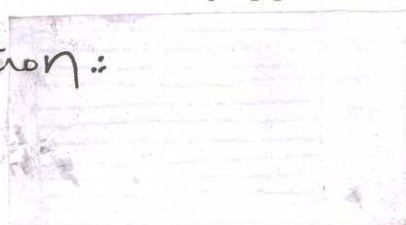


SCORING INDICATORS

CODE :2011

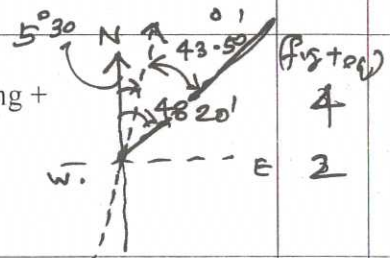
VERSION : Q.P

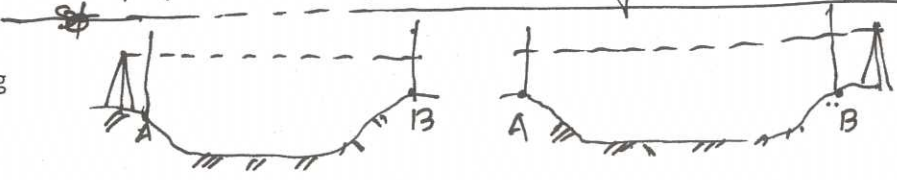
Qn No	Scoring indicators	Split score	Total score
Part A			
1	Work from whole to part location of point by measurement from two points of reference	1 1	2
2	Leveling, centering & orientation	2	2
3	True bearing; bearing measured from true north Magnetic bearing : bearing measured from magnetic north	2 1+1	2
4	vertical axis horizontal axis line of collimation axis of telescope axis of bubble tube	2	2
5	<p><del>Contour representation of uniform sloping ground</del></p> <p>Refraction: </p>	2	2
Part B			
1	<p>Sketch</p> <p>I visible at least two more stations</p> <p>II 2 possible to lay one or two baseline</p> <p>3 minimum survey line</p> <p>4 well-conditioned triangles</p> <p>5 each triangle at least one check line</p> <p>6 avoid obstacle to ranging and chaining</p> <p>7 survey line on level ground</p> <p>8 avoid -chain line crossing of passages and road</p>	2 4 LXC	6

any four 4x0.5

df. (2)

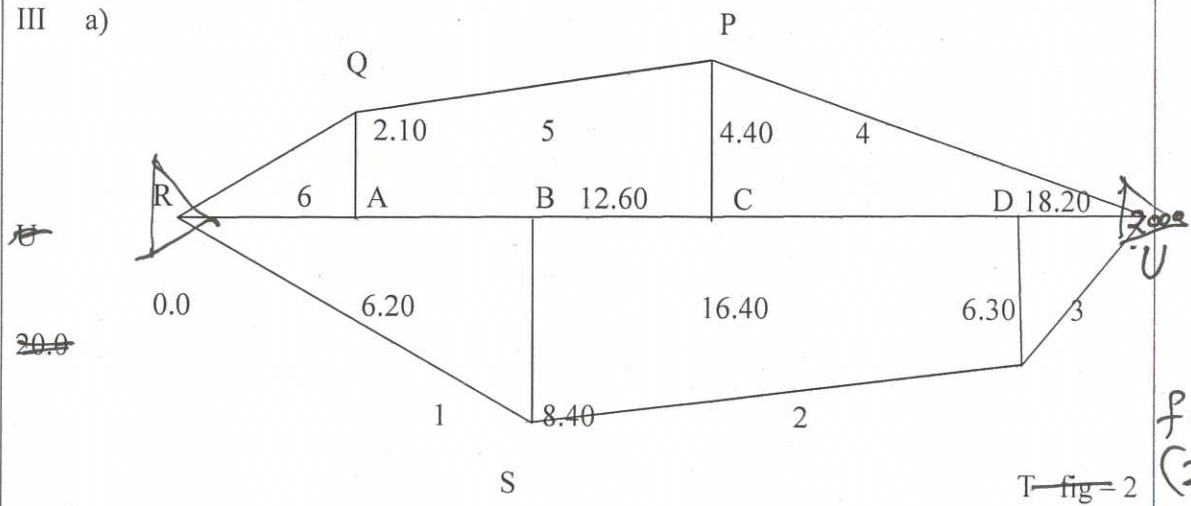
any six

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 NO	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)

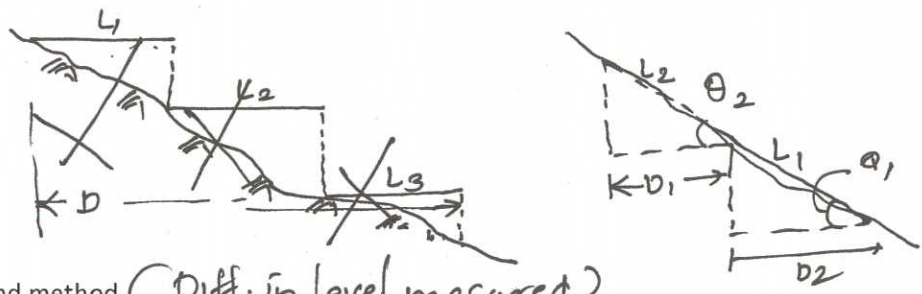
Result  
(2)

	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 mentod with figure						Fig + des.	3+4	7

2. indirect method with figure

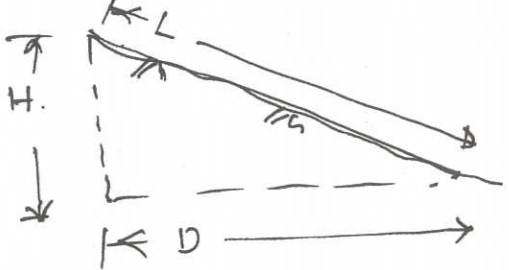
A. first method (Angle method)

horizontal distance = cose content of inclination x length

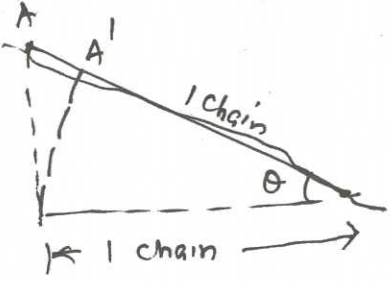


B. second method (Diff. in level measured)

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



C. Hypotenues allowance method



(sketches)

figure of resection method

b

3  
5

8

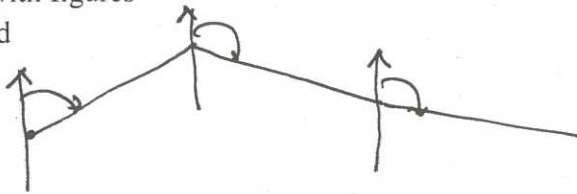
description of resection method  $\left\{ \begin{array}{l} \text{Resn. by Compass} \\ \text{Resn. by back sighting} \end{array} \right.$

4+  
4. 8

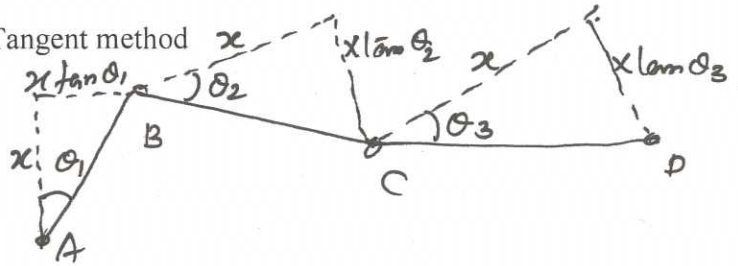
suitability in the field: it suitable to locate the plotted position of survey stations by drawing resectors from plotted position of the object

1. Angle and Distance method with figures

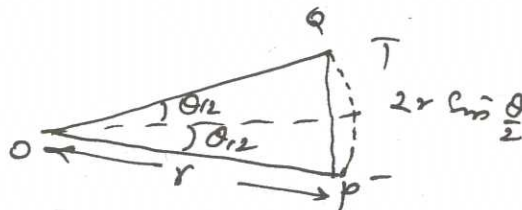
a. Protractor method



b. Tangent method



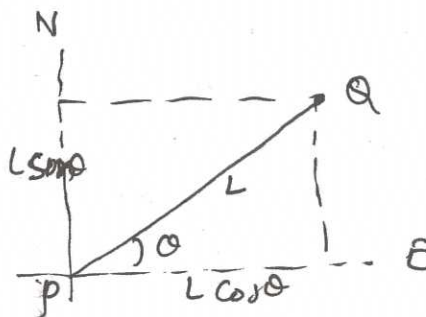
c. Chord method



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

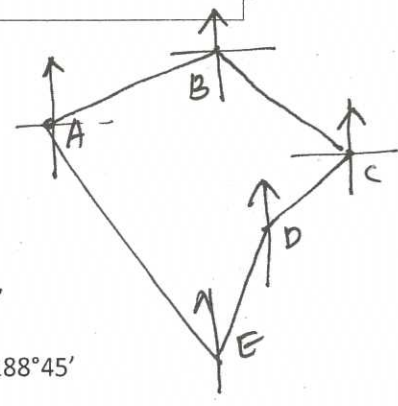
Computation of corrected bearing – 3 marks

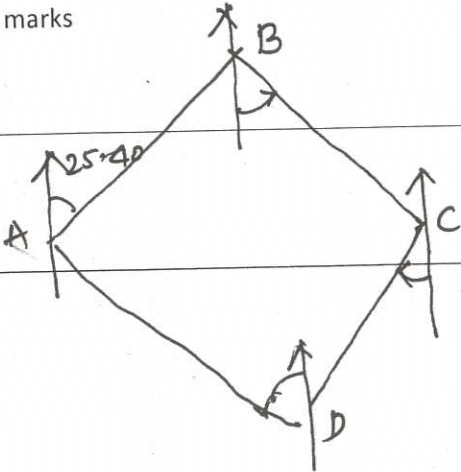
- Included angles  $\angle ABC = 248^\circ 15' - 148^\circ 45' = 99^\circ 30'$
- Included angles  $\angle BCD = 328^\circ 45' - 227^\circ 00' = 101^\circ 45'$
- Included angles  $\angle CDE = (360^\circ - 218^\circ 15') + 47^\circ 00' = 188^\circ 45'$
- Included angles  $\angle AED = (360^\circ - 327^\circ 45') + 38^\circ 15' = 70^\circ 30'$
- 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, horizontal & vertical axis.  
 Tilting - After levelling - Line of sight can tilt, without tilting rest. axis.  
 - use precise levelling.

10

VII a	State at least 3 differences between dumpy level and tilting level. - 7 marks	2x3.5	7																																																																						
b	<p>b) H. I. method</p> <table border="1" data-bbox="159 504 1300 1198"> <thead> <tr> <th>Station</th> <th>B S</th> <th>I S</th> <th>F S</th> <th>HI</th> <th>R L</th> <th>Remarks</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	HI	R L	Remarks	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	8
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VIII a	<p>a) For listing the instrument used in leveling (1 level, 2 levelling staff) - 1 marks</p> <p>For explaining the functions of the leveling instruments mentioned above - 5 marks</p>	3 4	7																																																																						

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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

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

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

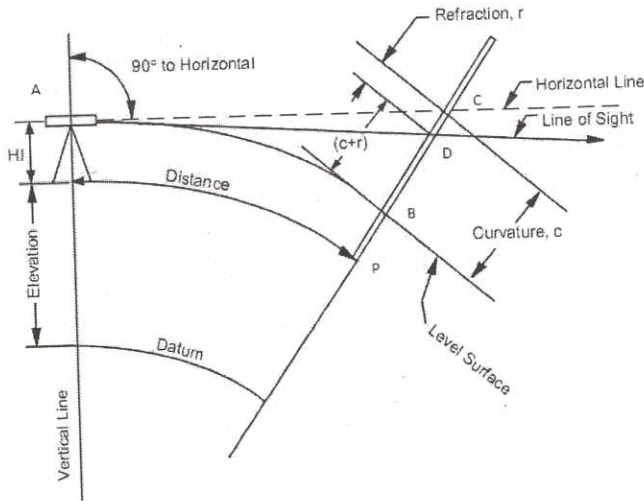


Fig - 1 mark

For deriving curvature correction - 2.5 marks

$$OC^2 = OA^2 + AC^2, \angle CAO = 90^\circ$$

$$BC = C = \text{correction for curvature}$$

$$AB = d, AO = R = \text{radius of earth} = 12740\text{m}$$

$$(R+C)^2 = R^2 + d^2 \Rightarrow C(2R + C) = d^2$$

$$C = \frac{d^2}{2R+C} = \frac{d^2}{2R} = \frac{d^2}{2 \times 12740}$$

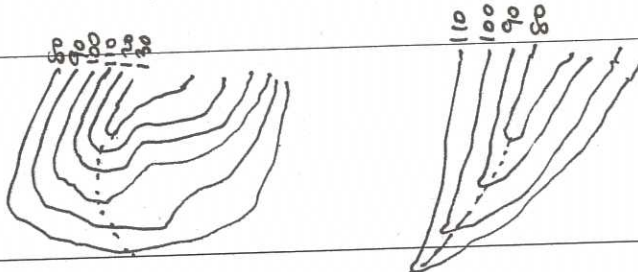
For deriving the refraction correction - 2.5 marks

$$\text{Correction for refraction, } r = \frac{1}{7} \times \frac{d^2}{2 \times 12740}$$

For computing the combined correction - 1 mark

$$\text{Combined correction} = C - r = \frac{6}{7} \times \frac{d^2}{2 \times 12740}$$

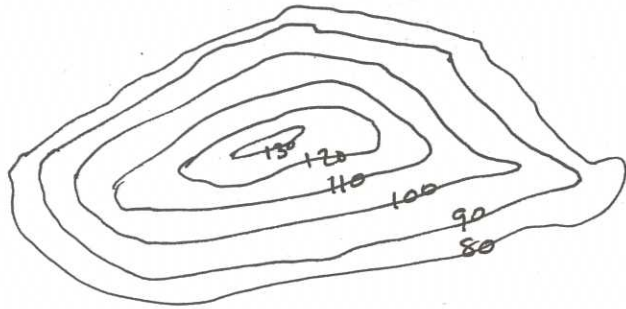
a) valley



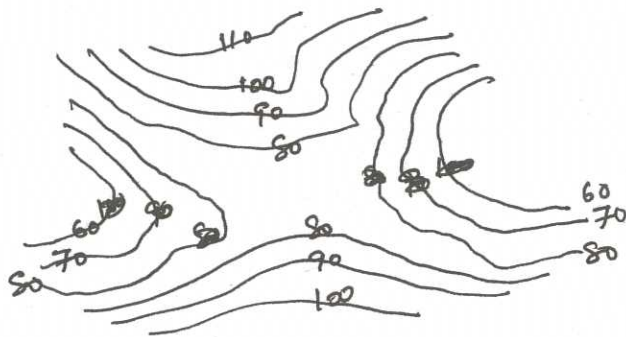
b

IX  
a

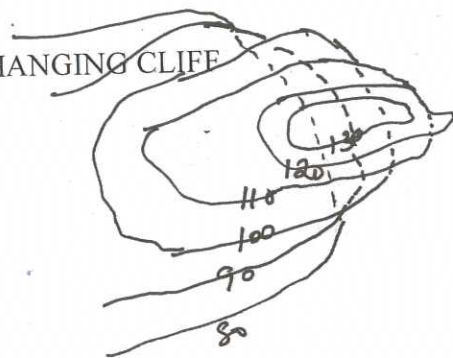
b) HILL



c) SADDLE



d) OVERHANGING CLIFF



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

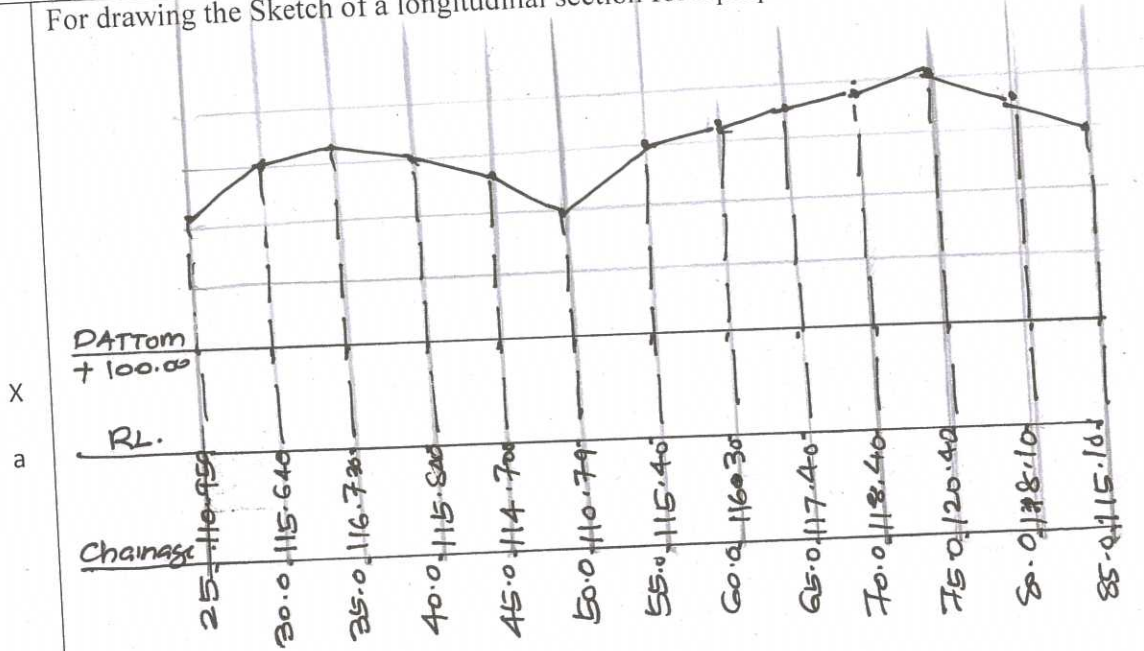


fig. (4)  
 descrn. (4)

7

8

interpolation of contours.

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

fig(3)  
 descrn- (4)

Xb

7

Contours denote spirit at valley 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.