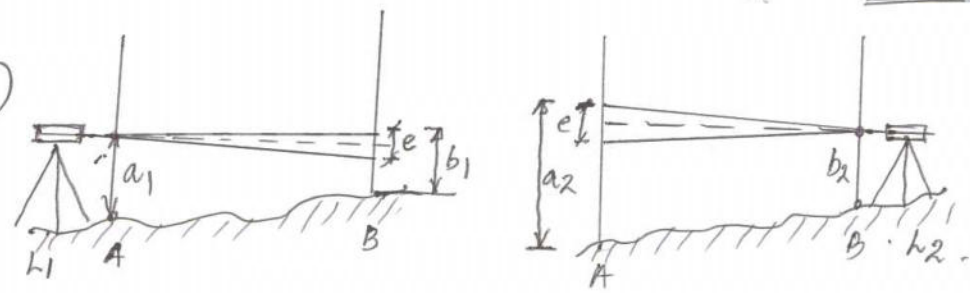
Explanations about rise and fall system 2

Standard tabulation form 2 6

Arithmetical check 2

II

6)



the correct reading on B on first set up = $b_1 - e$. 6

True difference between A & B in this set up = $b_1 - e - a_1$

the correct reading on A on second set up = $a_2 - e$. 3

True difference in this set up = $b_2 - (a_2 - e) = b_2 - a_2 + e$

Adding 2x difference = $(b_1 - a_1) + (b_2 - a_2) + 2e$

$$\therefore \text{True difference} = \frac{(b_1 - a_1) + (b_2 - a_2) + 2e}{2}$$

II

1) (a) Combined Correction for curvature and refraction for a distance 4.5 km
 $= 0.0673 D^2 = 0.0673 \times 4.5^2 = 1.363 \text{ m}$. 3

(b) Combined Correction for curvature and refraction for a distance 7.2 km
 $= 0.0673 D^2 = 0.0673 \times 7.2^2 = 3.489 \text{ m}$, 3

PART C

UNIT - I

III (a) The operation of keeping the plane table at each of the successive stations parallel to the position which it occupied at the first station is known as orientation.

2

- Methods (1) orientation by magnetic needle + explanation
 (2) orientation by back sighting + explanation

2

3

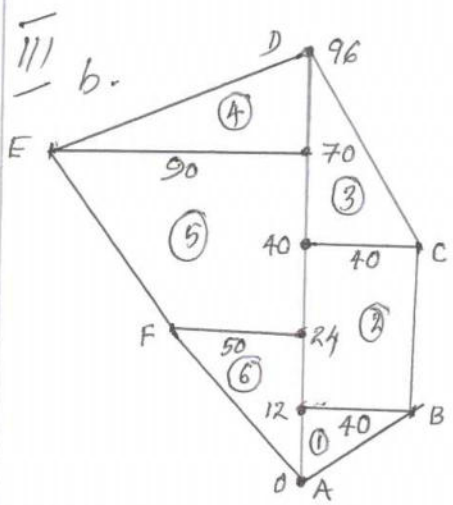


Fig: 4

$$\begin{aligned} \text{Area} &= \left[\frac{1}{2} \times 40 \times 12 \right] + [40 \times 28] + \\ & \left[\frac{1}{2} \times 40 \times 56 \right] + \left[\frac{1}{2} \times 26 \times 90 \right] + \\ & \left[\left(\frac{90+50}{2} \right) \times 46 \right] + \left[\frac{1}{2} \times 50 \times 24 \right] \\ &= \underline{\underline{7470 \text{ m}^2}} \end{aligned}$$

4

IV (a) Let $\angle DCB = \theta$.

In ΔCDB

$$DB^2 = DC^2 + CB^2 - 2 \cdot DC \cdot CB \cdot \cos \theta$$

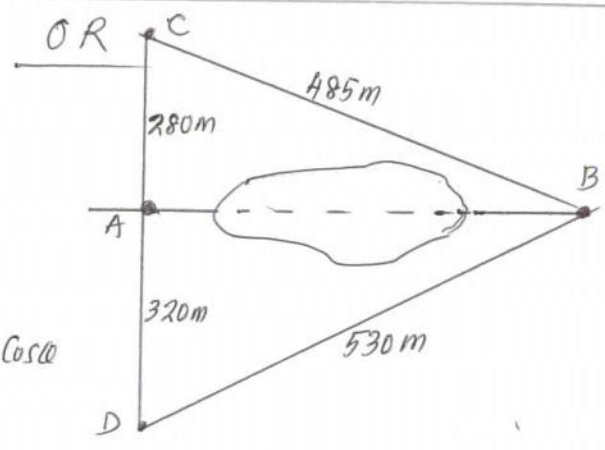
$$\cos \theta = \frac{DC^2 + CB^2 - DB^2}{2 \cdot DC \cdot CB}$$

$$= \frac{600^2 + 485^2 - 530^2}{2 \times 600 \times 485} = \underline{\underline{0.54}}$$

From ΔACB .

$$\begin{aligned} AB^2 &= AC^2 + BC^2 - 2 \cdot AC \cdot BC \cdot \cos \theta \\ &= 280^2 + 485^2 - 2 \times 280 \times 485 \times 0.54 \end{aligned}$$

Length $AB = \underline{\underline{408.60 \text{ m}}}$



3

2

2

7

8

15

7

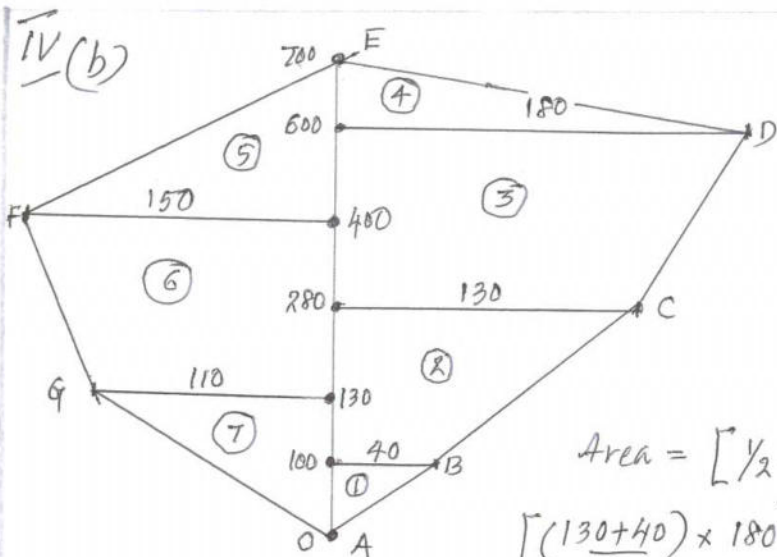


Fig: 3.

$$\begin{aligned} \text{Area} &= \left[\frac{1}{2} \times 100 \times 40 \right] + \\ & \left[\left(\frac{130+40}{2} \right) \times 180 \right] + \left[\left(\frac{180+130}{2} \right) \times 280 \right] \\ & + \left[\frac{1}{2} \times 180 \times 100 \right] + \left[\frac{1}{2} \times 150 \times 300 \right] + \left[\left(\frac{150+110}{2} \right) \times 270 \right] + \\ & \left[\frac{1}{2} \times 110 \times 130 \right] = \underline{\underline{140650 \text{ m}^2}} \end{aligned}$$

15

8

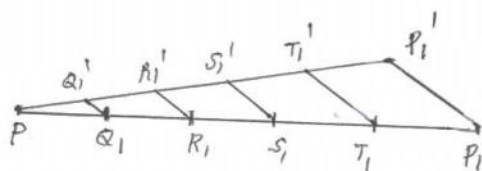
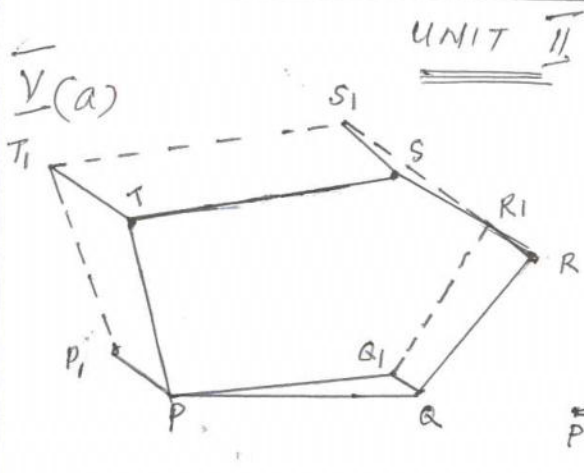


Fig 4

explanations:-

3.

7

V(b) the difference between the FB and BB of the line EA = 180° ∴ EA is not affected 1

∴ Correct FB of AB = 150° 20'

Correct BB of AB = 150° 20' + 180 = 330° 20'

Correction at B = 330° 20' - 328° 40' = +1° 40'

∴ Correct F.B of BC = 76° 0' + 1° 40' = 77° 40' 2

Correct B.B of BC = 180 + 77° 40' = 257° 40'

observed B.B of BC = $255^{\circ}30'$

Correction at C = $257^{\circ}40' - 255^{\circ}30' = \underline{\underline{+2^{\circ}10'}}$

Correct F.B of CD = $42^{\circ}30' + 2^{\circ}10' = 44^{\circ}40'$

Correct B.B of CD = $180^{\circ} + 44^{\circ}40' = 224^{\circ}40'$

observed B.B of CD = $223^{\circ}40'$

Correction at D = $224^{\circ}40' - 223^{\circ}40' = \underline{\underline{+1^{\circ}0'}}$

Correct F.B of DE = $313^{\circ}15' + 1^{\circ}0' = 314^{\circ}15'$

Correct B.B of DE = $314^{\circ}15' - 180^{\circ} = 134^{\circ}15'$

observed B.B of DE = $134^{\circ}15'$

Correction at E = $134^{\circ}15' - 134^{\circ}15' = \underline{\underline{-0^{\circ}0'}}$

2

2

8

15

1

Line	F.B	B.B
AB	$150^{\circ}20'$	$330^{\circ}20'$
BC	$77^{\circ}40'$	$257^{\circ}40'$
CD	$44^{\circ}40'$	$224^{\circ}40'$
DE	$314^{\circ}15'$	$134^{\circ}15'$
EA	$220^{\circ}15'$	$40^{\circ}15'$

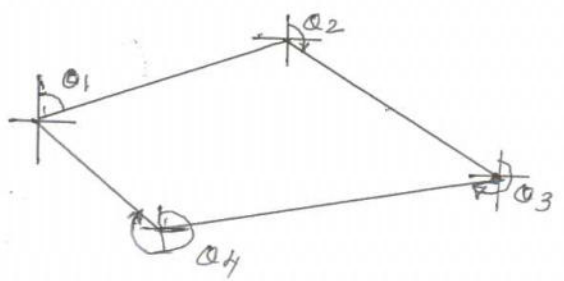
OR

VI (a) the commonly adopted methods are -

- 1: By parallel meridian method
- 2: By included angle method

3.

1: By parallel meridian method



+ explanation

2

VII (b)

Station	BS	IS	FS	Rise	Fall	RL	Remarks
A	0.735					120.00	
1		1.225			0.490	119.51	
2		1.575			0.350	119.16	
3		1.920			0.345	118.815	
4	0.950		2.560		0.64	118.175	
5		1.235			0.285	117.89	
6		1.850			0.615	117.275	
7	0.875		2.750		0.90	116.375	
8		1.325			0.45	115.925	
B			2.000		0.675	115.25	
$\Sigma =$		<u>2.56</u>	<u>7.31</u>		<u>4.75</u>		

tabular
2
3
8

15

Check. $\Sigma BS \sim \Sigma FS = 4.75$, $\Sigma Fall = 4.75$, $1^{st} RL - last RL = 4.75$

Total length from A to B = $9 \times 20 = 180m$.
Gradient = $4.75/180 = \underline{\underline{1/37.89}}$

OR

VIII (a) (1) Height of Instrument — Elevation of the ~~level~~ of collimation when the levelling instrument is perfectly levelled

(2) change point — A change point is a point denoting the shifting of the level. It is a point on which fore and back sight are taken.

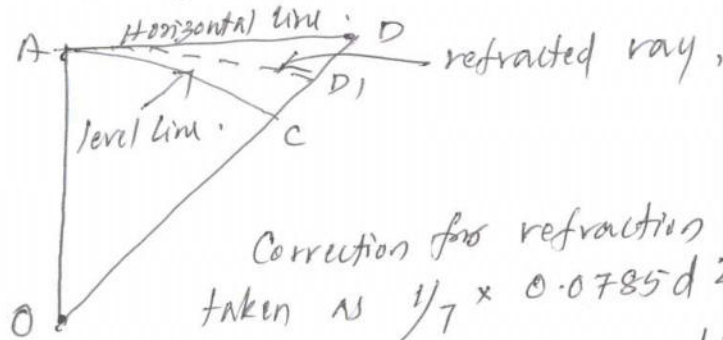
(3) Back sight and fore sight — It is a reading taken by a level on a levelling staff held on a point whose elevation is known. It is the first reading taken after setting level. Fore sight is the reading taken on a point whose elevation is to be found out. It is the last reading before shifting

2
2
7
1/2
1/2

$DC = 0.0785 d^2$ When DC is in m and d is in km.

Refraction.

The air is denser near the earth. The ray of light from staff to the instrument travels from a thinner medium to a denser medium. So the line of sight does not remain horizontal.



Correction for refraction is taken as $\frac{1}{7} \times 0.0785 d^2$
 Correction for refraction = $0.0112 d^2$

VIII(b)

station	BS	IS	FS	Rise	Fall	RL	Remark
1	3.865					100.00	
2		3.345		0.52		100.52	
3	1.950		2.930	0.415		100.935	CP1
4		0.855		1.095		102.03	
5	2.640		3.795		2.940	99.09	CP2
6	1.935		1.54	1.10		100.19	CP3
7		0.865		1.07		101.26	
8			0.665	0.20		101.46	
Σ	10.39		8.93	4.40	2.94		

$\Sigma BS - \Sigma FS = 10.39 - 8.93 = 1.46$

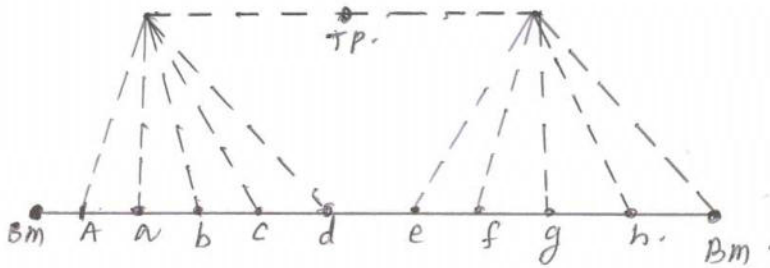
$\Sigma Rise \sim \Sigma Fall = 4.40 - 2.94 = 1.46$

$1^{st} RL - last RL = 101.46 - 100 = 1.46$

\therefore level difference between 1st & last point = 1.46m.

UNIT IV

- IX (a) (1) It is the process of levelling to determine the elevation of points at known distances apart along a given line.
 (2) It is also called longitudinal levelling
 (3) The fixed line may be the centre line of highway, railway, curves etc.
 (4) It starts from a B.M and ends at another B.M
 (5) If B.M is not available TBM may be established

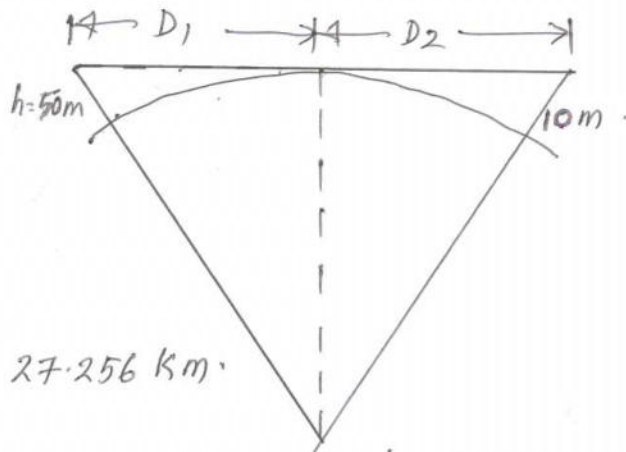


4

7

3

IX (b)



$h = 50 \text{ m}$

$\therefore 50 = 0.0673 D_1^2$

$D_1 = \sqrt{\frac{50}{0.0673}} = 27.256 \text{ km}$

observers position is 10m above sea level

$\therefore D_2 = \sqrt{\frac{10}{0.0673}} = 12.189 \text{ km}$

\therefore Distance of the observer from the light house $= D_1 + D_2 = 27.256 + 12.189 = 39.445 \text{ km}$

3

1

3

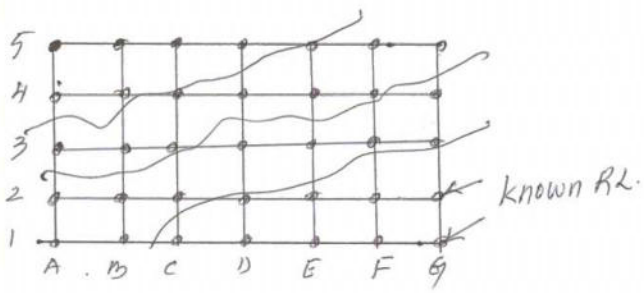
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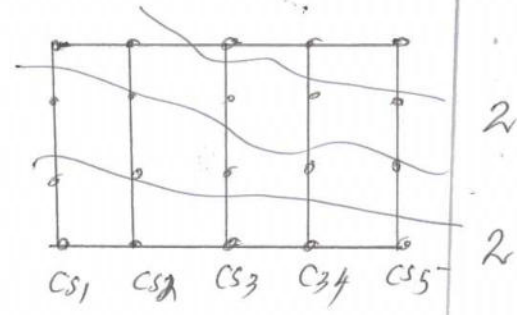
OR

X a) The reduced levels of points known as spot levels are taken along a series of lines laid out over the area and their positions are then plotted on the map and the contours are then interpolated - there are two methods.

(1) Grid or Square method (2) By Cross section method

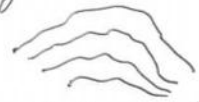


Grid or Square method

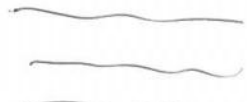


Cross section method

X b) 1: The spacing between the contour lines depends on the slope of the ground.



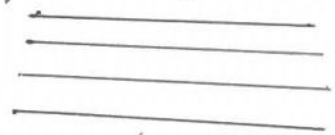
steeper slope



uniform slope

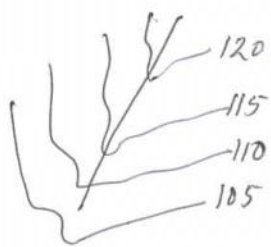
2: If the contour lines are equally spaced they indicate uniform slope.

3: If the contour lines are parallel, straight and equally spaced it indicates a plane surface.

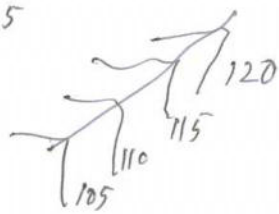


Plane surface

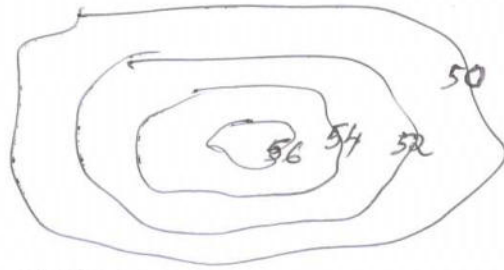
4: Ridge line



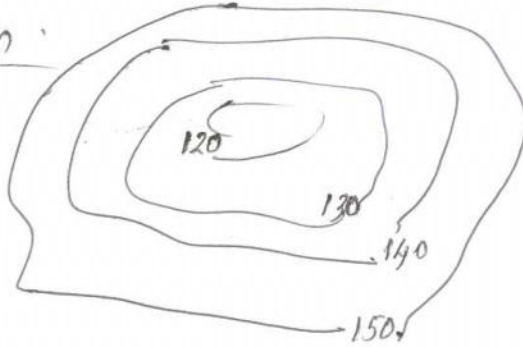
5: Valley line



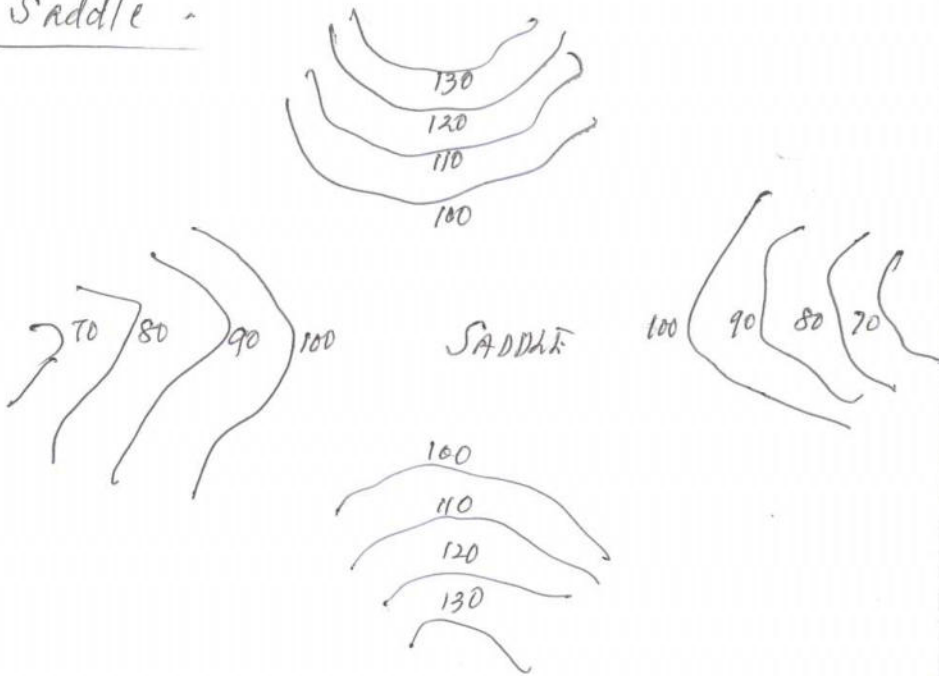
(6) Vertical cliff.



(7) Depression.



(8) Saddle.



8 8 15