

3 pages

2011

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N19-A0102

TED (15) – 2011

Reg. No. ....

(REVISION — 2015)

Signature .....

DIPLOMA EXAMINATION IN ENGINEERING/TECHNOLOGY/  
MANAGEMENT/COMMERCIAL PRACTICE — OCTOBER, 2019

**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. Write down fundamental principles of surveying.
2. List operations to set up the plane table on a station.
3. Differentiate true bearing and magnetic bearing.
4. List out any four important axes of leveling instrument.
5. Define refraction in optical survey instruments.

(5×2 = 10)

**PART — B**

(Maximum marks : 30)

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

1. Give the factors considered for marking stations in chain surveying.
2. Differentiate whole circle bearing and reduced bearing systems.
3. The magnetic bearing of a line is  $48^{\circ}20'$ . Calculate the true bearing, if the magnetic declinations are  $5^{\circ}30'$  East.
4. Explain different types of bench marks.
5. Differentiate following :
  - (a) Staff station and Change point
  - (b) Back sight and Fore sight
  - (c) Reduced level and Height of instrument
6. Write short notes on precise leveling and reciprocal leveling.
7. List characteristics of contour line.

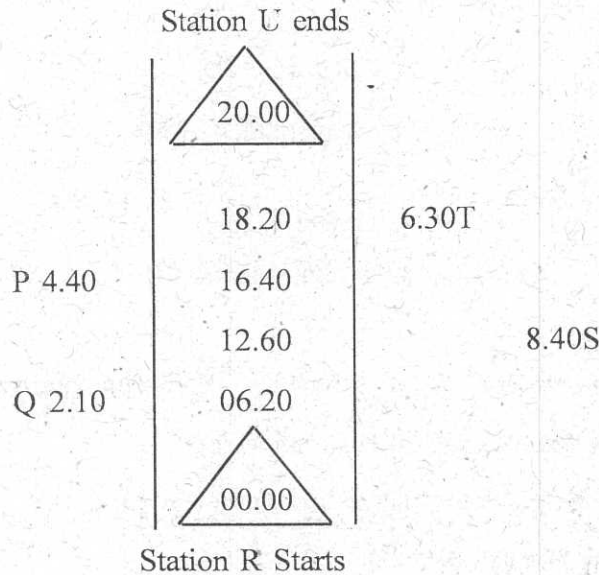
(5×6 = 30)

PART — C  
(Maximum marks : 60)

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

UNIT — I

- III (a) Plot the following cross staff survey of field P, Q, R, S, T, U and calculate its area.



8

- (b) Explain different methods of orientation in plane table survey.

7

OR

- IV (a) Explain with neat sketch the method of chain survey on sloping ground.

7

- (b) Explain with neat sketch the method of resection and its suitability in the field.

8

UNIT — II

- V (a) List methods of plotting campus survey and explain any one method.

7

- (b) The following bearings were observed in traversing with a compass in an area where local attraction was suspected. Find the amounts of local attraction at different stations, the correct bearings of lines and the included angle.

Line	FB	BB
AB	68°15'	248°15'
BC	148°45'	326°15'
CD	224°30'	46°00'
DE	217°15'	38°15'
EA	327°45'	147°45'

8

OR

- VI (a) Describe balancing of closed traverse. Explain any three methods of adjusting the traverse. 7
- (b) The following are the bearing of line in a closed traverse ABCD, calculate included angle of traverse.

<i>Line</i>	<i>fore bearing</i>
AB	N25°40'E
BC	S 85°20'E
CD	S40°10'W
DA	N 50°20'W

8

UNIT — III

- VII (a) Tabulate the points of difference between dumpy level and tilting level. 7
- (b) The following staff readings were taken with a level which was shifted after 3<sup>rd</sup>, 6<sup>th</sup> and 10<sup>th</sup> reading.  
1.350, 1.995, 0.780, 0.790, 0.930, 1.775, 1.235, 1.995, 2.005, 2.430, 2.010, 1.885.  
Assuming the RL of starting point as 50.000m. Enter the reading in the form of level book page and determine reduced levels of all points by rise and fall method. 8

OR

- VIII (a) List and explain the function of instruments used in leveling survey. 7
- (b) The staff reading was observed for a leveling survey work as follows 1.820, 2.150, 1.230, 1.460, .905, 2.345, 1.995, 1.860. The level was shifted after 4<sup>th</sup> staff reading. Reduced level of 5<sup>th</sup> staff point as 100.000. Calculate reduced level of all other staff points by collimation method. 8

UNIT — IV

- IX (a) Derive an expression for the combined effect of curvature and refraction in leveling survey. Given that diameter of earth as 12740m. 9
- (b) Show the conventional contour of following :
- (i) valley
  - (ii) hill
  - (iii) saddle
  - (iv) overhanging cliff
- 6

OR

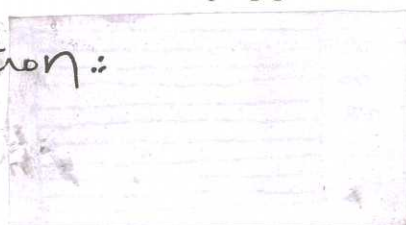
- X (a) Explain the method of longitudinal leveling and sketch a typical longitudinal section for a proposed road alignment. 8
- (b) Illustrate and explain the interpolation of contour. 7



SCORING INDICATORS

CODE :2011

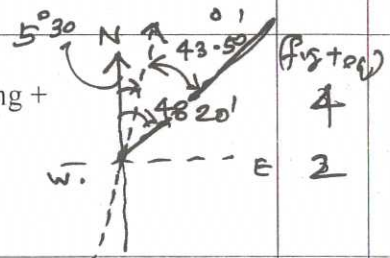
VERSION : Q.P

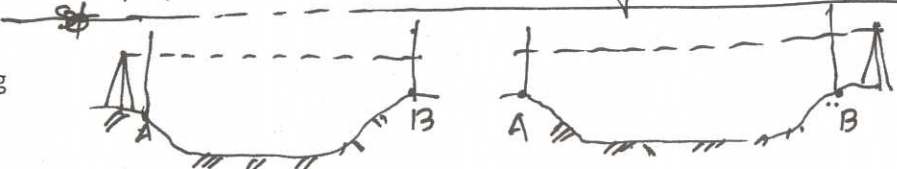
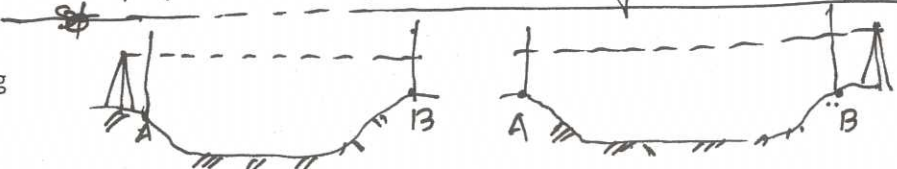
Qn No	Scoring indicators	Split score	Total score
Part A			
1	Work from whole to part location of point by measurement from two points of reference	1 1	2
2	Leveling, centering & orientation	2	2
3	True bearing; bearing measured from true north Magnetic bearing : bearing measured from magnetic north	2 1+1	2
4	vertical axis horizontal axis line of collimation axis of telescope axis of bubble tube	2	2
5	Contour representation of uniform sloping ground  Refraction: 	2	2
Part B			
1	Sketch I visible at least two more stations II possible to lay one or two baseline III minimum survey line IV well-conditioned triangles V each triangle at least one check line VI avoid obstacle to ranging and chaining VII survey line on level ground VIII avoid -chain line crossing of passages and road	2 4 LXC	6

any four 4x0.5

df. (2)

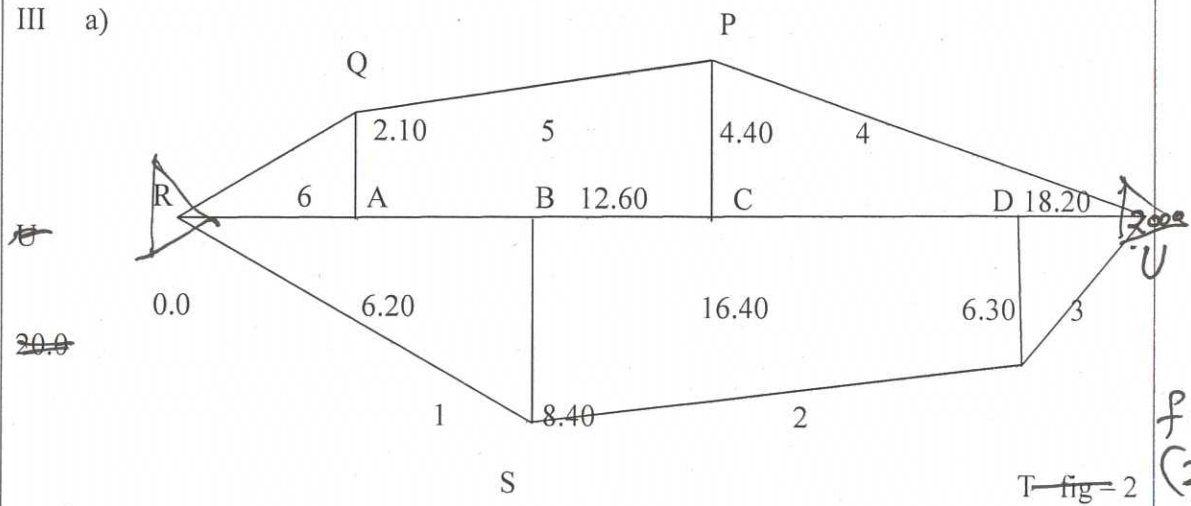
any six

2	<p style="text-align: center;">Whole circle bearing</p> <p>The value of bearing varies from 0 to 360          Prismatic compass is graduated on this system          all bearings measured from North          all measurement in clock wise direction</p> <p style="text-align: center;">Reduced bearing</p> <p>The value of bearing varies from 0 to 90          These bearings are observed by surveyor's compass          bearing are measure from North and South          all measurement in clock wise and anticlock wise direction</p>	3 3	6
3	<p>figure</p> <p>Stating the equation for true bearing ( Magnetic bearing + declination )</p> <p style="text-align: center;"><math>= 48^{\circ} 20' + 5^{\circ} 30' = 43^{\circ} 50'</math> - 2 marks</p> <p>↳ without a tripod. <math>fy + eq \text{ (4)} + B2</math></p>		6
4	<p style="text-align: center;"><u>GTS BM &amp; its explanation</u></p> <p>Established by survey of India-marked several places over the country with highest precision- marked w.r.to MSL -marked topo sheet</p> <p style="text-align: center;"><u>Permanent BM &amp; its explanations</u></p> <p>Established from <u>GTS</u> bench mark</p> <p>Marked by govt agencies on well defined permanent objects</p> <p style="text-align: center;"><u>Arbitrary BM &amp; its explanation</u></p> <p>Assumed bench mark for conducting small projects          Marked on fairly permanent objects</p> <p style="text-align: center;"><u>Temporary BM &amp; its explanation -</u></p> <p>Established at the end of day works for starting next day reference</p>	2 4	6

5	<p><u>Staff station</u>-A point whose elevation is to be determined or staff holding point</p> <p><u>Change point</u>- A point denoting shifting of leveling instrument point on which foresight and back sight are taken</p> <p><u>Back sight</u>- The first reading taken after sitting of instrument generally its elevation is known</p> <p><u>Foresight</u>- The staff reading taken whose elevation to be found out-last leading taken before shifting the instrument</p> <p><u>Reduced level</u>- The vertical distance measured above the MSL</p> <p><u>Height of instrument</u>-The elevation of line of collimation when instrument perfectly leveled</p>	<p>→</p> <p>→</p> <p>3x2</p>	6
6	<p>Precise leveling : BS - FS, eq. distance, Length of sight limit 100m, staff held vertical, tested levelling instrument,</p> <p>Figure-Description</p>  <p>Reciprocal leveling</p> <p>Figure-Description</p> <p>1.</p> 	<p>2x3</p> <p><del>3x2</del></p> <p>→</p>	6
7	<p>Lines are closed curves</p> <p>Spacing depends slope of ground</p> <p>Equally spaced means uniform slope</p> <p>Closely spaced steep slope</p> <p>Irregular contour uneven surface</p> <p>Approx. Concentric closed contour decreasing value -pond</p> <p>Approx. concentric closed contour increasing value-hill</p> <p>Lines are not intersect each other except overhanging</p> <p>Lines merge for vertical cliff</p>	6	6
Part C			
III a		4x2	8

PART - C

III a)



mark

fy  
(2)

SL N O	Figure	Chainage (m)	Base (m)	Offsets (m)	Mean (m)	Area (m <sup>2</sup> )
1	RBS	0.0&12.60	12.60	0&8.40	4.20	52.92
2	BDST	12.60&18.20	5.60	8.40&6.30	7.30	40.88
3	DUT	18.20&20.00	1.80	6.30&0.00	3.15	5.67
4	UPC	20.00&16.40	3.60	0.00&4.40	2.20	7.92
5	PCAQ	16.40&6.20	10.20	4.40&2.10	3.25	33.15

Tab  
(2)

CAL  
(2)

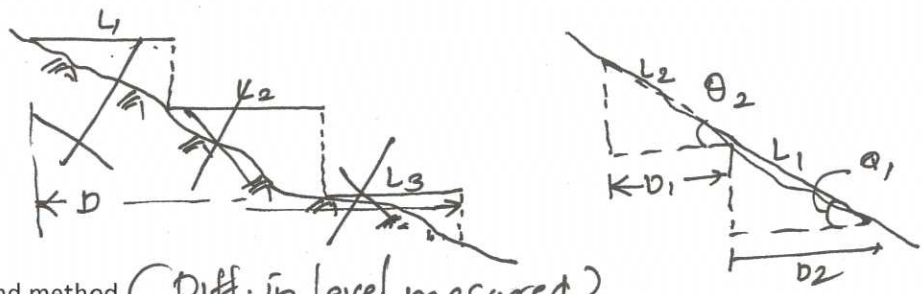
Result  
(2)

	6	RAQ	6.20&0.00	6.20	2.10&0.00	1.05	6.51		
	Total = 147.05 m <sup>2</sup>								
b	orientation by north description figure							Fig 1.5	2
	orientation by back sight - description figure							Fig 1.5	2
IV a	two method 1. direct method with figure						Fig + des.	3+4	7

2. indirect method with figure

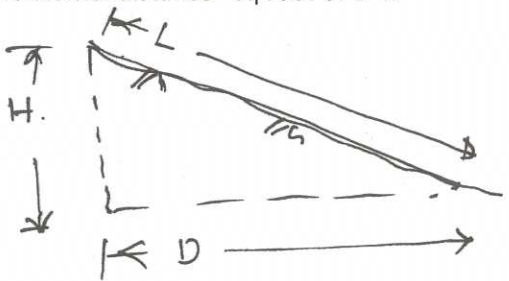
A. first method (Angle method)

horizontal distance = cose content of inclination x length

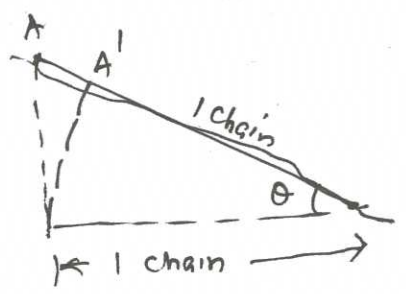


B. second method (Diff. in level measured)

horizontal distance = sq root of  $L^2 - h^2$



C. Hypotenues allowance method



(sketches)

figure of resection method

b

3  
5

8

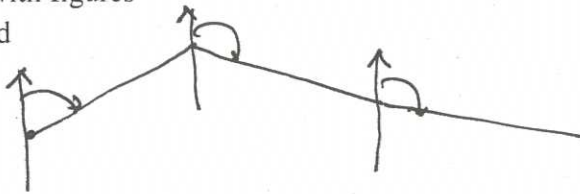
description of resection method  $\left\{ \begin{array}{l} \text{Resn. by Compass} \\ \text{Resn. by back sighting} \end{array} \right.$

4+  
4. 8

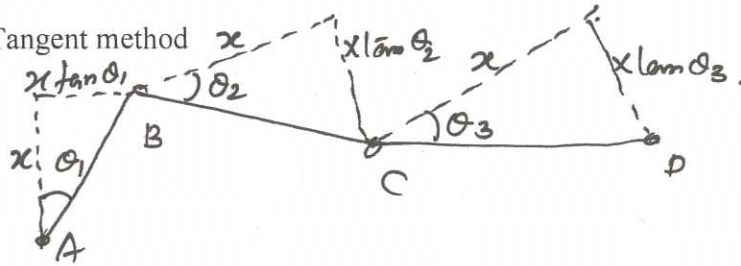
suitability in the field: it suitable to locate the plotted position of survey stations by drawing resectors from plotted position of the object

1. Angle and Distance method with figures

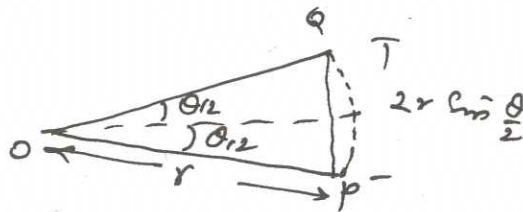
a. Protractor method



b. Tangent method



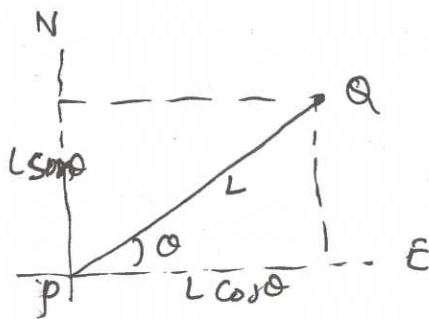
c. Chord method



3.5  
3.5

7

2. Coordinate method with figure



V  
a

b)

Line	Observed bearing	Correction	Corrected bearing	Remarks
AB	68°15'	0°00' at A	68°15'	Stations A,B&E Are effected by local attraction
BA	248°15'	0°00' at B	248°15'	
BC	148°45'	0°00' at B	148°45'	
CB	326°15'	2°30' at C	328°45'	
CD	224°30'	2°30' at C	227°00'	
DC	46°00'	1°00' at D	47°00'	
DE	217°15'	1°00' at D	218°15'	
ED	38°15'	0°00' at E	38°15'	
EA	327°45'	0°00' at E	327°45'	
AE	147°45'	0°00' at A	147°45'	

A  
B  
C  
D  
E  
b

For identifying the stations affected by local attraction – 2

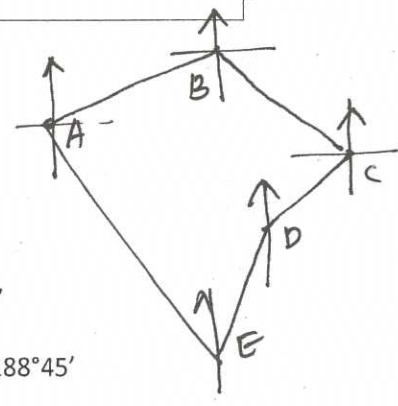
Computation of corrected bearing – 3 marks

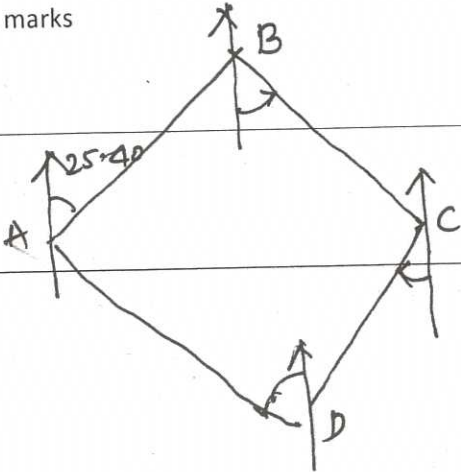
- Included angles  $\angle ABC = 248^\circ 15' - 148^\circ 45' = 99^\circ 30'$
- Included angles  $\angle BCD = 328^\circ 45' - 227^\circ 00' = 101^\circ 45'$
- Included angles  $\angle CDE = (360^\circ - 218^\circ 15') + 47^\circ 00' = 188^\circ 45'$
- Included angles  $\angle AED = (360^\circ - 327^\circ 45') + 38^\circ 15' = 70^\circ 30'$
- Included angles  $\angle EAB = 147^\circ 45' - 68^\circ 15' = 79^\circ 30'$

Theoretical sum =  $(2n-4) \times 90 = 540^\circ$

Error =  $(99^\circ 30' + 101^\circ 45' + 188^\circ 45' + 70^\circ 30' + 79^\circ 30') - 540^\circ = 0^\circ 00'$

Computation of included angles – 3 marks



<p>VI a</p>	<p>For explain balancing of traverse – 1 marks</p> <p>For explaining any three methods for balancing the traverse with fig if any (1 Bowditch's method, 2 Transit method, 3 Graphical method, 4 The axis method)</p> <p style="text-align: center;">figs. (3) descn. (4)</p>	<p>3.5 3.5</p>	<p>7</p>
<p>b</p>	<p>Plot traverse by using given bearings – 2(sketch)</p> <p>Included angle <math>\angle B = 45^\circ 10' + 60^\circ 40' = 105^\circ 50'</math></p> <p>Included angle <math>\angle C = 180^\circ - (60^\circ 40' + 9^\circ 50') = 104^\circ 00'</math></p> <p>Included angle <math>\angle D = 9^\circ 50' + 80^\circ 40' = 90^\circ 30'</math></p> <p>Included angle <math>\angle A = 180^\circ - (80^\circ 40' + 45^\circ 10') = 54^\circ 10'</math></p> <p style="text-align: center;">Sum = <math>360^\circ 00'</math>      computation of included angles – 5 marks</p> <p>Check <math>(2n-4) \times 90 = 360^\circ 00'</math> - 1 marks</p>	<p>2x4</p>	<p>8</p>
			

Dumpy level: After levelling Line of sight - both vertical, vertical axis vertical axis  
 Tilting - After levelling - Line of sight can tilt, without tilting vert. axis.  
 - use precise levelling. 10

VII	State at least 3 differences between dumpy level and tilting level. - 7 marks	2x3.5	7																																																																						
a																																																																									
b	<p style="text-align: center;">b) H. I. method</p> <table border="1" style="width: 100%; border-collapse: collapse; margin-bottom: 10px;"> <thead> <tr> <th style="width: 10%;">Station</th> <th style="width: 15%;">B S</th> <th style="width: 15%;">I S</th> <th style="width: 15%;">F S</th> <th style="width: 15%;">H I</th> <th style="width: 15%;">R L</th> <th style="width: 10%;">Rema</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>1.350</td> <td></td> <td></td> <td>51.350</td> <td>50.000</td> <td>Bm</td> </tr> <tr> <td>2</td> <td></td> <td>1.995</td> <td></td> <td>51.350</td> <td>49.355</td> <td></td> </tr> <tr> <td>3</td> <td>0.790</td> <td></td> <td>0.780</td> <td>51.36</td> <td>50.57</td> <td>CP</td> </tr> <tr> <td>4</td> <td></td> <td>0.930</td> <td></td> <td>51.36</td> <td>50.43</td> <td></td> </tr> <tr> <td>5</td> <td>1.235</td> <td></td> <td>1.775</td> <td>50.82</td> <td>49.585</td> <td>CP</td> </tr> <tr> <td>6</td> <td></td> <td>1.995</td> <td></td> <td>50.82</td> <td>48.825</td> <td></td> </tr> <tr> <td>7</td> <td></td> <td>2.005</td> <td></td> <td>50.82</td> <td>48.815</td> <td></td> </tr> <tr> <td>8</td> <td>2.010</td> <td></td> <td>2.430</td> <td>50.40</td> <td>48.39</td> <td>CP</td> </tr> <tr> <td>9</td> <td></td> <td></td> <td>1.885</td> <td>50.40</td> <td>48.515</td> <td></td> </tr> </tbody> </table> <p>For tabulating the staff readings - 2.5 marks                  Computation of H.I - 2.5 marks                  Computation of Reduced level - 2 marks  <math>\Sigma B. S. - \Sigma F. S. = \text{Last R. L.} - \text{First R. L.} - 1 \text{ mark}</math></p>	Station	B S	I S	F S	H I	R L	Rema	1	1.350			51.350	50.000	Bm	2		1.995		51.350	49.355		3	0.790		0.780	51.36	50.57	CP	4		0.930		51.36	50.43		5	1.235		1.775	50.82	49.585	CP	6		1.995		50.82	48.825		7		2.005		50.82	48.815		8	2.010		2.430	50.40	48.39	CP	9			1.885	50.40	48.515		8	
Station	B S	I S	F S	H I	R L	Rema																																																																			
1	1.350			51.350	50.000	Bm																																																																			
2		1.995		51.350	49.355																																																																				
3	0.790		0.780	51.36	50.57	CP																																																																			
4		0.930		51.36	50.43																																																																				
5	1.235		1.775	50.82	49.585	CP																																																																			
6		1.995		50.82	48.825																																																																				
7		2.005		50.82	48.815																																																																				
8	2.010		2.430	50.40	48.39	CP																																																																			
9			1.885	50.40	48.515																																																																				
VIII	<p style="text-align: center;">a) For listing the instrument used in leveling (1 level, 2 levelling staff) - 1 marks</p> <p style="text-align: center;">For explaining the functions of the leveling instruments mentioned above - 5 marks</p>	3 4	7																																																																						
a	<p style="text-align: center;">a)</p>																																																																								

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Problem can be solved either by H I method or by Rise & Fall method

Station	BS	IS	FS	Rise	Fall	R. L.	Ret
1	1.820					<del>101.08</del> 99.64	
2		2.150			0.330	<del>100.75</del> 99.31	
3		1.230		0.920		<del>101.67</del> 100.23	
4	0.905		1.460		0.230	<del>101.440</del> 100.000	
5		2.345			1.440	<del>100.000</del> 98.560	
6		1.995		0.350		<del>100.35</del> 98.910	
7			1.860	0.135		<del>100.485</del> 99.045	

b

8

For tabulating the staff readings – 2.5 marks

Computation of Rise & Fall or computation of H.I. in case of H.I. method – 2.5 marks

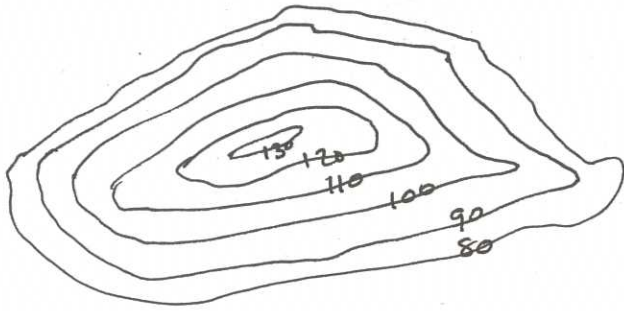
Computation of Reduced level – 2 marks

$\Sigma B. S. - \Sigma F. S. = \Sigma Rise - \Sigma Fall = Last R. L. - First R. L. - 1 mark$

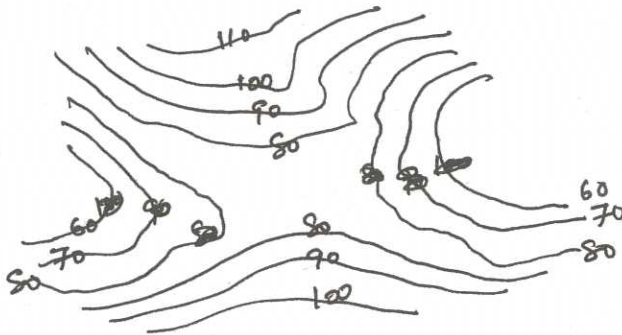
$$- 0.595 \quad - 0.595 \quad 0.595$$



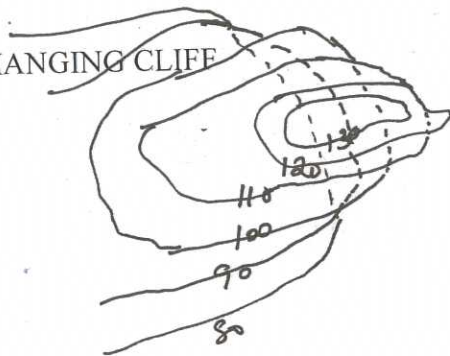
b) HILL



c) SADDLE



d) OVERHANGING CLIFF



For drawing the Sketch of a longitudinal section for a proposed road alignment - 3 marks

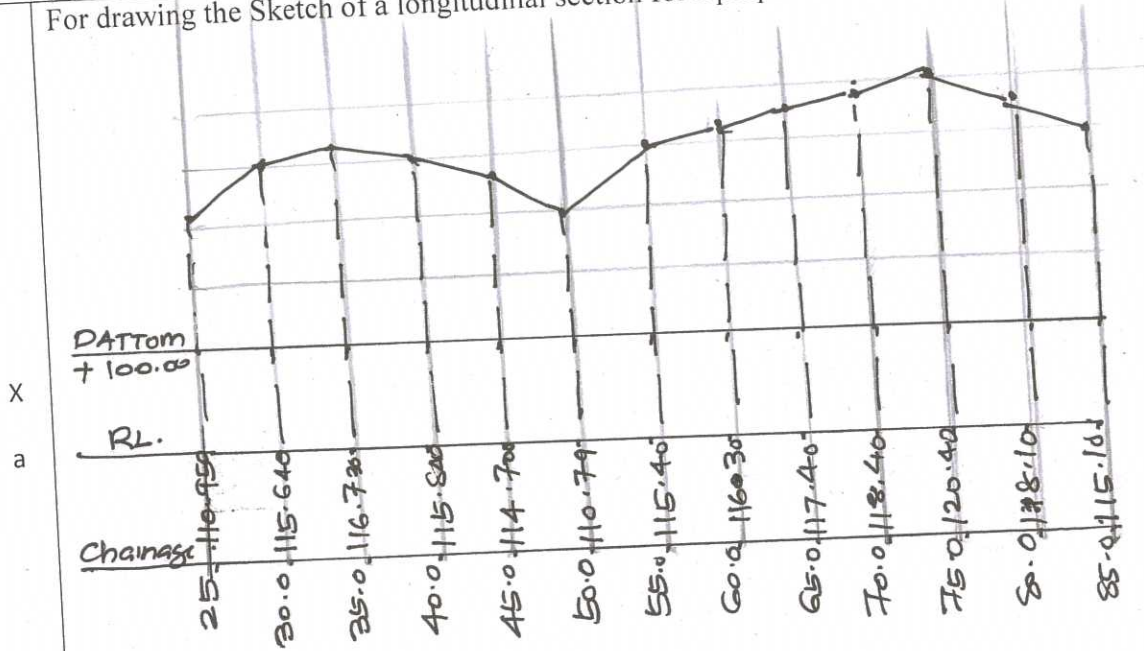


fig (4)  
descn. (4)

7

8

interpolation of contours.

1. Estimation
2. Arithmetic Calculators.
3. Mechanical or graphical method.

fig(3)  
descpn- (4)

Xb

7

Contours denote spirit level lines and determine at ridge lines. Contour lines in

	<p>U-shape cross a ridge and in V-shape cross a valley at right angles. The concavity in contour lines is towards higher ground in the case of ridge and towards lower ground in the case of valley.</p>		
--	--	--	--

*Handwritten notes:*  
U-shape cross a ridge  
V-shape cross a valley  
at right angles

*Handwritten notes:*  
The concavity in contour lines is towards higher ground in the case of ridge and towards lower ground in the case of valley.