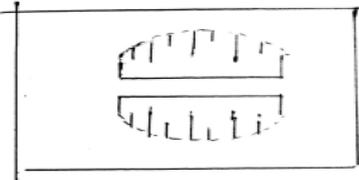
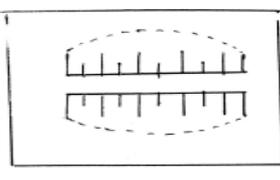




Important Instructions to examiners:

- 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 the candidate and those in the 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 the model answer.
- 6) In case of some questions credit may be given by judgment 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.

Que. No.	Sub. Que.	Model Answers	Marks	Total Marks
Q.1	(a) 1)	Attempt any SIX of the following Define surveying & state its objectives Ans- Surveying- It is branch of civil engineering in which relative positions of ground points are determined by taking linear and angular measurement. Objectives: 1. To determine the relative positions of the existing features of the ground 2. To layout our marked positions of proposed structures on the ground 3. To determine areas, volumes and other related quantities 4. To prepare a topographical map showing details of hills, valleys and rivers.	1	12
	2)	Draw conventional symbol- 1) Embankment 2) Cutting Ans- 1. Cutting  CUTTING 2. Embankment  EMBANKMENT	1/2 mark Each (Any two)	2



Que. No.	Sub. Que.	Model Answers	Marks	Total Marks
Q.1	3)	State the use of following- 1. Arrow 2. Wooden peg Ans- 1. Arrow Arrows are used for counting the number of chains while measuring a chain line. 2. Wooden peg Pegs are used for fixing the instrument station on the ground permanent marking	1 1	2
	4)	Define - 1. Base line 2. Check line Ans- 1. Base line- The line on which the framework of the survey is built is known as Base line. OR The longest of the main survey line is consider as Base line. 2. Check line The line joining the apex point of triangle to some fixed point on its base is known as the Check line	1 1	2
	5)	What is mean by perpendicular and oblique offset? Ans- Perpendicular offset- When the offset is taken at 90° or right angle to the survey line, then it is known as perpendicular offset. Oblique offset- When the offset is taken at an angle other than 90° to the survey line, then it is known as Oblique offset.	1 1	2
	6)	State principle of plane table survey. Ans- Principle of plane table survey- 1. The rays drawn from different points should pass through a single point i.e. position of station point. 2. The position of table should be same as that of previous station i.e. orientation should be done at each changed station.	1 marks each	2
	7)	Define True Meridian and Magnetic Meridian. Ans- 1. True Meridian: The line or plane passing through the geographical north pole, geographical south pole and any point on the surface of the earth is known as True Meridian. 2. Magnetic Meridian: The direction indicated by freely suspended and properly balanced Magnetic needle unaffected by local attractive force is called magnetic meridian.	1 1	2



Que. No.	Sub. Que.	Model Answers	Marks	Total Marks
Q.1	8)	Define- 1. Datum 2. Change point Ans- 1. Datum- It is the imaginary level surface or level line from which the vertical distance of different points are measured. 2. Change point- It is the point at which both back sight and foresight readings are taken before and after shifting the level instrument.	1 1	2
		(B) 1) Attempt any TWO of the following: State & explain principle of survey. Ans- Principle of surveys are as follows - 1.To work from the whole to the part According to the first principle, the whole area is first enclosed by main stations and main survey lines. The area is then divided into a number of parts by forming well conditioned triangles. A nearly equilateral triangle is considered to be the best well conditioned triangle. The main survey lines are measured very accurately with a standard chain. The sides of triangles are measured. The purpose of this process of working is to prevent accumulation of error. 2.To locate a new station by at least two measurement. The new stations should always be fixed by at least two measurement from fixed reference points. Linear measurements refer to horizontal distance measured by chain or tape. Angular measurements refer to the magnetic bearing or horizontal angle taken by a prismatic compass or theodolite.	2 2	4
	2)	A line was measured by a 20 m chain which was accurate before starting the day's work. After chaining 900m, the chain was found to be 6cm too long. After chaining 1575m the chain was found to be 14cm too long. Find the true distance of the line. Ans- Given data Standard length of chain= L = 20m, Measured length of chain (AB) = ML = 900 m, Error at B = 0.06m long Measured length of chain (AC)= ML = 1575 m, Error at C = 0.14m long To find- True length AC For 900 m distance (AB) Incorrect length = $20 + ((0+0.06)/2) = 20.03$ m $TL(AB) = (L^1/L) \times ML (AB)$ $TL(AB) = (20.03/20) \times 900$ TL(AB) = 901.35 m	1 1	

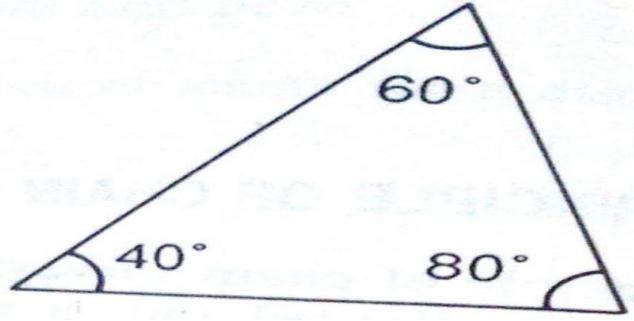
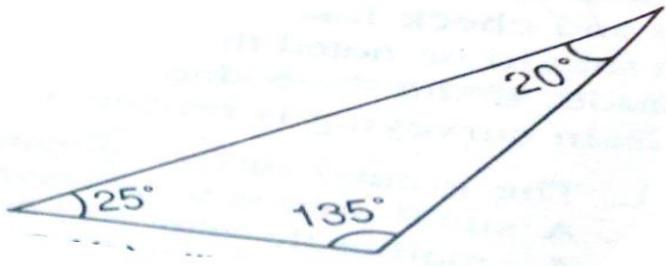


Que. No.	Sub. Que.	Model Answers	Marks	Total Marks																																
Q.1	2)	<p>For 1575 m Distance (BC) Measured Distance(BC) = 675 m Incorrect length = $20 + ((0.06+0.14)/2) = 20.1$ m $TL(BC) = (L^1/L) \times ML (BC)$ $TL(BC) = (20.1/20) \times 675$ TL(BC) = 678.375m</p> <p>True length (AC) = TL(AB) + TL(BC) True length (AC) = 901.35+678.375 True length (AC) = 1579.725 m</p>	1	4																																
	3)	<p>State any four codes of signals in ranging Ans-</p> <table border="1"> <thead> <tr> <th>Sr No.</th> <th>Signal given by surveyor</th> <th>Meaning of signal for the assistant</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>Rapid sweep with Right hand</td> <td>move considerably to your left</td> </tr> <tr> <td>2</td> <td>Slow sweep with Right hand</td> <td>move slowly to your left</td> </tr> <tr> <td>3</td> <td>Right arm extended</td> <td>continue to move to your left</td> </tr> <tr> <td>4</td> <td>Right arm up & moved to the right</td> <td>plumb the rod to your left</td> </tr> <tr> <td>5</td> <td>Rapid sweep with Left hand</td> <td>move considerably to your right</td> </tr> <tr> <td>6</td> <td>Slow sweep with Left hand</td> <td>move slowly to your right</td> </tr> <tr> <td>7</td> <td>Left arm extended</td> <td>continue to move to your right</td> </tr> <tr> <td>8</td> <td>Right arm up & moved to the Left</td> <td>plumb the rod to your right</td> </tr> <tr> <td>9</td> <td>Both hand above head & then brought down</td> <td>Ranging is correct</td> </tr> <tr> <td>10</td> <td>Both arm extended forward horizontally & hands brought down quickly</td> <td>Fix the ranging rod</td> </tr> </tbody> </table>	Sr No.		Signal given by surveyor	Meaning of signal for the assistant	1	Rapid sweep with Right hand	move considerably to your left	2	Slow sweep with Right hand	move slowly to your left	3	Right arm extended	continue to move to your left	4	Right arm up & moved to the right	plumb the rod to your left	5	Rapid sweep with Left hand	move considerably to your right	6	Slow sweep with Left hand	move slowly to your right	7	Left arm extended	continue to move to your right	8	Right arm up & moved to the Left	plumb the rod to your right	9	Both hand above head & then brought down	Ranging is correct	10	Both arm extended forward horizontally & hands brought down quickly	Fix the ranging rod
Sr No.	Signal given by surveyor	Meaning of signal for the assistant																																		
1	Rapid sweep with Right hand	move considerably to your left																																		
2	Slow sweep with Right hand	move slowly to your left																																		
3	Right arm extended	continue to move to your left																																		
4	Right arm up & moved to the right	plumb the rod to your left																																		
5	Rapid sweep with Left hand	move considerably to your right																																		
6	Slow sweep with Left hand	move slowly to your right																																		
7	Left arm extended	continue to move to your right																																		
8	Right arm up & moved to the Left	plumb the rod to your right																																		
9	Both hand above head & then brought down	Ranging is correct																																		
10	Both arm extended forward horizontally & hands brought down quickly	Fix the ranging rod																																		



Que. No.	Sub. Que.	Model Answers	Marks	Total Marks
Q.2	4)	4) $270^{\circ}0'$ $RB = WCB - 180^{\circ}$ $RB = 270^{\circ} - 180^{\circ}$ $RB = S90^{\circ}W$ or $N90^{\circ}W$	1	4
	5)	What is meant by orientation in plane table survey ? State its method and explain any one. Ans- Orientation is the process of keeping plane table in same position as that is occupied in previous station. Methods of orientation: i) Magnetic meridian method using trough compass ii) Back sighting method using alidade Backsight method of orientation- 1. Assume we have to orient the table at next station 'B' represented on paper by point 'b'. 2. the line 'ba' is drawn on previous station 'A'. 3. the alidade is kept on line 'ba' and the table is turned around its vertical axis such a way that line of sight passes through ground station 'A'. 4. When the plotted line 'ab' coincides with line 'AB' and table will be oriented. OR Magnetic meridian method of orientation- 1. The trough compass is placed on the top right corner of the plane table such a way that magnetic needle point exactly towards the N-S direction 2. Draw these line along the edge of compass. 3. Shift & set up the plane table on next station. 4. place the trough compass along the N-S line. Rotate the table till the magnetic needle coincides the N-S line drawn previously	1 1 2 2	
	6)	Explain temporary adjustments of Dumpy Level. Ans- 1. Setting up the level. a. The level fixed on tripod. b. The legs of tripod stand are well spread so that the level will remain stable on tripod. c. 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 d. Adjust the height of the instrument so that the observer can comfortably see through the telescope and note the readings. e. 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.	1	



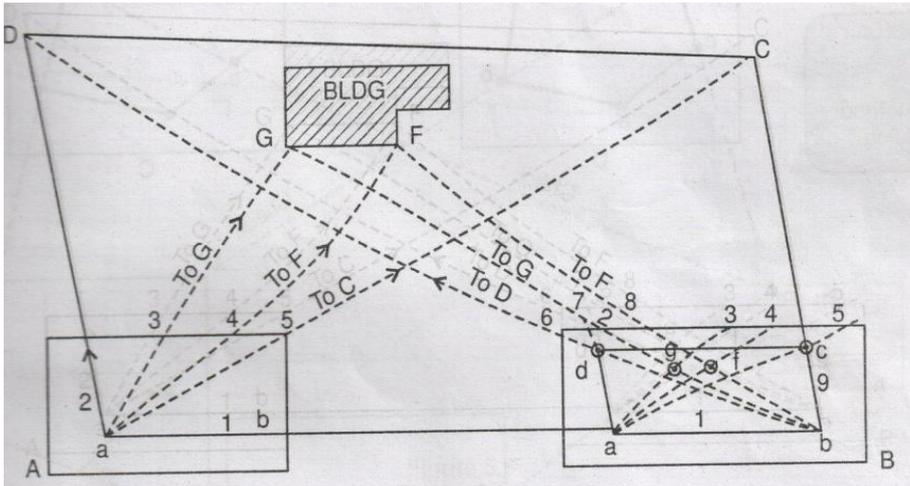
Que. No.	Sub. Que.	Model Answers	Marks	Total Marks
Q.3	2)	<p>What is meant by well conditioned and ill conditioned triangles? Draw the fig.</p> <p>Ans. well conditioned triangles:</p>  <p>A triangle in which no angle is less than 30° or greater than 120° is said to be well conditioned triangles.</p> <p>Ill conditioned triangles;</p>  <p>A triangle in which an angle is less than 30° or more than 120° is said to be ill conditioned triangles</p>	1 1 1	16
	3)	<p>Define- 1. Whole circle bearing 2. Reduced bearing 3. Fore bearing 4. Back bearing</p> <p>Ans.</p> <p>1. Whole circle bearing- The bearing measures only in the clockwise direction from meridian or north direction is known as whole circle bearing.</p> <p>2. Reduced bearing The bearing measures with respect to either north or south direction in clockwise or anticlockwise manner is known as reduced or quadrantal bearing</p> <p>3. Fore bearing The bearing observed in the direction of progress of survey in clockwise manner is called fore bearing</p> <p>4. Back bearing The bearing observed in the direction of opposite of survey is called fore bearing.</p>	1 1 1 1	4



Que. No.	Sub. Que.	Model Answers	Marks	Total Marks																														
Q.3	4)	<p>Following are the bearings of the line of closed traverse ABCD. Calculate interior angles of traverse.</p> <table border="1"> <thead> <tr> <th>Line</th> <th>FB</th> </tr> </thead> <tbody> <tr> <td>AB</td> <td>N45°10'E</td> </tr> <tr> <td>BC</td> <td>S60°40'E</td> </tr> <tr> <td>CD</td> <td>S9°50'W</td> </tr> <tr> <td>DA</td> <td>N80°40'W</td> </tr> </tbody> </table> <p>Ans.</p> <table border="1"> <thead> <tr> <th>Line</th> <th>FB (RB)</th> <th>FB (WCB)</th> <th>BB (WCB)</th> </tr> </thead> <tbody> <tr> <td>AB</td> <td>N45°10'E</td> <td>45°10'</td> <td>225°10'</td> </tr> <tr> <td>BC</td> <td>S60°40'E</td> <td>119°20'</td> <td>299°20'</td> </tr> <tr> <td>CD</td> <td>S9°50'W</td> <td>189°50'</td> <td>9°50'</td> </tr> <tr> <td>DA</td> <td>N80°40'W</td> <td>279°20'</td> <td>99°20'</td> </tr> </tbody> </table> <p>Interior angle A = BB of line DA – FB of line AB Interior angle A = 99°20' - 45°10' Interior angle A = 54°10'</p> <p>Interior angle B = BB of line AB – FB of line BC Interior angle B = 225°10' - 119°20' Interior angle B = 105°50'</p> <p>Interior angle C = BB of line BC – FB of line CD Interior angle C = 299°20' - 189°50' Interior angle C = 109°30'</p> <p>Interior angle D = BB of line CD – FB of line CD Interior angle D = 9°50' - 279°20' Interior angle D = -269°30' (It is exterior angle) Interior angle D = 360° - 269°30' Interior angle D = 90°30'</p> <p>Sum of all included angle = (2N-4) X 90 = (2X4 – 4)X 90 = 360°</p> <p>Sum of Calculated interior angle = 54°10'+105°50'+109°30'+ 90°30' Sum of Calculated interior angle = 360°</p>	Line	FB	AB	N45°10'E	BC	S60°40'E	CD	S9°50'W	DA	N80°40'W	Line	FB (RB)	FB (WCB)	BB (WCB)	AB	N45°10'E	45°10'	225°10'	BC	S60°40'E	119°20'	299°20'	CD	S9°50'W	189°50'	9°50'	DA	N80°40'W	279°20'	99°20'	<p>1</p> <p>1</p> <p>1</p> <p>1</p>	4
Line	FB																																	
AB	N45°10'E																																	
BC	S60°40'E																																	
CD	S9°50'W																																	
DA	N80°40'W																																	
Line	FB (RB)	FB (WCB)	BB (WCB)																															
AB	N45°10'E	45°10'	225°10'																															
BC	S60°40'E	119°20'	299°20'																															
CD	S9°50'W	189°50'	9°50'																															
DA	N80°40'W	279°20'	99°20'																															



Que. No.	Sub. Que.	Model Answers	Marks	Total Marks																																																																															
Q.4	1)	<p>Attempt any Four of the following Find the area of field done by cross staff survey</p> <table border="1"> <thead> <tr> <th rowspan="2">Fig. No.</th> <th rowspan="2">Figure</th> <th colspan="3">Chainage</th> <th colspan="3">Offset</th> <th>Area</th> </tr> <tr> <th>From</th> <th>To</th> <th>Base</th> <th>1</th> <th>2</th> <th>Mean</th> <th>Base x mean</th> </tr> </thead> <tbody> <tr> <td>I</td> <td>ΔAbB</td> <td>0</td> <td>20</td> <td>20</td> <td>0</td> <td>32</td> <td>16</td> <td>320</td> </tr> <tr> <td>II</td> <td>$\square BbCc$</td> <td>20</td> <td>35</td> <td>15</td> <td>32</td> <td>40</td> <td>36</td> <td>540</td> </tr> <tr> <td>III</td> <td>ΔCcD</td> <td>35</td> <td>84</td> <td>49</td> <td>40</td> <td>0</td> <td>20</td> <td>980</td> </tr> <tr> <td>IV</td> <td>ΔDeE</td> <td>84</td> <td>65</td> <td>19</td> <td>0</td> <td>30</td> <td>15</td> <td>285</td> </tr> <tr> <td>V</td> <td>$\square EefF$</td> <td>65</td> <td>50</td> <td>15</td> <td>30</td> <td>45</td> <td>37.5</td> <td>562.5</td> </tr> <tr> <td>VI</td> <td>ΔAfF</td> <td>50</td> <td>0</td> <td>50</td> <td>45</td> <td>0</td> <td>22.5</td> <td>1125</td> </tr> <tr> <td colspan="8" style="text-align: right;">Total Area</td> <td>3812.5</td> </tr> </tbody> </table>	Fig. No.	Figure	Chainage			Offset			Area	From	To	Base	1	2	Mean	Base x mean	I	ΔAbB	0	20	20	0	32	16	320	II	$\square BbCc$	20	35	15	32	40	36	540	III	ΔCcD	35	84	49	40	0	20	980	IV	ΔDeE	84	65	19	0	30	15	285	V	$\square EefF$	65	50	15	30	45	37.5	562.5	VI	ΔAfF	50	0	50	45	0	22.5	1125	Total Area								3812.5	1	16
Fig. No.	Figure	Chainage			Offset			Area																																																																											
		From	To	Base	1	2	Mean	Base x mean																																																																											
I	ΔAbB	0	20	20	0	32	16	320																																																																											
II	$\square BbCc$	20	35	15	32	40	36	540																																																																											
III	ΔCcD	35	84	49	40	0	20	980																																																																											
IV	ΔDeE	84	65	19	0	30	15	285																																																																											
V	$\square EefF$	65	50	15	30	45	37.5	562.5																																																																											
VI	ΔAfF	50	0	50	45	0	22.5	1125																																																																											
Total Area								3812.5																																																																											
	2)	<p>State any four sources of errors in compass survey Ans. Following are the sources of errors in compass survey-</p> <p>1. Instrumental survey-</p> <ol style="list-style-type: none"> Needle may not be perfectly straight and might not be balanced properly over the station. Graduations of the rings may not be uniform. The ring may not rotate freely, due to head of the pivot being broken or may be eccentric. The sight vane may not be vertical Horse hair may not be straight or vertical. <p>2. Personal errors-</p> <ol style="list-style-type: none"> centering may not be done perfectly over the station. Graduated ring may not be leveled. The object might not be bisected properly. Observer may be carrying magnetic substances. 	2	4																																																																															
			1																																																																																

Que. No.	Sub. Que.	Model Answers	Marks	Total Marks
Q.4	2)	<p>3. Other sources of substances-</p> <p>a. There may be attraction due to the presence of magnetic substances near the station.</p> <p>b. Magnetic field may vary on account of some natural causes.</p>	1	4
	3)	<p>Explain the intersection method of plane table survey.</p> <p>Intersection method</p> <p>Ans.</p> 	1	
		<p>1. Lay out a base line AB and measure it and Plot a distance 'ab' on sheet using any scale.</p> <p>2. Set up instrument at 'A' with 'a' over 'A'</p> <p>3. Orient the table by placing alidade 'ab' and turn table until ranging rod at 'B' is bisected and clamp it.</p> <p>4. With alidade touching point 'a' draw rays 1, 2,3,4,5 of indefinite length as shown in figure below.</p>	3	
		<p>5. The table is then moved to station 'B' orient by back sighting on 'A'. Draw rays towards points previously sighted i.e. 6,7,8,9 rays are drawn to determine points intersection, d, g, f, c.</p>	4	
	4)	<p>Explain types of bench marks.</p> <p>Ans.</p> <p>Types of bench mark-</p> <p>1. Great trigonometrical survey bench mark-</p> <p>a. These are the bench marks established with very high precision at regular intervals by survey of India Dept. all over the country . Their positions and bench mark values with respect to the mean sea level at Karachi are given in catalogue formed by department.</p> <p>2. Permanent Benchmark: These are the benchmarks established by state government agencies like PWD. They are established with reference to GTS benchmarks. They are usually on the corner of plinth of public buildings.</p> <p>3. Arbitrary Benchmark: In many engineering projects the difference in elevations of neighbouring points is more important than their reduced level with respect to mean sea level. In such cases a relatively permanent point, like plinth of a building or corner of a</p>	1	1
			1	1
			1	1



Que. No.	Sub. Que.	Model Answers	Marks	Total Marks														
Q.4	(4)	<p>culvert, are taken as benchmarks, their level assumed arbitrarily</p> <p>4. Temporary Benchmark: This type of benchmark is established at the end of the day's work, so that the next day work may be continued from that point. Such point should be on a permanent object so that next day it is easily identified.</p>	1	4														
	5)	<p>Difference between H.I method & rise and fall method.</p> <p>Ans</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 5%;">Sr. No</th> <th style="width: 45%;">H.I method</th> <th style="width: 50%;">Rise & Fall method</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">1</td> <td>The method is more rapid & required less time</td> <td>The method is tedious & require more time</td> </tr> <tr> <td style="text-align: center;">2</td> <td>It is used for calculating RL of Profile leveling & in construction work Like canal, roads etc.</td> <td>It is used for calculating RL of Precise leveling work & check leveling</td> </tr> <tr> <td style="text-align: center;">3</td> <td>It is simple & requires less calculation</td> <td>It is complicated & requires more calculations</td> </tr> <tr> <td style="text-align: center;">4</td> <td>Arithmetical check $\Sigma B.S. - \Sigma F.S = \text{Last RL} - \text{First RL}$</td> <td>Arithmetical check $\Sigma B.S. - \Sigma F.S = \text{Last RL} - \text{First RL} = \Sigma \text{Rise} - \Sigma \text{fall}$</td> </tr> </tbody> </table>	Sr. No	H.I method	Rise & Fall method	1	The method is more rapid & required less time	The method is tedious & require more time	2	It is used for calculating RL of Profile leveling & in construction work Like canal, roads etc.	It is used for calculating RL of Precise leveling work & check leveling	3	It is simple & requires less calculation	It is complicated & requires more calculations	4	Arithmetical check $\Sigma B.S. - \Sigma F.S = \text{Last RL} - \text{First RL}$	Arithmetical check $\Sigma B.S. - \Sigma F.S = \text{Last RL} - \text{First RL} = \Sigma \text{Rise} - \Sigma \text{fall}$	1 Mark each
Sr. No	H.I method	Rise & Fall method																
1	The method is more rapid & required less time	The method is tedious & require more time																
2	It is used for calculating RL of Profile leveling & in construction work Like canal, roads etc.	It is used for calculating RL of Precise leveling work & check leveling																
3	It is simple & requires less calculation	It is complicated & requires more calculations																
4	Arithmetical check $\Sigma B.S. - \Sigma F.S = \text{Last RL} - \text{First RL}$	Arithmetical check $\Sigma B.S. - \Sigma F.S = \text{Last RL} - \text{First RL} = \Sigma \text{Rise} - \Sigma \text{fall}$																
	6)	<p>The Bearing of line AB is $153^{\circ}30'$ and angle ABC is $135^{\circ}40'$. What is bearing of BC.</p> <p>Ans. CASE-1</p> <p>FB of line AB = $153^{\circ}30'$ BB of AB = FB of line AB + 180° = $153^{\circ}30' + 180^{\circ}$ = $333^{\circ}30'$</p> <p>FB of BC = BB of AB + $\angle ABC$ = $333^{\circ}30' + 135^{\circ}40'$ = $469^{\circ}10'$</p> <p>But bearing is greater than 360° Therefore, FB of BC = $469^{\circ}10' - 360$ FB of BC = $109^{\circ}10'$</p> <p style="text-align: center;">OR</p> <p>CASE-2</p> <p>FB of line AB = $153^{\circ}30'$ BB of AB = FB of line AB + 180° = $153^{\circ}30' + 180^{\circ}$ = $333^{\circ}30'$</p> <p>$\angle ABC = \text{BB of AB} - \text{FB of BC}$ $153^{\circ}30' = 333^{\circ}30' - \text{FB of BC}$ FB of BC = $197^{\circ}50'$</p>	<p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p>	4														



Que. No.	Sub. Que.	Model Answers	Marks	Total Marks
Q.5	2)	<p>What is meant by local attraction? How will you suspect local attraction at the field ? state its effect on included angle.</p> <p>Ans.</p> <p>Local attraction: It is the deviation or deflection of magnetic needle from its normal position under influence of external magnetic forces is called as local attraction.</p> <p>Suspect of local attraction</p> <p>To suspect the presence of local attraction, the fore and back bearing of a line should be taken. If the difference of the fore and back bearing of a line is exactly 180°, then there is no local attraction.</p> <p>Effect on included angle</p> <p>The needle is affected by local attraction therefore it does not give a corrected angle</p>	2 1 1	4
	3)	<p>State any four advantages and disadvantages of plane table survey.</p> <p>Ans-</p> <p>Advantages of plane table surveying-</p> <ol style="list-style-type: none">1. It is most rapid method and suitable for small scale.2. there is no need of field book.3. Irregular objects may be represented properly.4. it is suitable in magnetic area.5. The surveyor can compare the plotted work with the actual features of the area.6. It is less costly.7. No greater skill is required to prepare map. <p>Disadvantages of plane table surveying</p> <ol style="list-style-type: none">1. The plane table survey is not possible in unfavorable climates such as rain, fog etc.2. This method of survey is not very accurate and thus unsuitable for large scale or precise work.3. As no field book is maintained, plotting at different scale require full exercise.4. The method requires large amount of time to be spent in the field.5. Quality of the final map depends largely on the drafting capability of the surveyor.6. This method is effective in relatively open country where stations can be sighted easily .	$\frac{1}{2}$ Marks each (any four) $\frac{1}{2}$ Marks each (any four)	4



Que. No.	Sub. Que.	Model Answers	Marks	Total Marks																																																																							
Q.5	4)	<p>What is meant by profile leveling and cross-sectioning ? Ans. profile leveling- To know the nature of the ground surface the profile leveling is done along the Centre of the road at some regular intervals if required, staff readings may also be taken at points of importance where the slope of the ground suddenly changes.</p> <p>cross-sectioning- While profile leveling is in progress, cross-sectional leveling should also be done. The cross-sections are taken perpendicular to the Centre line of the alignment at some regular intervals. The purpose of cross-sectional leveling is to know the undulation of the ground surface transverse to the Centre of the road. The length depend upon the nature of the work.</p>	2	4																																																																							
	5) Ans.	<p>Following readings were taken with dumpy level. 3.865 , 3.345 , 2.930, 1.950, 0.855, 3.795, 2.640, 1.540, 1.935, 0.865 and 0.665 The level was shifted after 5th and 8th reading. The first reading was taken on BM of RL 150.250. Calculate RL of remaining points. Apply Usual check use HI method Ans.</p> <table border="1" style="width: 100%; border-collapse: collapse; text-align: center;"> <thead> <tr> <th rowspan="2">Sr. No.</th> <th colspan="3">Staff Reading</th> <th rowspan="2">HI</th> <th rowspan="2">RL</th> <th rowspan="2">Remark</th> </tr> <tr> <th>BS</th> <th>IS</th> <th>FS</th> </tr> </thead> <tbody> <tr><td>1</td><td>3.865</td><td></td><td></td><td>154.115</td><td>150.250</td><td>BM</td></tr> <tr><td>2</td><td></td><td>3.345</td><td></td><td></td><td>150.770</td><td></td></tr> <tr><td>3</td><td></td><td>2.930</td><td></td><td></td><td>151.185</td><td></td></tr> <tr><td>4</td><td></td><td>1.950</td><td></td><td></td><td>152.165</td><td></td></tr> <tr><td>5</td><td>3.795</td><td></td><td>0.855</td><td>157.055</td><td>153.260</td><td>CP1</td></tr> <tr><td>6</td><td></td><td>2.640</td><td></td><td></td><td>154.415</td><td></td></tr> <tr><td>7</td><td>1.935</td><td></td><td>1.540</td><td>157.450</td><td>155.515</td><td>CP2</td></tr> <tr><td>8</td><td></td><td>0.865</td><td></td><td></td><td>156.585</td><td></td></tr> <tr><td>9</td><td></td><td></td><td>0.665</td><td></td><td>156.785</td><td>Last</td></tr> </tbody> </table> <p>$\Sigma BS = 9.595$ $\Sigma FS = 3.060$</p> <p>Arithmetic check:- $\Sigma BS - \Sigma FS = Last\ RL - First\ RL$ $9.595 - 3.060 = 156.785 - 150.250$ $6.535 = 6.535$</p>	Sr. No.		Staff Reading			HI	RL	Remark	BS	IS	FS	1	3.865			154.115	150.250	BM	2		3.345			150.770		3		2.930			151.185		4		1.950			152.165		5	3.795		0.855	157.055	153.260	CP1	6		2.640			154.415		7	1.935		1.540	157.450	155.515	CP2	8		0.865			156.585		9			0.665		156.785
Sr. No.	Staff Reading			HI	RL	Remark																																																																					
	BS	IS	FS																																																																								
1	3.865			154.115	150.250	BM																																																																					
2		3.345			150.770																																																																						
3		2.930			151.185																																																																						
4		1.950			152.165																																																																						
5	3.795		0.855	157.055	153.260	CP1																																																																					
6		2.640			154.415																																																																						
7	1.935		1.540	157.450	155.515	CP2																																																																					
8		0.865			156.585																																																																						
9			0.665		156.785	Last																																																																					
			1	4																																																																							



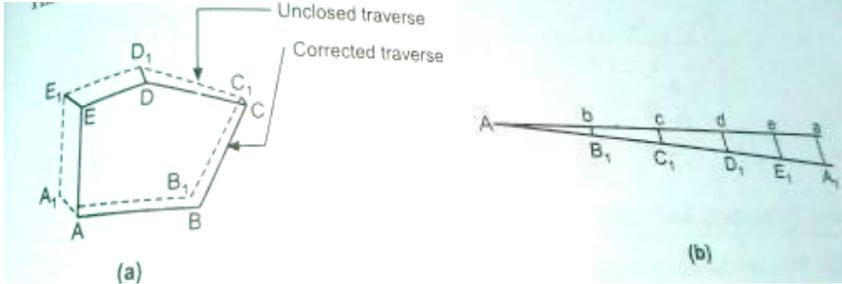
Que. No.	Sub. Que.	Model Answers	Marks	Total Marks																																																																																			
Q.5	6)	<p>Following consecutive reading were taken on continuously sloping ground with dumpy level. 3.875, 3.630, 2.865, 1.945, 0.920, 3.165, 2.895, 2.895, 1.125, 0.965 and 0.785. The first reading was taken on BM of RL 260.865m. Use Rise and Fall method. Find the RL 's of all points and apply usual check.</p> <p>Ans.</p> <table border="1"> <thead> <tr> <th rowspan="2">Sr. No.</th> <th colspan="3">Staff Reading</th> <th rowspan="2">Rise</th> <th rowspan="2">Fall</th> <th rowspan="2">RL</th> <th rowspan="2">Remark</th> </tr> <tr> <th>BS</th> <th>IS</th> <th>FS</th> </tr> </thead> <tbody> <tr><td>1</td><td>3.875</td><td></td><td></td><td></td><td></td><td>260.865</td><td>B.M.</td></tr> <tr><td>2</td><td></td><td>3.630</td><td></td><td>0.245</td><td></td><td>261.11</td><td></td></tr> <tr><td>3</td><td></td><td>2.865</td><td></td><td>0.765</td><td></td><td>261.875</td><td></td></tr> <tr><td>4</td><td></td><td>1.945</td><td></td><td>0.92</td><td></td><td>262.795</td><td></td></tr> <tr><td>5</td><td>3.165</td><td></td><td>0.920</td><td>1.025</td><td></td><td>263.82</td><td>CP1</td></tr> <tr><td>6</td><td></td><td>2.895</td><td></td><td>0.27</td><td></td><td>264.09</td><td></td></tr> <tr><td>7</td><td></td><td>1.125</td><td></td><td>1.77</td><td></td><td>265.86</td><td></td></tr> <tr><td>8</td><td></td><td>0.965</td><td></td><td>0.16</td><td></td><td>266.02</td><td></td></tr> <tr><td>9</td><td></td><td></td><td>0.785</td><td>0.18</td><td></td><td>266.20</td><td></td></tr> </tbody> </table> <p>$\Sigma\text{BS} = 7.040$ $\Sigma\text{FS} = 1.705$ $\Sigma\text{Rise} = 5.315$ $\Sigma\text{Fall} = 0$</p> <p>Arithmetic check:- $\Sigma\text{BS} - \Sigma\text{FS} = \Sigma\text{Rise} - \Sigma\text{Fall} = \text{Last RL} - \text{First RL}$ $7.040 - 1.705 = 5.335 - 0 = 266.200 - 260.865$ $5.335 = 5.335 = 5.335$</p>	Sr. No.	Staff Reading			Rise	Fall	RL	Remark	BS	IS	FS	1	3.875					260.865	B.M.	2		3.630		0.245		261.11		3		2.865		0.765		261.875		4		1.945		0.92		262.795		5	3.165		0.920	1.025		263.82	CP1	6		2.895		0.27		264.09		7		1.125		1.77		265.86		8		0.965		0.16		266.02		9			0.785	0.18		266.20		3	4
Sr. No.	Staff Reading			Rise	Fall	RL					Remark																																																																												
	BS	IS	FS																																																																																				
1	3.875					260.865	B.M.																																																																																
2		3.630		0.245		261.11																																																																																	
3		2.865		0.765		261.875																																																																																	
4		1.945		0.92		262.795																																																																																	
5	3.165		0.920	1.025		263.82	CP1																																																																																
6		2.895		0.27		264.09																																																																																	
7		1.125		1.77		265.86																																																																																	
8		0.965		0.16		266.02																																																																																	
9			0.785	0.18		266.20																																																																																	
Q.6	1)	<p>Attempt any TWO of the following-</p> <p>1) Following fore and back bearings were observed in running close compass traverse.</p> <p>1) Find the Station free local attraction</p> <p>2) Find Corrected FB and BB</p> <table border="1"> <thead> <tr> <th>Line</th> <th>FB</th> <th>BB</th> </tr> </thead> <tbody> <tr><td>AB</td><td>44°30'</td><td>226°30'</td></tr> <tr><td>BC</td><td>124°30'</td><td>303°15'</td></tr> <tr><td>CD</td><td>181°0'</td><td>1°0'</td></tr> <tr><td>DA</td><td>289°30°</td><td>108°45°</td></tr> </tbody> </table> <p>Ans.</p> <table border="1"> <thead> <tr> <th>Line</th> <th>FB</th> <th>BB</th> <th>Difference</th> </tr> </thead> <tbody> <tr><td>AB</td><td>44°30'</td><td>226°30'</td><td>182°0'</td></tr> <tr><td>BC</td><td>124°30'</td><td>303°15'</td><td>178°45'</td></tr> <tr><td>CD</td><td>181°0'</td><td>1°0'</td><td>180°0'</td></tr> <tr><td>DA</td><td>289°30°</td><td>108°45°</td><td>180°45'</td></tr> </tbody> </table> <p>The difference of FB and BB of line CD is exactly 180°. So C and D are free from local attraction. The observed FB of line DA & CD and BB of DC & BC is correct.</p>	Line	FB	BB	AB	44°30'	226°30'	BC	124°30'	303°15'	CD	181°0'	1°0'	DA	289°30°	108°45°	Line	FB	BB	Difference	AB	44°30'	226°30'	182°0'	BC	124°30'	303°15'	178°45'	CD	181°0'	1°0'	180°0'	DA	289°30°	108°45°	180°45'	2	16																																																
Line	FB	BB																																																																																					
AB	44°30'	226°30'																																																																																					
BC	124°30'	303°15'																																																																																					
CD	181°0'	1°0'																																																																																					
DA	289°30°	108°45°																																																																																					
Line	FB	BB	Difference																																																																																				
AB	44°30'	226°30'	182°0'																																																																																				
BC	124°30'	303°15'	178°45'																																																																																				
CD	181°0'	1°0'	180°0'																																																																																				
DA	289°30°	108°45°	180°45'																																																																																				
			1																																																																																				



Que. No.	Sub. Que.	Model Answers	Marks	Total Marks																																																							
Q.6	1)	<p>Sample calculations- Corrected BB of DA = Correct /Observed FB of DA - 180° $= 289^{\circ}30' - 180^{\circ}$ $= 109^{\circ}30'$</p> <p>Correction At A = Corrected BB of DA – Observed BB of DA $= 109^{\circ}30' - 108^{\circ}45'$ $= + 0^{\circ}45'$</p> <p>Corrected FB of AB = Observed FB of AB + Correction at A $= 44^{\circ}30' + 0^{\circ}45'$ $= 45^{\circ}15'$</p> <p>Corrected BB of AB= Correct FB of AB +180° $= 45^{\circ}15' + 180^{\circ}$ $= 225^{\circ}15'$</p> <p>Correction At B = Corrected BB of AB – Observed BB of AB $= 225^{\circ}15' - 226^{\circ}30'$ $= - 1^{\circ}15'$</p> <p>Corrected FB of BC = Observed FB of BC - Correction at B $= 124^{\circ}30' - 1^{\circ}15'$ $= 123^{\circ}15'$</p> <table border="1" style="width: 100%; border-collapse: collapse; margin-top: 10px;"> <thead> <tr> <th rowspan="2">Line</th> <th colspan="2">Observed</th> <th rowspan="2">Correction</th> <th colspan="2">Corrected</th> </tr> <tr> <th>FB</th> <th>BB</th> <th>FB</th> <th>BB</th> </tr> </thead> <tbody> <tr> <td>AB</td> <td>44°30'</td> <td>226°30'</td> <td>A = 0°45'</td> <td>45°15'</td> <td>225°15'</td> </tr> <tr> <td>BC</td> <td>124°30'</td> <td>303°15'</td> <td>B = -1°15'</td> <td>123°15'</td> <td>303°15'</td> </tr> <tr> <td>CD</td> <td>181°0'</td> <td>1°0'</td> <td>C = 0°</td> <td>181°0'</td> <td>1°0'</td> </tr> <tr> <td>DA</td> <td>289°30'</td> <td>108°45'</td> <td>D = 0°</td> <td>289°30'</td> <td>109°30'</td> </tr> </tbody> </table>	Line	Observed		Correction	Corrected		FB	BB	FB	BB	AB	44°30'	226°30'	A = 0°45'	45°15'	225°15'	BC	124°30'	303°15'	B = -1°15'	123°15'	303°15'	CD	181°0'	1°0'	C = 0°	181°0'	1°0'	DA	289°30'	108°45'	D = 0°	289°30'	109°30'	<p>2</p> <p>(any one station)</p> <p>3</p>	8																					
	Line	Observed		Correction	Corrected																																																						
FB		BB	FB		BB																																																						
AB	44°30'	226°30'	A = 0°45'	45°15'	225°15'																																																						
BC	124°30'	303°15'	B = -1°15'	123°15'	303°15'																																																						
CD	181°0'	1°0'	C = 0°	181°0'	1°0'																																																						
DA	289°30'	108°45'	D = 0°	289°30'	109°30'																																																						
	2)	<p>Find the missing readings. Calculate RL's of all stations apply arithmetical check.</p> <table border="1" style="width: 100%; border-collapse: collapse; margin-top: 10px;"> <thead> <tr> <th>St.</th> <th>BS</th> <th>IS</th> <th>FS</th> <th>Rise</th> <th>Fall</th> <th>RL</th> <th>Remark</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>2.345</td> <td></td> <td></td> <td></td> <td></td> <td>129.50</td> <td>BM1</td> </tr> <tr> <td>2</td> <td>1.650</td> <td></td> <td>X</td> <td>0.035</td> <td></td> <td></td> <td></td> </tr> <tr> <td>3</td> <td></td> <td>2.210</td> <td></td> <td></td> <td>X</td> <td></td> <td></td> </tr> <tr> <td>4</td> <td>X</td> <td></td> <td>1.850</td> <td>X</td> <td></td> <td></td> <td></td> </tr> <tr> <td>5</td> <td>1.850</td> <td></td> <td>1.925</td> <td></td> <td>0.455</td> <td></td> <td></td> </tr> <tr> <td>6</td> <td></td> <td></td> <td>X</td> <td>0.37</td> <td></td> <td>129.00</td> <td>BM2</td> </tr> </tbody> </table> <p>Ans. Note- Given RL of station 6 is wrong , therefore only BS &FS & rise & fall check will be correct.</p> <p>1) FS of Station 2 = BS of station 1 - FS of Station 2 = Rise at station 2 2.345 - FS of Station 2 = 0.035 FS of Station 2 = 2.310</p> <p>2) Fall of station 3= BS of station 2 - IS of Station 3 =Fall at station 3 1.650- 2.210 = Fall at station 3 Fall at station 3 = -0.56</p> <p>3) Rise of Station 4 = IS of station 3 - FS of Station 4 = Rise at station 4 2.21-1.85 = Rise at station 4 Rise at station 4 = 0.36</p>	St.	BS	IS	FS	Rise	Fall	RL	Remark	1	2.345					129.50	BM1	2	1.650		X	0.035				3		2.210			X			4	X		1.850	X				5	1.850		1.925		0.455			6			X	0.37		129.00	BM2	<p>1</p> <p>1/2</p> <p>1/2</p>
St.	BS	IS	FS	Rise	Fall	RL	Remark																																																				
1	2.345					129.50	BM1																																																				
2	1.650		X	0.035																																																							
3		2.210			X																																																						
4	X		1.850	X																																																							
5	1.850		1.925		0.455																																																						
6			X	0.37		129.00	BM2																																																				



Que. No.	Sub. Que.	Model Answers	Marks	Total Marks																																																								
Q.6	2)	<p>4) BS of Station 4 = BS of station 4 - FS of Station 5 = Fall at station 5 BS of station 4 - 1.925 = -0.455 BS of station 4 = 1.470</p> <p>5. FS of Station 6 = BS of station 5 - FS of Station 6 = Rise at station 1.85 - FS of Station 6 = 0.37 FS of Station 6 = 1.480</p> <p>6. RL of Station 2 = RL of Station 2 = RL of Station 1 + Rise at St. 2 RL of Station 2 = 129.50 + 0.035 RL of Station 2 = 129.535</p> <p>7) RL of Station 3 = RL of Station 3 = RL of Station 2 – Fall at st. 3 RL of Station 2 = 129.535 - 0.56 RL of Station 2 = 128.975</p> <p>8) RL of Station 4 = RL of Station 4 = RL of Station 3 + Rise at St. 4 RL of Station 2 = 128.975 + 0.36 RL of Station 2 = 129.335</p> <p>9) RL of Station 5 = RL of Station 5 = RL of Station 4 – Fall at st. 5 RL of Station 2 = 129.335 - 0.455 RL of Station 2 = 128.88</p> <p>Arithmetic check:- $\Sigma BS - \Sigma FS = \Sigma Rise - \Sigma Fall = Last\ RL - First\ RL$ $7.315 - 7.565 = 0.765 - 1.015 = 129 - 129.5$ $-0.25 = -0.25 = -0.50$</p> <table border="1" style="width: 100%; border-collapse: collapse; margin-top: 10px;"> <thead> <tr> <th>St.</th> <th>BS</th> <th>IS</th> <th>FS</th> <th>Rise</th> <th>Fall</th> <th>RL</th> <th>Remark</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>2.345</td> <td></td> <td></td> <td></td> <td></td> <td>129.50</td> <td>BM1</td> </tr> <tr> <td>2</td> <td>1.650</td> <td></td> <td>2.310</td> <td>0.035</td> <td></td> <td>129.535</td> <td></td> </tr> <tr> <td>3</td> <td></td> <td>2.210</td> <td></td> <td></td> <td>0.560</td> <td>128.975</td> <td></td> </tr> <tr> <td>4</td> <td>1.470</td> <td></td> <td>1.850</td> <td>0.360</td> <td></td> <td>129.335</td> <td></td> </tr> <tr> <td>5</td> <td>1.850</td> <td></td> <td>1.925</td> <td></td> <td>0.455</td> <td>128.88</td> <td></td> </tr> <tr> <td>6</td> <td></td> <td></td> <td>1.480</td> <td>0.37</td> <td></td> <td>129.00</td> <td>BM2</td> </tr> </tbody> </table>	St.	BS	IS	FS	Rise	Fall	RL	Remark	1	2.345					129.50	BM1	2	1.650		2.310	0.035		129.535		3		2.210			0.560	128.975		4	1.470		1.850	0.360		129.335		5	1.850		1.925		0.455	128.88		6			1.480	0.37		129.00	BM2	<p>1</p> <p>$\frac{1}{2}$</p> <p>1</p> <p>$\frac{1}{2}$</p> <p>$\frac{1}{2}$</p> <p>$\frac{1}{2}$</p> <p>2</p>	8
	St.	BS	IS	FS	Rise	Fall	RL	Remark																																																				
1	2.345					129.50	BM1																																																					
2	1.650		2.310	0.035		129.535																																																						
3		2.210			0.560	128.975																																																						
4	1.470		1.850	0.360		129.335																																																						
5	1.850		1.925		0.455	128.88																																																						
6			1.480	0.37		129.00	BM2																																																					
	3) i)	<p>What is meant by closing error? How will you adjusted graphically? Ans. Closing error : While plotting compass traverse, when first and last survey line does not coincides by some amount of distance, that distance is called as closing error.</p>	1																																																									

Que. No.	Sub. Que.	Model Answers	Marks	Total Marks
Q.6	i)	Adjustment of closing error		
	Ans.	 <p style="text-align: center;"> Compass Traverse Bowditch Rule </p> <p>Explanation :</p> <ol style="list-style-type: none"> To distribute the closing error AA1 (Fig. a), draw one horizontal line of length equal to perimeter of traverse with some reduced scale. Now mark the survey stations on it proportionally (Fig. b) and transfer closing error of same length using roller scale to point a. Join the point A and A1 with straight line. Also draw parallel lines at point b,c,d and e. Transfer B1b, C1c, D1d and E1e to point B1, C1, D1 and E1 respectively in compass traverse. Finally join new points to get corrected traverse ABCDEA after graphical adjustment of closing error. 	1	
	ii)	<p>State any four advantages of auto level.</p> <p>Ans-</p> <p>Advantages of auto level:</p> <ol style="list-style-type: none"> 1.Auto level gives quick and easy leveling 2. It is most accurate and precise which gives least error about 0.5 to 0.8 in 5km 3.It is simply to use, 4. compact in nature and easy to handle. 5.Regular reading can be observed 	1 mark each (any four)	4