

TED (15) – 2011

Reg. No.....

(REVISION – 2015)

Signature

SECOND SEMESTER DIPLOMA EXAMINATION IN CIVIL
ENGINEERING — APRIL, 2017

SURVEYING - I

[Time : 3 hours

(Maximum marks : 100)

PART — A

(Maximum marks : 10)

Marks

I Answer the following questions in one or two sentences. Each question carries 2 marks.

1. List the principles of surveying.
2. Define, bearing of a survey line.
3. What do you mean by bench mark ?
4. List the classification of levelling.
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. Explain stepping method of chaining on sloping ground.
2. Distinguish between resection and intersection methods of plane table surveying.
3. Differentiate whole circle bearing and quadrantal bearing.
4. Explain the component parts of the telescope of a dumpy level.
5. Determine the combined correction for curvature and refraction for a distance of 3.8km and 3400m.
6. With the aid of a neat sketch, explain reciprocal levelling.
7. Write the procedure of collimation adjustment of a dumpy level.

(5 × 6 = 30)

UNIT — III

- VII (a) The following staff readings were observed successively with a level, the instrument having been moved after third, sixth and eighth readings. 2.115, 1.605, 1.005, 2.190, 2.865, 1.255, 0.705, 1.985, 1.035 and 2.675m. Enter the readings in a level field book form and determine the reduced levels of the points by rise and fall method when the first reading was taken with a staff held on a bench mark of 535.000m. 9
- (b) Define the terms :
- (i) Level line (ii) Horizontal line (iii) Plumb line 6

OR

- VIII (a) The following consecutive readings were taken with a dumpy level and 4m levelling staff on continuously sloping ground at a common interval of 20m. 0.4000, 1.200, 1.625, 2.835, 3.700, 0.625, 2.105, 3.100 and 3.925. Rule out a page of level field book and enter the above readings. Calculate the reduced levels of all the points by height of collimation method and also find out the gradient of the line joining the first and last point. The reduced level of first point is 150.000m. 9
- (b) Describe different types of leveling staff. 6

UNIT — IV

- IX (a) An observer standing on the deck of a ship just sees the top of a light house which is 40m above sea level. If the height of the observer's eye is 8m above the sea level, determine the distance of the observer from the light house. 9
- (b) Define contour interval. List out the factors to be considered in selecting the contour interval. 6

OR

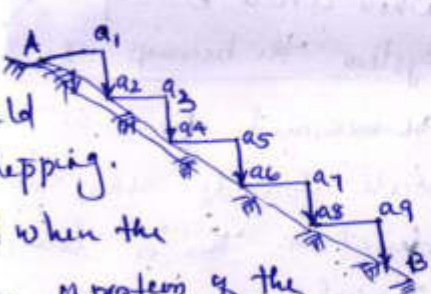
- X (a) Explain indirect methods of locating contours. 9
- (b) Explain profile levelling. 6

Scoring Indicators

Code 2011(15)

Version (2015)

SURVEYING - I

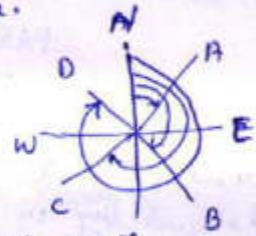
Qn:No	Scoring Indicators	Split score	Total score
I	<p>PART-A.</p> <ol style="list-style-type: none"> 1. Work from whole to part 2. Fixing new stations 3. Bearing is the angle between the survey lines concerned and a fixed line of reference with a compass. 3. Bench mark is a point whose elevation is known. 4. Differential levelling, flylevelling, profile levelling, cross-sectioning 5. 1. It furnishes information regarding the character and topography of the area. 2. Engineers to select most economical and suitable site for engineering works. 3. Quantities of earthwork can be calculated. 4. Determination of capacity of reservoir <p>PART-B.</p>	<p>2.</p> <p>2</p> <p>2.</p> <p>2</p> <p>any 2</p> <p>2..</p>	
II	<p>1. In this case the distance is measured horizontally in the field by the process of stepping.</p> <p>The method is adopted when the slope is not very steep. A portion of the chain is stretched horizontally with one end resting on the ground and the other end</p> 		

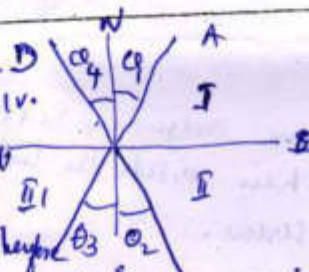
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	<p>end held in line above the ground at convenient height of less than 1.8m. The point a_2 vertically below this end a_1 is then accurately found on the ground by means of a plumb bob. The next step is commenced from the point a_2 and the process is continued. The length of the step $Aa_1 + a_2a_3 + a_4a_5$ is the length of the line.</p> <p>2. This method Intersection method is widely employed for plotting the details on map. The various points can be located by the intersection of rays drawn from two different stations.</p> <p>3. Resection method is for locating station points only. The main feature of this method is that the point plotted on the sheet is the station occupied by the table.</p> <p>3. Whole circle bearing:- In this system the bearings of lines are measured from the north point towards the line in clockwise direction. This is known as W.C.B. of a line. The value of bearing may 0° to 360°. The letters N, S, E, W are not at all used to designate the bearing.</p> <p>Quadrantal bearing:- The bearing of a</p>	<p>Fig: 2 exple 4</p> <p>3</p> <p>3</p> <p>3</p>	<p>6.</p> <p>6.</p> <p>3</p>

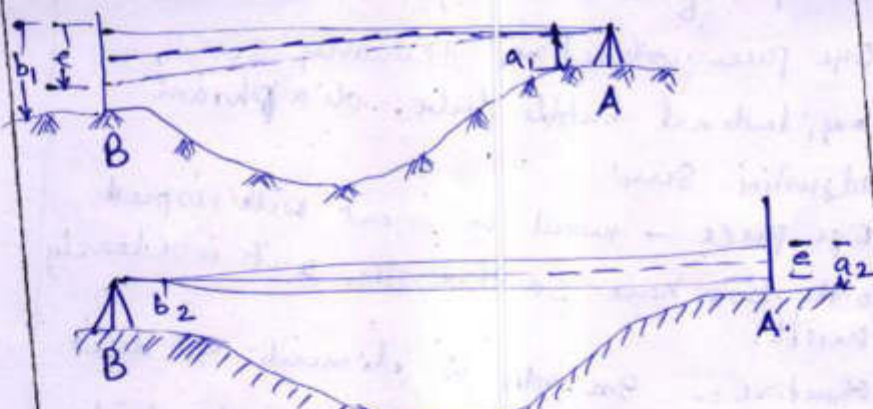


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	<p>  </p> <p> direction is measured clockwise from the north or south point whichever is nearer to the line towards East or West. Therefore it becomes necessary to mention the point from which the angle is measured and the direction in which is measured. The plane around the station is divided into four quadrants. In first quadrant the bearing of OA is expressed as N 45° E. </p> <p> 4. Eye piece - objective, focussing screw, longitudinal bubble tube, diaphragm adjusting screw Eye piece - moved in or out with respect to the cross hairs so that the slit is clearly visible. Objective :- In order to eliminate the defect of aberration the eye piece and objective lens are made up of two or more simple lenses. The objective is invariably a compound lens consisting of (1) a front double convex lens made of crown glass (2) back concave convex lens made of flint glass. Focussing screw -> Clear the image. Longitudinal bubble - It is for levelling the instrument by using foot screws - bubble should be centre </p>	<p>3</p> <p>1</p> <p>2</p> <p>1</p>	<p>6.</p>

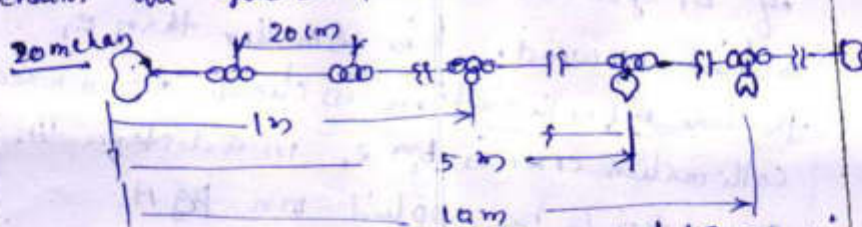
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5.	<p>Diaphragm adjusting screw:-- The position of the cross hair inside the tube can be adjusted by this screw.</p> <p>combined correction for curvature and refraction = $0.0673 d^2$ when d is km.</p> <p>= $0.9718m$</p> <p>$d = 3400m = \frac{3400}{1000} = 3.4 km.$</p> <p>$2 \times 0.0673 \times 3.4^2 = 0.7779m$</p>	<p>1</p> <p>3</p> <p>3</p>	<p>6</p> <p>6</p>
6.	 <p>Determine the difference of elevations between two points at a considerable distance apart with an instrument consisting of collimation error and also determine eliminate the error due to curvature and refraction.</p> <p>Set up the instrument near to A. the staff reading a_1, b_1</p> <p>Set up the instrument near to B reading a_2, b_2.</p> <p>The true difference in levels between two point</p>	<p>$1\frac{1}{2}$</p> <p>$1\frac{1}{2}$</p>	

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7.	<p>is the average of the two apparent differences of levels.</p> <p>Abhi chh' detekhi the collimation error - Find out the whether the the true difference is a rise or fall.</p>	3	6.
		Fig: 2	
	<p>∵ a is greater than b - Peg A is lower than Peg B. ground is rising from A to B. b is greater than 'a' ground is falling A to B.</p> <p>error $e = a_1 \mp$ true difference (using + sign for fall and - sign for rise)</p> <p>if b_1 greater than e, line of collimation is inclined upward. b_1 is smaller than e, the line of collimation is inclined downwards.</p> <p>collimation error is $b_1 \mp e$, in a distance D.</p> <p>Correction to be applied on Peg A</p> $c_1 = \frac{d}{D} (b_1 \mp e)$ <p>Cor. Peg B = $c_2 = \frac{d+D}{D} (b_1 \mp e)$</p> <p>The correction c_1 & c_2 are to be added to the staff readings a_1 & b_1 on Peg A & B</p>	1	1

Qn:No	Scoring Indicators	Split score	Total score
	<p>if the line of collimation is inclined downwards, if the collimator is inclined upwards R_1 & C_2 are to be subtracted from a, p, b, and get correct staff reading.</p> <p>Peg A : $a_1 + c_1$ } if the line of collimation is inclined upwards. Peg B : $b_1 + c_2$ }</p> <p>Peg A : $a_1 - c_1$ } if the line of collimation is inclined downwards. Peg B : $b_1 - c_2$ }</p> <p>The adjustment is made by adjusting the diaphragm by the diaphragm screws so that the correct staff readings are obtained when the staff is held on A & B.</p> <p style="text-align: center;"><u>PART C</u></p> <p>iii a. chain, ranging rods, arrows, Description of metric chain :- 20m & 30m chains are generally used</p>  <p>1. made up of mild steel $\frac{1000}{100}$ 8mm bar & 2mm wire 2. two handles - brass 3. brass ring for 1m length 4. 100 links - 1 link = 20cm 5. each five mch - 1 pin tally. 6. 10m - two pins tally. 7. Handles with special swivel arrangements.</p>	2	6
		4	

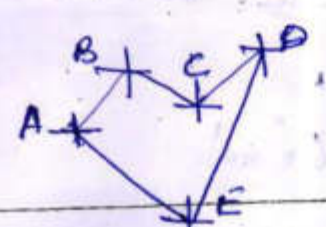
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	<p>Ranging rods:- They are made of straight grained, well seasoned timber either circular or octagonal in section 25 to 38 mm diameter and shod with iron shoe at the lower end. They may be 2, 3, 4 m long painted in two or three colours are marked and is used for ranging a long line.</p> <p>Arrows. To mark out the end of the chain lengths and to record the number of times the chain is laid down in measuring a line, also known as marking pin or chaining pin. They are made of good quality hardened and tempered steel wire of minimum tensile strength of 40 kg/cm² and diameter is 4 mm. The arrow has an eye at one end and is pointed at the other end. Length - 400 ± 5 mm and dia is 4 mm.</p> <p>b. Alidade - sighting object Upright plumbob - centring the plumb point to ground. Spirit level. - Level the table. Rough compass - Mark north direction on sheet. Water proof cover paper & pencil</p>  	<p>2 1/2</p> <p>2 1/2</p>	<p>9</p> <p>6</p>

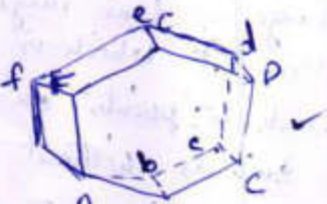
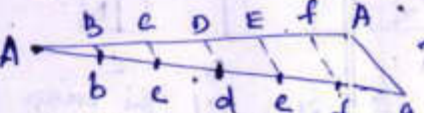

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IV a.	<p>A point of significance or importance at the beginning or at the end of a chain line is called station-</p> <ul style="list-style-type: none"> * Main stations are indelible. * All triangles are well conditioned * The main principles of surveying should be observed * Each portion of the survey should be provided with check line and tie line * A few lines as possible, should be run without offsets. * Obstacles to ranging and chains should be avoided as far as possible. * The base line should be run through the middle of the area * Offsets should be short particularly for locating the important features. <p>b. Ranging by eye :- The ranging rods should be erected vertically behind at each end of the line. To range a rod in line, the surveyor stands at one end station of the line and the assistant holds a ranging rod at his arms length - at the desired intermediate position. The surveyor directs the</p>	<p>(3)</p> <p>any 6x 1x -6-</p>	<p>9.</p>

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	<p>assistant to move the rod left or right until the three rods at the end stations and the third at the intermediate station appear to be in the same straight line.</p> <p>Ranging by line ranger:- Line ranger is a small reflecting instrument which is used to fixing up the intermediate points on the line with two distant signals without going to and sighting from one of them. For locating an intermediate point 'O' in line with the poles A & B the observer stands approximately in line near 'O' and held instrument at the eye level turning it until one of the poles A is seen in the field of view.</p> <p>Module II</p> <p>V a.</p> <table border="1" data-bbox="487 1500 1104 1825"> <thead> <tr> <th>line</th> <th>FB</th> <th>BB</th> </tr> </thead> <tbody> <tr> <td>AB</td> <td>60° 00'</td> <td>240° 00'</td> </tr> <tr> <td>BC</td> <td>122° 30'</td> <td>302° 30'</td> </tr> <tr> <td>CD</td> <td>45° 30'</td> <td>225° 30'</td> </tr> <tr> <td>DE</td> <td>206° 00'</td> <td>26° 00'</td> </tr> <tr> <td>EA</td> <td>300° 30'</td> <td>120° 30'</td> </tr> </tbody> </table> <div style="display: flex; align-items: center;">  <div style="margin-left: 20px;"> <p>$\angle A = 60^\circ 30'$</p> <p>$\angle B = 117^\circ 30'$</p> <p>$\angle C = 257^\circ 00'$</p> <p>$\angle D = 19^\circ 30'$</p> <p>$\angle E = 85^\circ 30'$</p> </div> </div>	line	FB	BB	AB	60° 00'	240° 00'	BC	122° 30'	302° 30'	CD	45° 30'	225° 30'	DE	206° 00'	26° 00'	EA	300° 30'	120° 30'	<p>3</p> <p>3</p>	<p>6.</p>
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b.	<p>check :- $(2n-4)90 = (2 \times 5 - 4)90 = 540$ $\angle A + \angle B + \angle C + \angle D + \angle E = \underline{540^\circ}$</p>  <p>Let ABCDEF be the true survey and let abcdefa be the polygon obtained after the results are plotted, a should have coincided with A. provided the work is correct.</p>  <p>Draw a line Aa equal to the total length of the traverse and mark out the distance AB, Ab, bc, cd, de, ef, aA equal and parallel to the closing error and join Aa. Through the points a, b, c, d, e, f, draw parallels to aA to cut the line at B, C, D, E and F. The corrections at the stations a, b, c, d, e, f are represented by bB, cC, dD, eE and fF through stations a, b, c, d, e, and f parallel and equal to their lengths. Join ABCDEF the resulting figure. OR</p>	3	3
VI a.	<p>Bearing of AB = $60^\circ 00'$</p> 		6

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	<p> $\angle A = 140^\circ$ $\angle B = 90^\circ 45'$ $\angle C = 61^\circ$ $\angle D = 68^\circ 15'$ </p> <p> Bearing of AB = 60° </p> <p> Bearing of BC = $200^\circ 00' - 90^\circ 45' = 149^\circ 15'$ </p> <p> Bearing of CD = $329^\circ 15' - 61^\circ = 268^\circ 15'$ </p> <p> Bearing of DA = $88^\circ 15' - 68^\circ 15' = 20^\circ 00'$ </p> <p> Bearing of AB = $200^\circ - 140^\circ = 60^\circ$ (check) </p> <p> True bearing:- The angle between a survey line and the true meridian is termed as true bearing of a line. </p> <p> Magnetic bearing:- The angle between a survey line and magnetic meridian is called magnetic bearing. </p> <p> Dip:- The inclination of the magnetic axis of the needle with the horizontal line at a place is called dip. </p> <p> Declination:- The horizontal angle between the two directions (True meridian and magnetic meridian) is called declination. </p> <p style="text-align: center;">Module III</p>	<p>3</p> <p>3</p> <p>3</p> <p>9</p> <p>1/2 x 4 = 6</p> <p>6.</p>																																																																
VIII a.	<table border="1" style="width: 100%; border-collapse: collapse; text-align: center;"> <thead> <tr> <th>BS</th> <th>IS</th> <th>FS</th> <th>Rise</th> <th>Fall</th> <th>RL</th> <th>Remarks</th> </tr> </thead> <tbody> <tr> <td>2.115</td> <td></td> <td></td> <td></td> <td></td> <td>535.00</td> <td></td> </tr> <tr> <td></td> <td>1.605</td> <td></td> <td>0.510</td> <td></td> <td>535.51</td> <td></td> </tr> <tr> <td>2.190</td> <td></td> <td>1.005</td> <td>0.600</td> <td></td> <td>536.110</td> <td>CP</td> </tr> <tr> <td></td> <td>2.685</td> <td></td> <td></td> <td>0.495</td> <td>535.615</td> <td></td> </tr> <tr> <td>0.705</td> <td></td> <td>1.255</td> <td>1.430</td> <td></td> <td>537.045</td> <td>CP</td> </tr> <tr> <td>1.035</td> <td></td> <td>1.985</td> <td></td> <td>1.280</td> <td>535.765</td> <td>CP</td> </tr> <tr> <td></td> <td></td> <td>2.675</td> <td></td> <td>1.640</td> <td>534.125</td> <td></td> </tr> <tr> <td>6.045</td> <td></td> <td>6.920</td> <td>2.540</td> <td>3.415</td> <td></td> <td></td> </tr> </tbody> </table> <p> $\sum BS - \sum FS = \sum R - \sum F = LRL - FRL$ $6.045 - 6.920 = 2.54 - 3.415 = 534.125 - 535.00$ $-0.875 = -0.875 = -0.875$ </p>	BS	IS	FS	Rise	Fall	RL	Remarks	2.115					535.00			1.605		0.510		535.51		2.190		1.005	0.600		536.110	CP		2.685			0.495	535.615		0.705		1.255	1.430		537.045	CP	1.035		1.985		1.280	535.765	CP			2.675		1.640	534.125		6.045		6.920	2.540	3.415			<p>Full book form - 2</p> <p>check - 1</p> <p>Reduced level - 126</p>	9.
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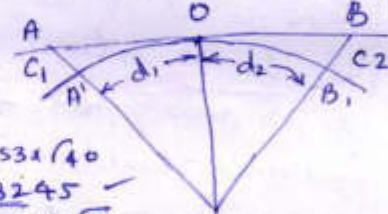
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b.	<p>Level line:- A line lying throughout on a level surface is a level line, this is normal to the plumb line at all points.</p> <p>Horizontal line:- Any line lying throughout in a horizontal plane is termed as horizontal line.</p> <p>Plumb line:- A vertical line at any point is a line normal to the level surface at that point. A plumb line is an example of vertical line.</p> <p style="text-align: center;">OR</p>	2 2 2	6																																																						
VIII a.	<table border="1" style="width: 100%; border-collapse: collapse; margin-bottom: 10px;"> <thead> <tr> <th>BS</th> <th>IS</th> <th>FS</th> <th>HI</th> <th>RL</th> <th>Remarks</th> </tr> </thead> <tbody> <tr> <td>0.400</td> <td></td> <td></td> <td>150.400</td> <td>150.00</td> <td>BM</td> </tr> <tr> <td></td> <td>1.200</td> <td></td> <td></td> <td>149.200</td> <td>20</td> </tr> <tr> <td></td> <td>1.625</td> <td></td> <td></td> <td>148.775</td> <td>40</td> </tr> <tr> <td></td> <td>2.835</td> <td></td> <td></td> <td>147.565</td> <td>60</td> </tr> <tr> <td>0.625</td> <td></td> <td>3.700</td> <td></td> <td>146.700</td> <td>80</td> </tr> <tr> <td></td> <td>2.505</td> <td></td> <td></td> <td>145.220</td> <td>100</td> </tr> <tr> <td></td> <td>3.100</td> <td></td> <td></td> <td>144.225</td> <td>120</td> </tr> <tr> <td></td> <td></td> <td>3.925</td> <td></td> <td>143.400</td> <td>140</td> </tr> </tbody> </table> <p> $\sum BS = 0.25$ $\sum FS = 7.625$ $\sum BS - \sum FS = LRL - FRL$ $1.025 - 7.625 = 143.400 - 150.000$ $-6.600 = -6.600$ </p> <p>As gradient of the 1st and last point = $\frac{1}{17/2}$</p> <p style="text-align: center;"> $\frac{1}{\left(\frac{140}{6.6}\right)} = \frac{1}{21.212} = \frac{1}{21.212}$ </p>	BS	IS	FS	HI	RL	Remarks	0.400			150.400	150.00	BM		1.200			149.200	20		1.625			148.775	40		2.835			147.565	60	0.625		3.700		146.700	80		2.505			145.220	100		3.100			144.225	120			3.925		143.400	140	<p>field B-2 check = 1 Red: $\frac{1}{2} \times 2$ = 4 gradient 2.</p>	9.
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b.	<p>levelling staff can be classified as:</p> <ol style="list-style-type: none"> 1) self reading 2) target staff. <p>Self reading :- The staff held vertically on a point of which the level is to be determined. On looking through the telescope, when the line of sight is horizontal, the</p>																																																								

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	<p>level of graduation on the staff coinciding with the horizontal cross hair of the telescope shows the level of the line of sight or line of collimation or the height of the instrument.</p> <p>Self reading levelling of three types - solid staff, folding collapsible staff, telescopic.</p> <p>Target staff:- This is made of two pieces of which one solid piece slides into the hollow of the other. A target slides across its graduation on the staff. On looking through the telescope the target is brought into coincidence with the horizontal cross hair by the staffman holding staff vertically and the vernier provided with the staff is also adjusted by him according to the instructions of the levelman looking through the telescope, for accurate measurement.</p>	<p>3</p> <p>3</p>	<p>6</p>
<p>Tx a.</p>	$d = \sqrt{\frac{c}{0.06735}} = 3.8553\sqrt{c}$ <p>in meter</p>  $d_1 = 3.8553\sqrt{40} = 3.8553 \times 6.3245 = 24.38$ $d_2 = 3.8553\sqrt{8} = 3.8553 \times 2.8284 = 10.89$ $d = d_1 + d_2 = 24.38 + 10.89 = 35.27 \text{ m}$	<p>Fig: 3</p> <p>2+2+2</p> <p>=</p>	<p>9.</p>

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Code

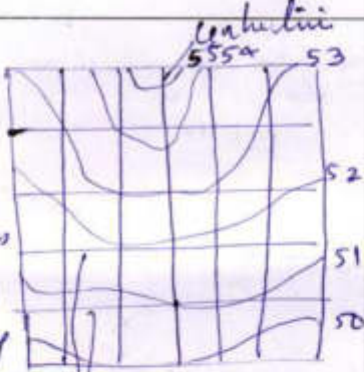
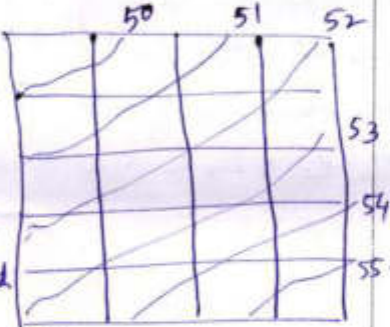
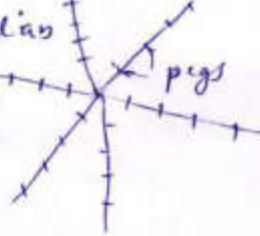
Version

Qn:No	Scoring Indicators	Split score	Total score
b.	<p>Contour interval:- The vertical height between two consecutive contour is called contour interval. Contour interval depends on the following factors.</p> <ol style="list-style-type: none"> 1. Time and expense of field and groundwork:- When the contour interval is small, the time and expenditure to conduct the survey is more. 2. Purpose and extent of survey:- When the contour plan is required for the design of an engineering structure or for the calculation of earthwork, the area involved will be small and as the detailed information regarding the topography of the country is required, the contour interval may be small. But in the case of preliminary survey for reservoirs, drainages lines of communication etc. the area involved is very large and the contour interval is comparatively large. <p>Nature of Country:- In flat and uniformly sloping country, the contour interval may be large. But in the case of undulating ground the contour interval be small.</p> <p>4. Scale of plan:- Scale of plan:- The contour interval should be in inverse ratio to the scale of the map or plan.</p> <p>OR</p> <p>Indirect methods of locating contours. There are three methods.</p> <ol style="list-style-type: none"> 1. By cross sections:- The cross sections are run 	2	124
X a.			6

Scoring Indicators

Code :

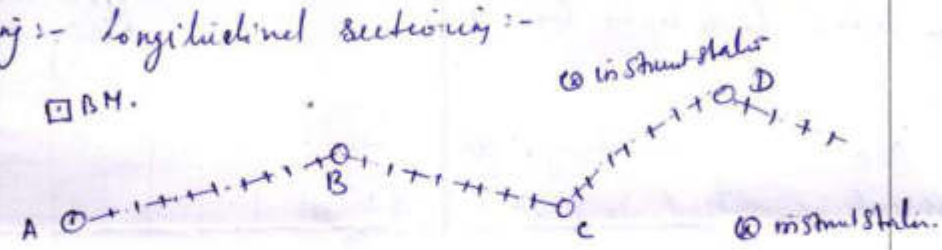
Version:

Qn. No.	Scoring Indicators	Split score	Total score
	<p>perpendicular to the centre line of the work. and various representative points are marked along the lines of cross sections. The lines of cross sections need not be perpendicular or right angles to the centre line of the work. The spacing of the cross sections depends on the topography of the country and the nature of the survey. Spot levels are taken on various representative points and the contours are interpolated.</p> 	3	
	<p>By squares:- On this method, the whole area is divided into a number of squares, the sides of which may vary from 3-3m, depending on the nature of the ground and the contour interval. The size of the square may vary depending on convenience. The corners of the square are pegged out and the reduced levels of these points are determined. The squares are plotted and the reduced level of the corners are written on plan. The contour may then be interpolated.</p> 	3.	
	<p>By Tacheometry:- On this method tacheometry is employed. The horizontal distance between the instrument and the staff stations may be determined by multiplying the difference between the upper and lower cross hair staff readings, by stadia constant of the instrument is usually 100. A number of the radius line are set out and dike levels are on levels and calculate the elevations and then interpolated.</p> 	3	9.

Scoring Indicators

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b.	<p>Profile levelling :- Longitudinal sectioning :-</p> <p>□ B.M.</p>  <ol style="list-style-type: none"> 1. The line are marked ^x instrument station at every equal intervals by means of pegs 2. The instrument is set up at a convenient point. such that the maximum number of points can be commanded from this position of the instrument 3. The staff readings are taken ^{is} on the starting point and at ^{is} equal intervals and record in their respective columns, and the where the inclination are is change. 4. After the levels are reduced the plotting of line are started. 		6.