SUMMER– 19 EXAMINATION

Subject Name: **Model Answer** Subject Code: 22205

Important Instructions to examiners:

1) The answers should be examined by key words 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 errors such as grammatical, spelling errors should not be given more Importance (Not applicable for subject English and Communication Skills.
4) While assessing figures, examiner may give credit for principal components indicated in the figure. The figures 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 some cases, the assumed constant values may vary and there may be some difference in the candidate's answers and model answer.
6) In case of some questions credit may be given by judgement on part of examiner of relevant answer based on candidate's understanding.
7) For programming language papers, credit may be given to any other program based on equivalent concept.

Q. No.	Sub Q.N.	Answer	Marking Scheme
1.		**Attempt any FIVE of the following :**	**5 x 2 =10 Marks**
	(a)	**State two principles of survey.**	***2 M***
	Ans.	Two principles of surveying are: 1) To work from whole to part. 2) To locate a point at least by two independent processes	***(01 Mark)*** ***(01 Mark)***
	(b)	**Define: (i) offset , (ii) Tie line**	***2 M***
	Ans.	**(i) offset** The ground features such as buildings, boundaries, roads ,nallas etc, are located with reference to the chain lines. Distances are measured from the chain lines to the objects right or left of chain line. Such distances (lateral measurements) are called "offsets" **(ii) Tie line:** It is a line joining some fixed points as tie stations on the main chain lines. It enables surveyor to locate the interior details.	***(01Mark)*** ***(01Mark)***
	(c)	**State the meaning of term true bearing.**	***2 M***
	Ans.	The horizontal angle between the line and true meridian is called a true bearing of the line.	***(02 Marks)***

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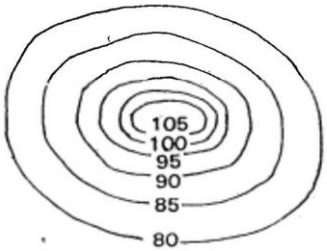
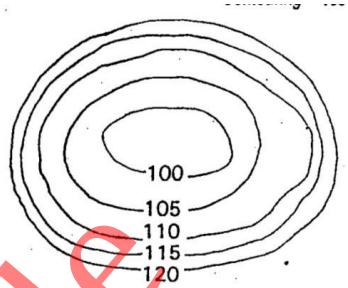
Q. No.	Sub Q.N.	Answer	Marking Scheme
1.	(d)	**List any four types of bench marks.**	*(02 Marks)*
	Ans.	Following are the four types of bench mark (a) GTS Bench-Marks (b) Permanent Bench-Marks (c) Arbitrary Bench-Marks (d) Temporary Bench-Marks	*1/2 mark each*
	(e)	**Draw sketches of (i) hill (ii) depression with contour values**	*(02 Marks)*
	Ans.	 Hill  Depression	*1 mark each*
	(f)	**List any four component parts of digital planimeter.**	*(02 Marks)*
	Ans.	Components of digital planimeter: i) Digital display ii) Rolling wheel or Rollers iii) Tracing arm iv) Function keys or buttons v) Sliding wheel vi) Magnifying glass	*1/2 mark each for any four*
	(g)	**State any two uses of survey**	*(02 Marks)*
	Ans.	Following are the uses of survey 1) It is basically useful for the measurement of areas. 2) It is useful for other purposes, such as engineering, architectural, commercial, scientific, geographical, exploratory, navigational etc. 3) It is used for making of plans in connection with legal documents. 4) Surveying plays an important role in military operations.	*1 mark each for any two*
2.		**Attempt any THREE of the following:**	**12**
	(a)	**List any eight component parts of prismatic compass with their function in brief.**	
	Ans.	Component parts of compass with their function.	*(04 Marks)*

Sr.No	Component	Function
1.	Circular metal box	To protect needle and pivot.

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		2.	Steel pivot	To carry magnetic needle and graduated ring.
		3.	Sighting vane	To sight the object.
		4.	Prism	To see graduation clearly.
		5.	Prism	To see graduation clearly.
		6.	Lifting pin	To lift the needle and hold against glass, thus prevent wear of pivot.
		7.	Glass lid	To protect the graduated ring from external effect.
		8.	Sun glasses/ ray shade	When sun or other luminous objects are to be sighted.
		9.	Metal cover	To protect glass lid.
		10.	Agate cap	To protect the prism from dust.
		11.	Ball and socket arrangement	For leveling the prism
		12.	Graduated ring	To take the bearing of line.
		13.	Break pin	To stop the movement of graduated ring on pivot.
		14.	Focusing stud	To adjust the prism to eye sight of observer
		15.	Magnetic needle	To obtain the north direction.

½ mark each for any eight

(b) State any four differences between plane survey and geodetic survey. ***(04 Marks)***

Ans.

Points	**Plane Surveying**	**Geodetic Surveying**
Definition	Plane surveying is that type of surveying in which mean surface of earth is considered as plane and the spherodical shape is neglected	Geodetic surveying is that type of surveying in which mean surface of earth is considered as spherodical. All lines laying in the surface are curved lines.

01 mark each for any four

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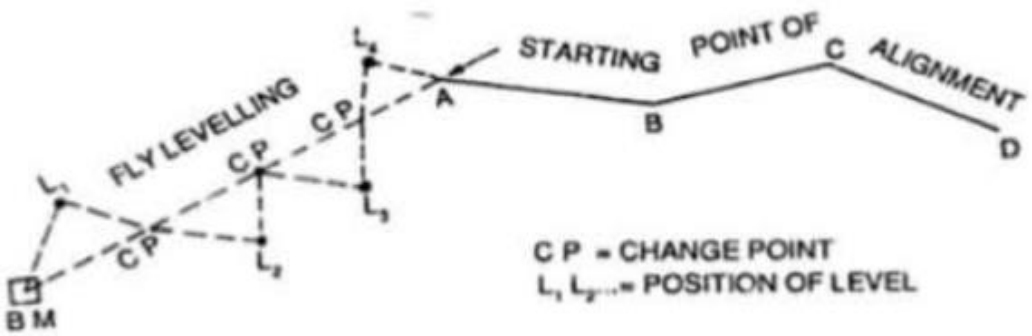
Area	It is carried out upto area less than 250 km^2	It is carried for area more than 250 km^2
Accuracy	Accuracy of plane survey is less as compared to geodetic survey.	Accuracy is more in geodetic survey.
Agencies	It is carried out by any agencies like PWD, Builder etc.	It is carried out by G.T.S
Equipment	Traditional survey equipment is used.	Precise and modern survey equipment are required

(c) Mention the procedure of fly leveling and state the purpose of doing it. **4M**

Ans:

Procedure:

1. Set up the level at a point from where BM is visible and perform temporary adjustments.
2. Position of the level should be approximately midway between the BS and FS stations.
3. Rotate the telescope towards the leveling staff on BM, observed and record the staff readings in the BS columns of the level book.
4. Take a FS on the point towards working site. This point would be change point (CP). **2M**
5. Shift the instrument to new position. First reading from the new instrument position is the BS on change point.
6. Continue the procedure till the readings on the suitable station at working site is recorded.
7. Return back by shortest route to the B.M and take the last reading on B. M
8. Find the elevations of the points by HI or rise and fall method. Last reading taken on B. M should have same R. L of B. M.



1M (Diagram)

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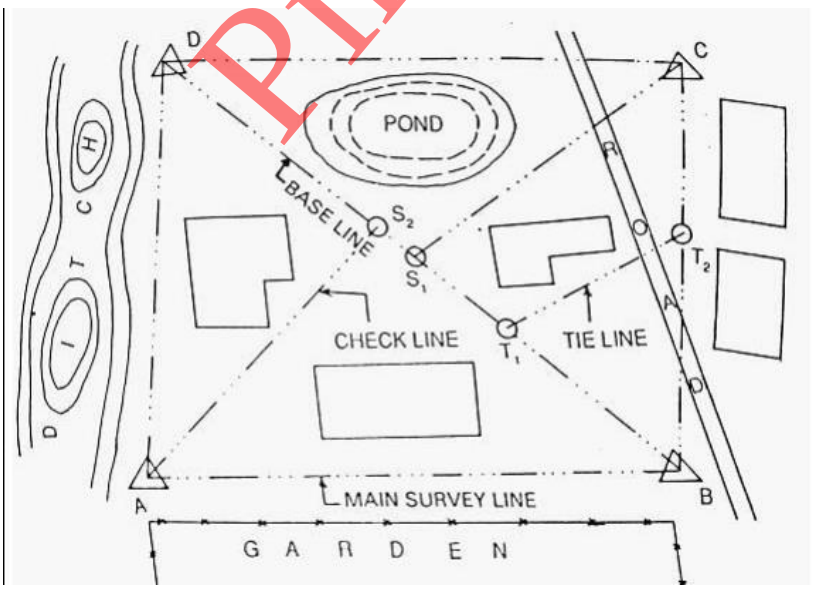
		Purposes: **1.** Carrying of B.M to the required survey site. **2.** At the end of survey works for checking the accuracy of survey. **3.** To connect the B.M at any intermediate point of the alignment.	**1M** **(Any two)**
	(d) **Ans.**	**Convert the following bearing from WCB to QB:** **(i) 325˚30'** **(ii) 265˚15'** **(iii) 195˚45'** **(iv) 60˚30'** (i) 325˚30' **QB = 360˚ - 325˚30' = N34˚30'W** (ii) 265˚15' **QB = 265˚15' -180˚ = S85˚15'W** (iii) 195˚45' **QB = 195˚45' -180˚ = S15˚45'W** (iv) 60˚30' **QB = N60˚30'E**	***(04 Marks)*** ***1 Mark for each***
3.		**Attempt any THREE of the following:**	**12 Marks**
	(a) **Ans.**	**Draw survey map showing Base line ,Tie line and Check line.**  	***(04 Marks)***
3	**(b)**	**The following are bearing taken on a closed compass traverse:**	**4 M**

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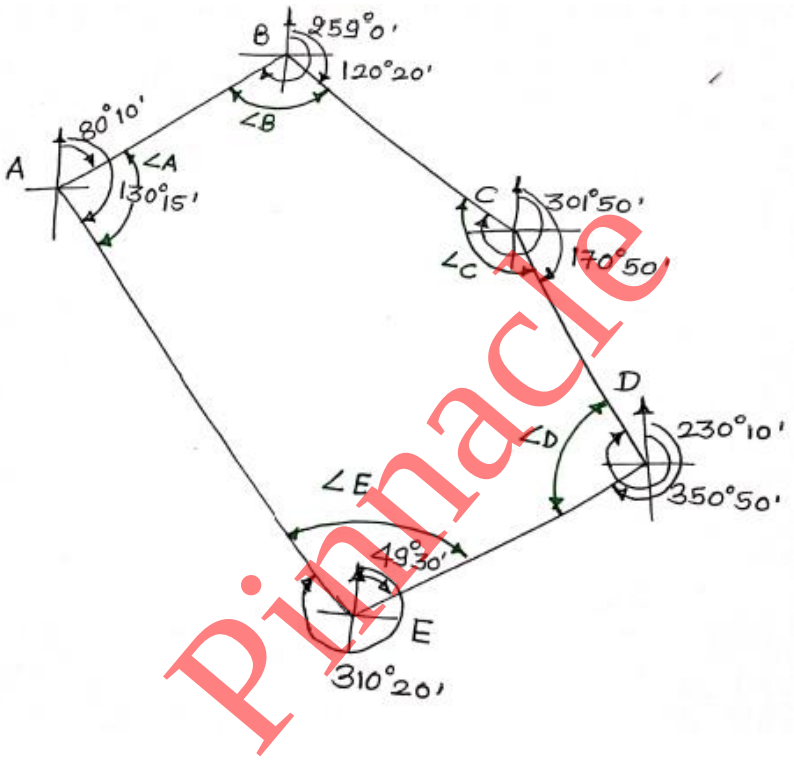
Line	FB	BB
AB	80˚10’	259˚0’
BC	120˚20’	301˚50’
CD	170˚50’	350˚50’
DE	230˚10’	49˚30’
EA	310˚20’	130˚15’

Compute the interior angles and find the corrected angles.

Ans.



01Mark

By referring above fig.

Angle A = 130˚15’ - 80˚10’ = **50˚5’**
Angle B = 259˚ - 120˚20’ = **138˚40’**
Angle C = 301˚50’ - 170˚50’ = **131˚**
Angle D = 350˚50’ - 230˚10’ = **120˚40’**
Angle E = 360˚ - 310˚20’ + 49˚30’ = **99˚10’**

01Mark

Sum of Interior Angle = 539˚35’
Theoretical sum of interior Angles = (2x5- 4) x 90 = 540˚
Thus correction in interior Angles = 540˚ -539˚35’ = + 0˚25’
Correction for each Angle = 0˚25’/5 = + 0˚5’
Therefore, Corrected Angles are
Angle A = **50˚10’**
Angle B = **138˚45’**

01Mark

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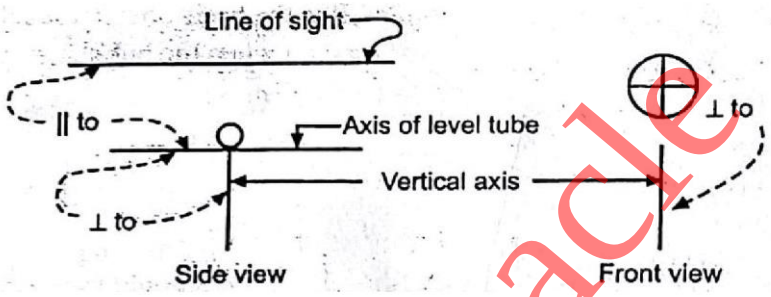
		Angle C = **131˚5'** Angle D = **120˚45'** Angle E = **99˚15'** _____ = 540˚ -----OK	**01Mark**
3	**(c)** **Ans.**	**List four fundamental axes of dumpy level and show the relationship with neat sketch.** There are four fundamental axes of a dumpy level. 1. The vertical axis. 2. The axis of the bubble tube (Level tube). 3. The line of collimation. 4. The axis of the telescope. Desired relations in dumpy level. For a dumpy level in perfect adjustment, the following relations should exist.  1. The axis of the level tube should be perpendicular to the vertical axis. 2. The line of collimation should be parallel to the axis of the bubble (level) tube. 3. Axis of telescope and line of collimation should coincide.	**4 M** **(02 Marks)** **(01 Mark)** **(01 Mark)**
3	**(d)** **Ans.**	**State the adjustment of dumpy level on field.** Adjustment of dumpy level on field: **I. Setting up the level.** i. The level fixed on tripod. ii. The legs of tripod stand are well spread so that the level will remain stable on tripod. iii. Bring all the three foot screws in the Centre of their run so that they can be turned clockwise or anticlockwise as required, for Levelling purpose. iv. Adjust the height of the instrument so that the observer can Comfortably see through the telescope and note the readings. v. Fix two legs of tripod and adjust third leg in such a way that the levelling head will become as horizontal as possible by eye judgment. **II. Levelling up the level.** i. The base of the tripod is already leveled with the help of cross bubble. ii To make accurate adjustment of the level, the longitudinal level is adjusted in the Centre of its run, with the help of three foot screws.	**4 M** ***(01 Mark)*** ***(01 Mark)***

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		iii. Make the bubble parallel to the any selected pair of foot screws. Now; turn both the foot screws either inward or outward with the help of foot screws till the bubble appears in the center. iv. Turn the telescope through 90° and now with the help of third screw bring the bubble of levelling tube in the center. v. Repeat above process, until bubble will remain at centre in both position. Then levelling is said to be completed. **III. Focusing the eye piece.** i. Hold a sheet of white paper in front of the objective glass 4 to 6 cm away from objective glass and see through the eye piece. ii. Turn the eye piece inwards or outwards in the socket so that the cross hair on the diaphragm appears sharp and clear. **IV. Focusing the object glass.** i. Direct the telescope towards any object, say a levelling staff in the field which is kept at a distance. See through eyepiece whether the staff is visible, distinct or not. ii. If not, then turn the focusing screw till the image is distinct and clear. The cross hair on the diaphragm should also be seen clearly.	***(01 Mark)*** ***(01 Mark)***
Q.4		**Attempt any THREE of the following:**	**(12)M**
	a) Ans:	**Mention any four points to be kept in mind while entering the staff reading in a level field book.** The following points kept in mind while entering the staff reading in a level field book. 1) The reading should be entered in the respective columns and in order of their observation. 2) The first entry on the page is always a back sight and the last one always a foresight. 3) In carrying forward the readings from one page to the next, if the last entry happens to be an intermediate sight, it is entered in a both, I.S and F.S columns against it should also be repeated on the next page. 4) The fore and back sight of the change point should be written in the same horizontal line. 5) The R.L of plane of collimation should be written in the same horizontal line opposite the back sight. 6) Bench marks, change points, and other important points should be briefly but accurately described in the Remarks column, and their sketches drawn on the left hand side of the page.	**4M** **(1 Mark for each Any four)**
Q.4	b) Ans:	**Explain in brief four uses of contour map.** Following are uses of contour map: i. To draw longitudinal section and plan of given map. ii. To determine inter-visibility between two points. iii. To trace contour gradient and to locate route for alignments of railways, roadways, canals etc. iv. To measurement of drainage areas. v. To calculate reservoir capacity. vi. To find intersection of surfaces and measurement of earth work. vii. To determine nature of ground in proposed area.	**4M** **(1 Mark for each) (Any four)**
Q.4	c) Ans:	**Explain stepwise procedure of measurement of area by digital planimeter**. The procedure of measurement of an area using digital planimeter is as follows: i. Take the area on the plane surface of table and fix it with clips so that while measurement	**4M**

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		it does not move. ii. Start the planimeter by pressing on button on key pad of it. Screen will be displayed. iii. Set the scale by pressing scale button on key pad. iv. Mark one starting point on boundary of that area and place the point of magnifier of tracing arm of digital planimeter. v. Press the start button and move tracing arm on boundary of area and end it again at its starting point. Press the end button. vi. The area of given figure is displayed in digital display of digital planimeter.	
Q.4	d) Ans:	**Explain the stepwise procedure of estimating volume of reservoir from any contour map.** Reservoirs are made for water supply and for power or irrigation projects. A contour map is very useful to study the possible location of a dam and the volume of water to be confined. All the contours are closed lines within the reservoir area. The areas A_1, A_2, A_3…..A_n between successive contour lines can be determined by a planimeter and if h is the contour interval, the capacity of the reservoir can be estimated by the application of either the trapezoidal or the prismoidal formula. **(a) Trapezoidal formula** Volume, $V = h\left[\frac{A_1 + A_n}{2} + A_2 + A_3 + \ldots + A_{n-1}\right]$ **(b) Prismoidal formula** Volume, $V = \frac{h}{3}[A_1 + A_n + 4(A_2 + A_4 + \ldots + A_{n-1}) + 2(A_3 + A_5 + \ldots + A_{n-2})]$	**4M** **2M** **2M**
Q.4	e) Ans:	**The following consecutive readings were taken with a level and a 4m levelling staff on continuously slopping ground at a common interval of 30 m :** **0.585 on A, 0.936, 1.953, 2.846, 3.644, 3.938, 0.962, 1.035, 1.689, 2.534, 3.844, 0.956, 1.979, 3.016 on B.** **The elevation of A was 520.450.** **Prepare a page of level book and apply usual checks. Use collimation plane method.** **H.I = R.L of B.M + B.S at station A** = 520.450 + 0.585 = **521.035** **R.L of station = H.I – I.S of station\ F.S of station** R.L at station 30 = 521.035 – 0.936 = **520.099** Similarly worked out all the R.Ls.	**4M** **1M**

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Station	B.S	I.S	F.S	H.I	R.L	Remark
A 0	0.585			**521.035**	**520.450**	B.M
30		0.936			**520.099**	
60		1.953			**519.082**	
90		2.846			**518.189**	
120		3.644			**517.391**	
150	0.962		3.938	**518.059**	**517.097**	C.P1
180		1.035			**517.024**	
210		1.689			**516.370**	
240		2.534			**515.525**	
270	0.956		3.844	**515.171**	**514.215**	C.P2
310		1.979			**513.192**	
B 330			3.016		**512.155**	
	ΣB.S=2.503		**ΣF.S=10.798**			

2M

Arithmetic check-

Σ BS - Σ FS = RL of Last Point – RL of First Point

2.503 – 10.798 = 512.155 – 520.450

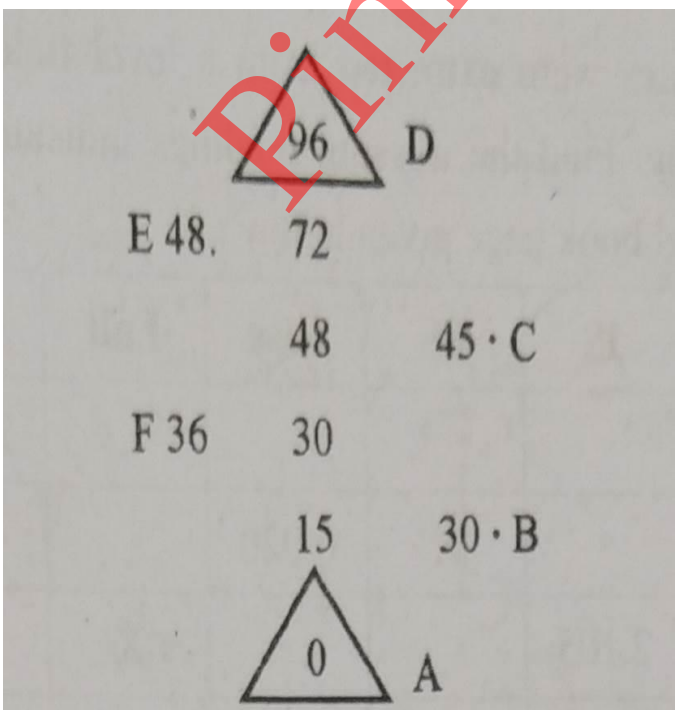
- 8.295 = - 8.295

OK

1M

Q.5 **Attempt any TWO of the following:** **12M**

(a) **Plot the following cross staff survey of a field ABCDEFA and calculate its area.** **6M**



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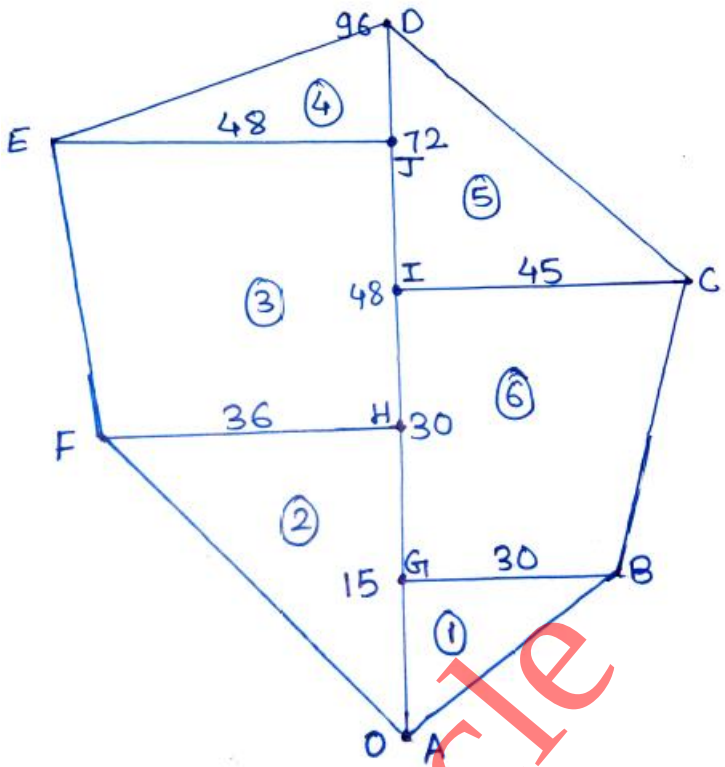
Ans:



Sr.No.	Fig.	Chainages (m)		Base (m)	Offsets		Mean offset (m)	Area (m^2) (Base x Mean offset)
		From	To		O_1	O_2		
1	△ ABG	0	15	15	0	30	15	225
2	△ AFH	0	30	30	0	36	18	540
3	⏢ FHEJ	30	72	42	36	48	42	1764
4	△ EJD	72	96	24	48	0	24	576
5	△ DCI	96	48	48	0	45	22.5	1080
6	⏢ CIBG	48	15	33	45	30	37.5	1237.5
							Total Area =	**5422.5 m^2**

6M

Q.5 b) **Following are the observed bearings of the traverse ABCDEA. Identify the stations affected by the local attraction. Find the corrected bearing of the lines.** **6M**

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Line	FB	BB
AB	**$191^0\ 45'$**	**$13^0\ 0'$**
BC	**$39^0\ 30'$**	**$222^0\ 30'$**
CD	**$22^0\ 15'$**	**$200^0\ 30'$**
DE	**$242^0\ 45'$**	**$62^0\ 45'$**
EA	**$330^0\ 15'$**	**$147^0\ 45'$**

Ans:

On examining the values of the observed bearings of the lines, we find that the fore bearings and the back bearings of the line DE differ exactly by 180^0.
Stations D and E are, therefore, free from local attraction.
At station A, B, & C local attraction is suspected. Consequently, the observed a FB of EA is correct i.e.**$330^0\ 15'$**
Hence, corrected B.B of EA = $330^0\ 15' - 180^0 = 150^0\ 15'$
Correction at A = $150^0\ 15' - 147^0\ 45' = +\ 2^0\ 30'$
Corrected F.B of AB = $191^0\ 45' + 2^0\ 30' = 194^0\ 15'$
Corrected B.B of AB = $194^0\ 15' - 180^0 = 14^0\ 15'$
Correction at B = $14^0\ 15' - 13^0\ 0' = +\ 1^0\ 15'$
Corrected F.B of BC = $39^0\ 30' + 1^0\ 15' = 40^0\ 45'$
Corrected B.B of BC = $40^0\ 45' + 180^0 = 220^0\ 45'$
Correction at C = $220^0\ 45' - 222^0\ 30' = -\ 1^0\ 45'$
Corrected F.B of CD = $22^0\ 15' - 1^0\ 45' = 20^0\ 30'$ and
Therefore the B.B of CD must be $20^0\ 30' + 180^0 =$ **$200^0\ 30'$**, which agrees with the back bearing of CD observed at a station D, which is free from local attraction and **hence it is verified.**

4M

Line	Observed		Correction	Corrected		Remark
	F.B	B.B		F.B	B.B	
AB	$191^0\ 45'$	$13^0\ 0'$	$+\ 2^0\ 30'$ at A	$194^0\ 15'$	$14^0\ 15'$	**All stations except D and E are affected by local attraction**
BC	$39^0\ 30'$	$222^0\ 30'$	$+\ 1^0\ 15'$ at B	$40^0\ 45'$	$220^0\ 45'$	
CD	$22^0\ 15'$	$200^0\ 30'$	$-\ 1^0\ 45'$ at C	$20^0\ 30'$	$200^0\ 30'$	
DE	$242^0\ 45'$	$62^0\ 45'$	0^0 at D	$242^0\ 45'$	$62^0\ 45'$	
EA	$330^0\ 15'$	$147^0\ 45'$	0^0 at E	$330^0\ 15'$	$150^0\ 15'$	

2M

Q.5 c) **The following staff readings were observed successively with a level, the instrument having been moved after third, sixth and eight readings :**
2.228, 1.606, 0.988, 2.090, 2.864, 1.262, 0.602, 1.982, 1.044, 2.684 metres.
Enter the above readings in a page of a level book and calculate the R.L of points if the first reading was taken with a staff held on a bench mark of 432.384 on.
Use rise and fall method. Apply arithmetic check.

6M

Ans:

The difference of level between the two consecutive readings is found by comparing the staff readings i.e. 2.228 and 1.606.
The second point is lower than first by 2.228 – 1.606 = **0.622**. It indicates rise which is to be added in previous R.L. i.e. 432.384
Hence R.L at station no. 2 = R.L of A + Rise = 432.384 + 0.622
= **433.384**
Similarly, by adding rise from and deducting fall to the preceding R.L, the R.Ls of remaining points are worked out as shown in the table below.

1M

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Station	B.S	I.S	F.S	Rise(+)	Fall(-)	R.L	Remark
1	2.228					**432.384**	B.M
2		1.606		**0.622**		**433.006**	
3	2.090		0.988	**0.618**		**433.624**	C.P 1
4		2.864			**0.774**	**432.850**	
5	0.602		1.262	**1.602**		**434.452**	C.P 2
6	1.044		1.982		**1.380**	**433.072**	C.P 3
7			2.684		**1.640**	**431.432**	

4M

Arithmetic Check =

ΣB.S - ΣF.S = Σ Rise – Σ Fall = Last R.L – First R.L

5.964 – 6.916 = 2.842 – 3.794 = 431.432 – 432.384

- 0.952 = - 0.952 = -0.952

OK

1M

Q.6 **Attempt any TWO of the following :** **12M**

a) **List any four methods of plotting a compass traverse survey & explain any one in brief. Also state the meaning of adjustment of closing error of traverse.** **6M**

Ans:

Methods of plotting compass traverse are: **2M(Any four)**

1. By parallel meridian through each station.
2. By included angle.
3. By paper protractor.
4. By rectangular co-ordinates.
5. Plotting by tangents.

(1) By Parallel Meridians through each station:

(Fig.4.20) Having fixed the position of the starting station A suitably on the paper, a line representing the magnetic meridian is drawn through it.

The bearing of the line AB is plotted with an ordinary protractor and its length is marked off with the scale, thus fixing the position of the station B.

Through B a meridian is drawn, the bearing of BC is set off and its length measured off with the scale. The process is repeated at each station until all the lines are drawn.

If the traverse is a closed one, the last line should end on the starting station A; if it does not, the discrepancy is referred to as the “closing error".

2M (for any 1 of the method)

(2) By Included Angles:

Fig.4.21) In this method the meridian is drawn through the starting point A and the bearing of the line AB plotted and its length laid off with the scale, thus fixing the point B.

At B the included angle ABC as calculated, from the bearings of AB and BC, is plotted with a

Pinnacle

protractor and the length of BC is measured off with the scale. The operation is repeated at each of the succeeding stations.

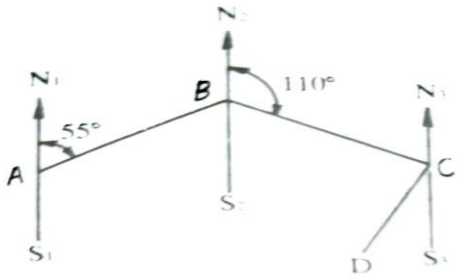

Fig. 4.20

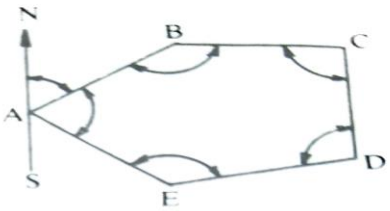

Fig. 4.21

(3) By Paper Protractor:

(Fig.4.22). This method consists of plotting the bearings of all the lines at any point in the centre of the paper with reference to the meridian by using a large circular paper protractor, and then transferring these directions to their proper positions by drawing parallel lines with the help of a parallel ruler.

Having marked the point O in the centre of the paper, draw a line through O to represent the meridian. Place the protractor with the 0 and 180° graduations coinciding with the line. At O plot the bearings of all the lines with reference to the meridian.

Having settled the position of the starting point A, draw a line AB through it parallel to its bearing marked at O with the help of a parallel ruler and measure its length with the scale, thus fixing the point B as in **fig.4.23**. Proceed similarly until all the lines are drawn. This method is a compass traverse.

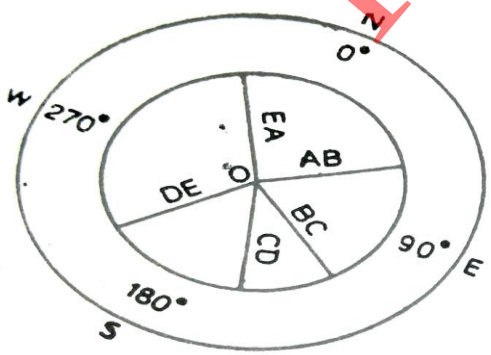

Fig. 4.22

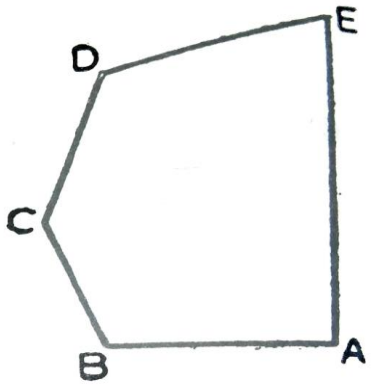

Fig. 4.23

(4) By Rectangular Co-ordinates:

(Fig.4.24) In this method each of the points of the traverse is plotted by its co-ordinates with reference to two lines drawn through some Convenient point at right angles to each other.

These lines are known as the axes of co-ordinates and their point of intersection is called the origin of co-ordinates. One of the axes OX called the X-axis represents the north and south line, (true, magnetic or arbitrary) and the other OY known as the Y-axis is a line at right angles there to, and represents the east and west line. Any point may be plotted by measuring with a scale X or Y co-

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ordinate along the X or Y axis and laying off the other co-ordinate on the line drawn at right angles at this point. The advantage of this method is that each point is plotted independently with reference to the meridian and the line at right angles to it through a common origin and not with regard to the preceding one. Consequently, if any point is wrongly plotted, the position of any of the succeeding points is not thereby affected.

The errors of plotting cannot, therefore, accumulate. Also the position of each point can be checked by scaling the distance between the point and the preceding one and by comparing it with the length measured in the field.

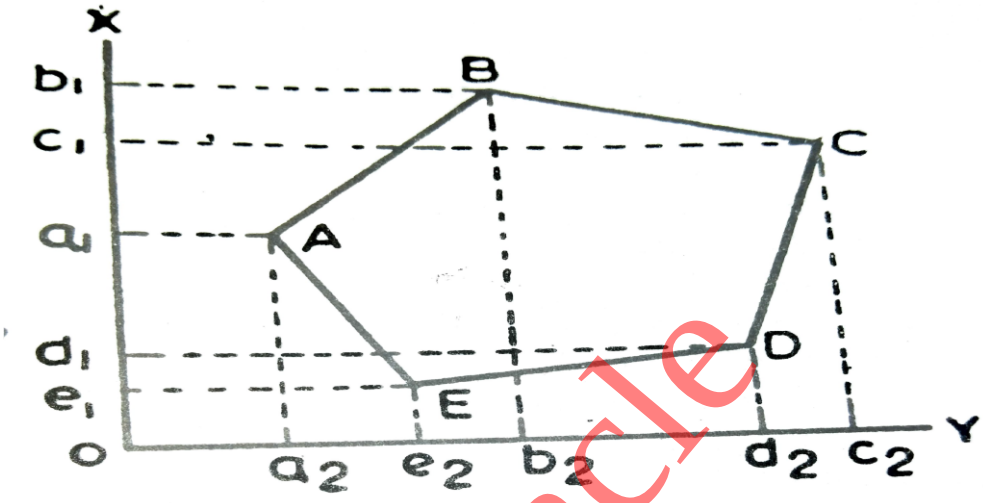

Fig. 4.24

(5) Plotting by Tangents:

In this method the angles between the various lines are plotted by geometrical construction with the help of a table of natural tangents. Having fixed the position of the starting point, a line representing the meridian is drawn through it (always pointing to the top of the paper) as in **fig.4.25.** To plot the bearing of the first line AB, a length ABI of 20 cm is marked off on the meridian the bearing of the line AB (cm) is then laid off on this perpendicular. The line joining the points A and B2 determines the direction of the first line AB. On this line is scaled off the length of AB, thus fixing the position of the point B. The line AB is then produced to C1 making BC1 equal to 20 cm. At C1 a perpendicular is erected and the distance C1 and C2 equal 20 X tangent of deflection angle at B (cm) is scaled off on the perpendicular .The line connecting the points B and C2 gives the direction of the line BC. To mark the point C, the length of BC is marked off with the scale on BC2. Other lines are similarly plotted, marked of with the scale on BC2. Other lines are similarly plotted. If there is no room for a 20 cm base, a shorter base of 10 cm may be used.

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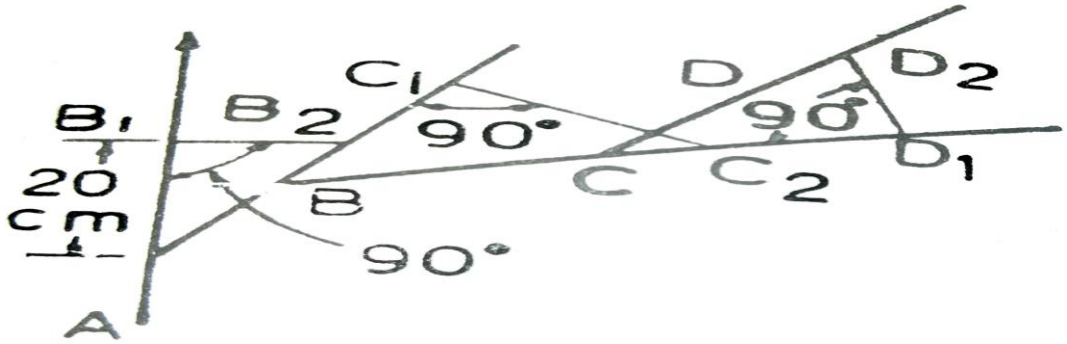
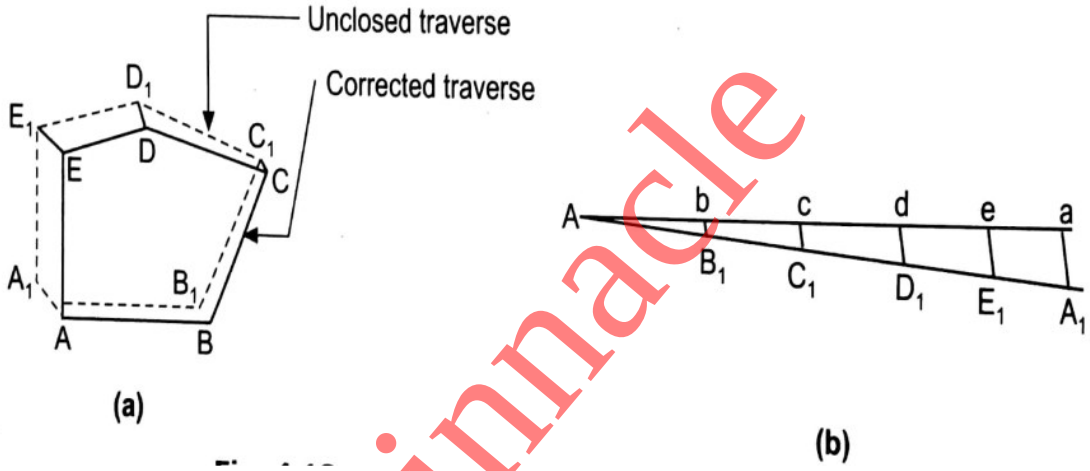


Fig. 4.25

Adjustment of closing error of traverse:

2M



Explanation :

1. To distribute the closing error AA1 (Fig. a), draw one horizontal line of length equal to perimeter of traverse with some reduced scale.
2. Now mark the survey stations on it proportionally (Fig. b) and transfer closing error of same length using roller scale to point a.
3. Join the point A and A1 with straight line. Also draw parallel lines at point b, c, d and e.
4. Transfer B1b, C1c, D1d and E1e to point B1, C1, D1 and E1 respectively in compass traverse.
5. Finally join new points to get corrected traverse ABCDEA after graphical adjustment of closing error.

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Q.6 b) **The following figures were extracted from a level field book, some of the readings are missing. Find the missing readings indicated by 'X' and apply usual checks in level book page given below :** **6M**

Station	BS	IS	FS	Rise	Fall	R.L	Remark
1.	2.285					232.460	BM 1
2.	1.650		X	0.020			
3.		2.105			X		
4.	X		1.960	X			
5.	2.050		1.925		0.300		
6.		X		X		232.255	BM 2
7.	1.690		X	0.340			
8.	2.865		2.100		X		
9.			X	X		233.425	BM 3

Ans:

The fore sight of station No.2 is missing.
Difference of station 1 and 2.
station 1 is higher than station 2 by 0.020
Hence, missing reading at station = 2.285 - 0.020 = **2.265**
R.L at station 2 = 232.460 + 0.020 = **232.480**
Fall at station 3 is missing. It is the difference of staff reading on station 2 and station 3
= 1.650 – 2.105 = **0.455**
The rise of station 4 = 2.105 – 1.960 = **0.145**
Similarly, the B.S reading of station 4 is found from the fall of station 5
= 1.925 - 0.300 = **1.625**
The RLs of station 1 to 5 can now be worked out as all the readings upto station 5 are available. **3M**
missing Rise of station 6 = 232.255 – 231.870 = **0.385**
Hence missing IS of station 6 = 2.050 – 0.385 = **1.665**
F.S of station 7 = 1.665 – 0.340 = **1.325**
Fall at station 8 = 1.690 – 2.100 = **0.410**
The RLs of station 6 to 8 can now be worked out.
Hence, Rise at station 9 = 233.425 – 232.185 = **1.240**
Similarly, F.S at station 9 = 2.865 – 1.240 = **1.625**
Thus, all the missing readings are worked out and RLs are calculated.
The results are entered in the following table –
The readings which were missing are bold :

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Station	BS	IS	FS	Rise	Fall	R.L	Remark
1.	2.285					232.460	BM 1
2.	1.650		**2.265**	0.020		**232.480**	
3.		2.105			**0.455**	**232.025**	
4.	**1.625**		1.960	**0.145**		**232.170**	
5.	2.050		1.925		0.300	**231.870**	
6.		**1.665**		**0.385**		232.255	BM 2
7.	1.690		**1.325**	0.340		**232.595**	
8.	2.865		2.100		**0.410**	**232.185**	
9.			**1.625**	**1.240**		233.425	BM 3

2M

Arithmetic Check:

Σ BS – Σ FS = Σ Rise – Σ Fall = Last R.L. – First R.L.

Therefore, 12.165 – 11.200 = 2.130 – 1.165 = 233.425 – 232.460

0.965 = 0.965 = 0.965

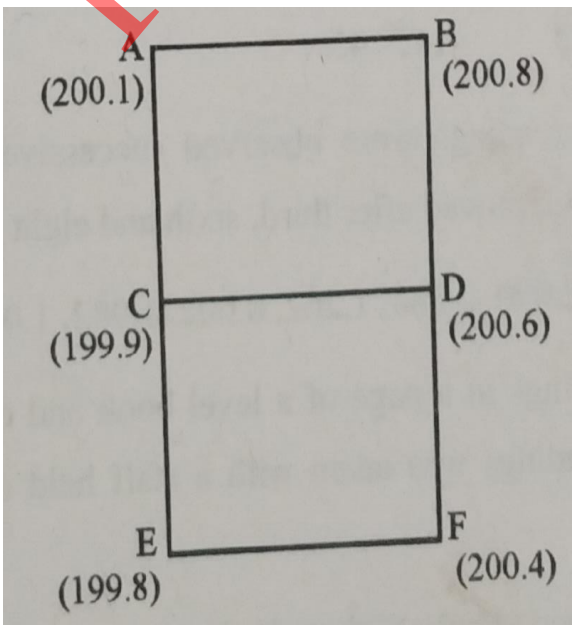
OK

1M

Q.6 c)

Contour survey data of a field is shown in figure given below. Draw 200.2 m contour line by linear interpolation method. Show all calculations. Grid size is 10 m X 10 m.

6 M



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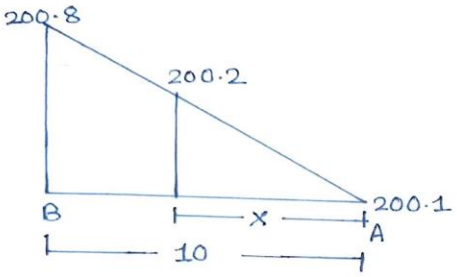
Ans:

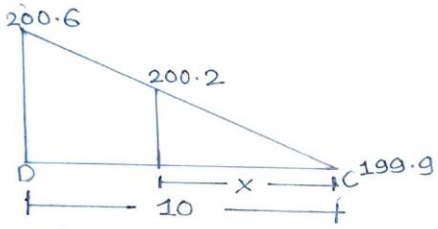


$$\frac{200.8-200.1}{10}=\frac{200.2-200.1}{x}$$

$$\frac{0.70}{10}=\frac{0.10}{x}$$

$$x=1.43\text{m}$$

1.5M

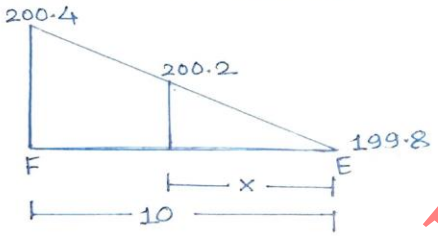


$$\frac{200.6-199.9}{10}=\frac{200.2-199.9}{x}$$

$$\frac{0.70}{10}=\frac{0.30}{x}$$

$$x=4.29\text{m}$$

1.5M

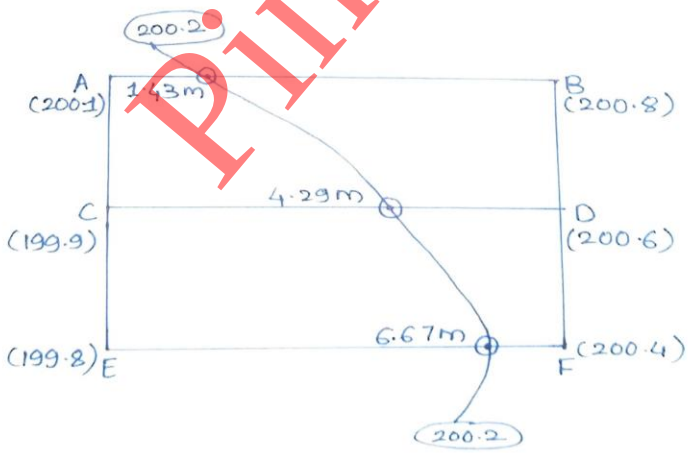


$$\frac{200.4-199.8}{10}=\frac{200.2-199.8}{x}$$

$$\frac{0.60}{10}=\frac{0.40}{x}$$

$$x=6.67\text{m}$$

1.5M



1.5M

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