



WINTER – 2015 EXAMINATION

Subject: Surveying

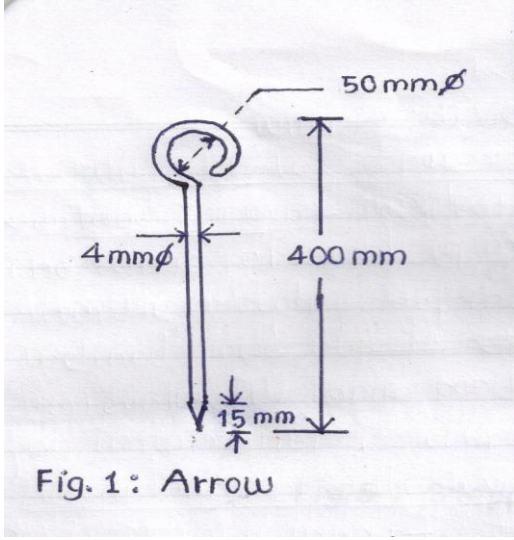
Subject Code: 17310

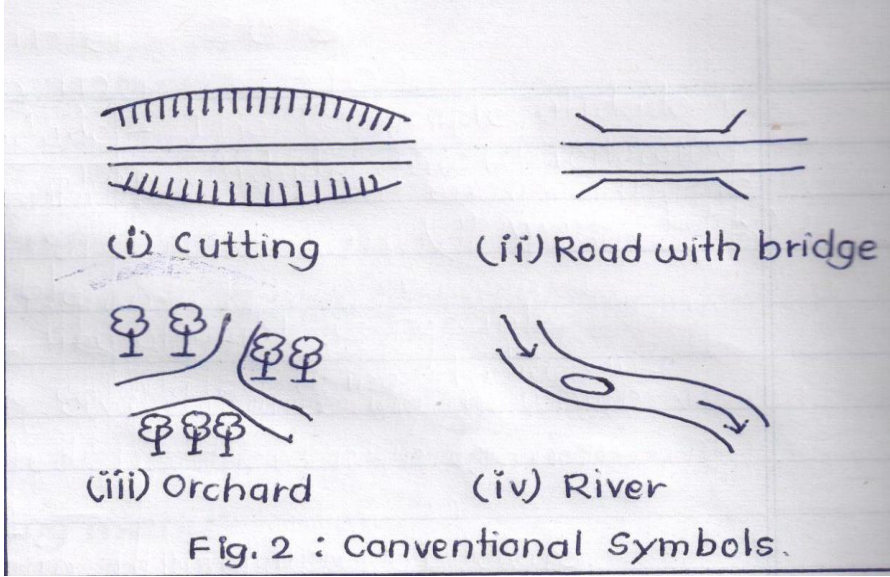
Important Instructions to examiners:

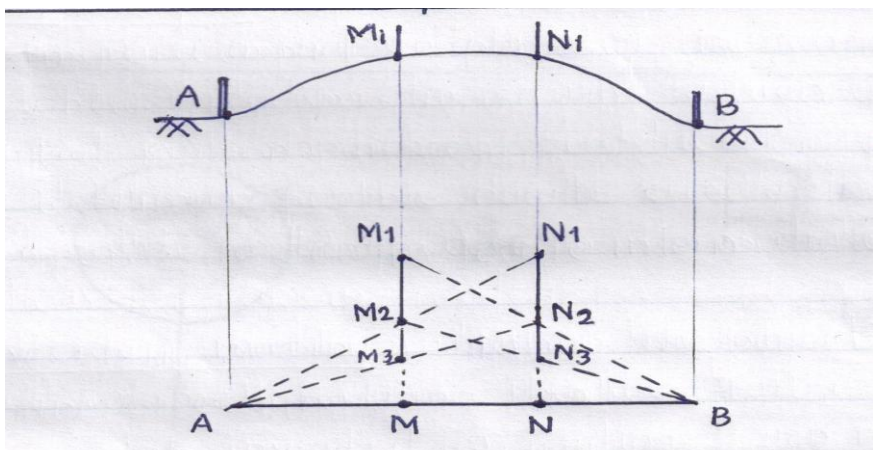
- 1) The answers should be examined by key words and not as word-to-word as given in the model answer scheme.
- 2) The model answer and the answer written by candidate may vary but the examiner may try to assess the understanding level of the candidate.
- 3) The language errors such as grammatical, spelling 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.

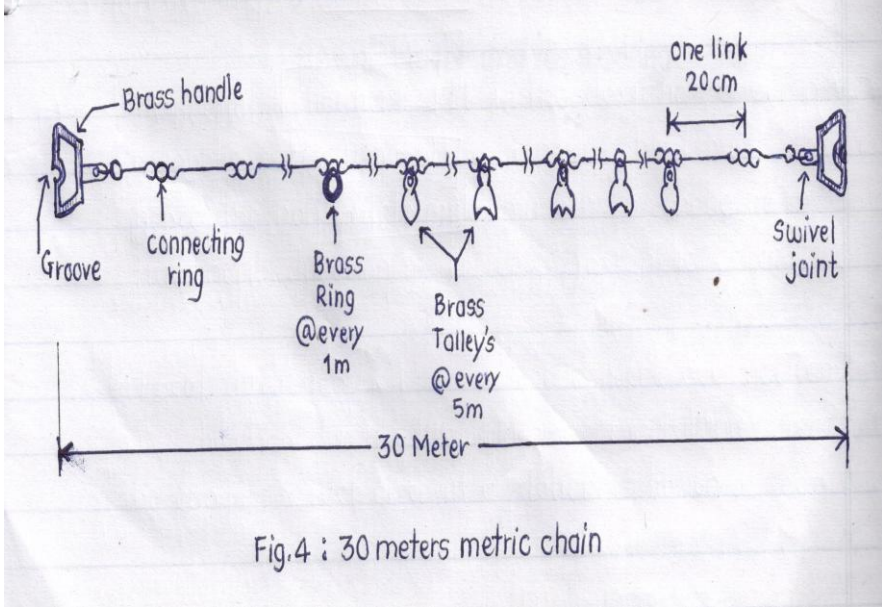
Model Answer

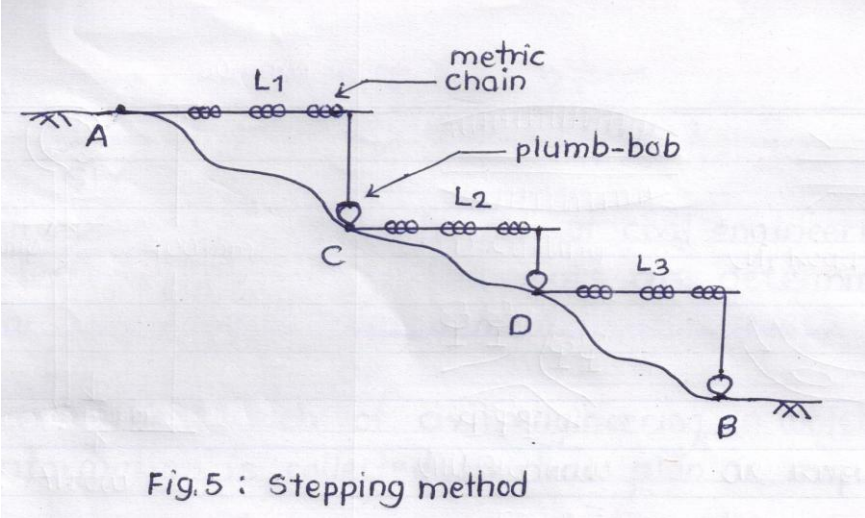
Que. No.	Sub. Que.	Model Answers	Marks	Total Marks
1)	A)	Attempt any <u>SIX</u> of the following:		12
	a)	Define surveying.		
	Ans.	Surveying- It is branch of civil engineering in which relative positions of ground points are determined by taking linear and angular measurement.	2	2
	b)	State any two uses of survey.	1	
	Ans:	Survey is useful for following: 1. To prepare a map or plan of the surveyed area for attaching it to legal documents. 2. To plot control points of boundaries of locality 3. To determine relative heights or elevations of object. 4. To finalize and mark alignment i.e. center line of roadway, railway or runway routes. 5. To decide suitable gradient and camber of road depending on equal volume of cutting and filling.	(1 mark each Any two)	2

Que. No.	Sub. Que.	Model Answers	Marks	Total Marks
1)	c) Ans.	<p>Draw a neat sketch of an arrow with dimensions.</p>  <p>Fig. 1: Arrow</p>	(1 mark for sketch 1 mark for dimensions)	2
	d) Ans.	<p>What is magnetic declination? Magnetic declination- It is the deviation or shifting magnetic needle from true or geographical north direction, hence the horizontal angle made by magnetic north with true north direction is known as Magnetic declination.</p>	2	2
	e) Ans.	<p>What is Local attraction? Local attraction – when magnetic needle does not remain in N-S direction due to effect of magnetic substances present around the compass, such error at station is known as local attraction.</p>	2	2
	f) Ans.	<p>What is advantage of wing telescopic alidade? Advantage of wing telescopic alidade is as follows-</p> <ol style="list-style-type: none"> 1. The range of sight is more 2. Accurate bisection 3. Inclined line of sight is possible 4. Horizontal distance can be calculated using stadia hairs. 5. Quick levelling is possible due to circular bubble tube as compared to dumpy level. 	(1 mark each For Any two of these)	2
	g) Ans.	<p>State any two advantages of auto level. Advantages of auto level-</p> <ol style="list-style-type: none"> 1. Easy to handle. 2. Quick levelling is possible 3. Regular reading can be observed 	(1 mark each Any two)	2
	h) Ans.	<p>What is negative staff reading? When the object is to be bisected is above line of collimation, then the staff is kept inverted for reading, such reading is entered with negative sign in the field book, which is known as negative staff reading.</p>	2	2

Que. No.	Sub. Que.	Model Answers	Marks	Total Marks														
1)	B)	<p>Attempt any <u>TWO</u> of the following:</p> <p>a) Draw conventional symbol for: i. Cutting ii. Road with bridge iii. Orchard iv. river</p> <p>Ans.</p> <div style="text-align: center;">  <p style="text-align: center;">Fig. 2 : Conventional Symbols.</p> </div>	<p>(1 mark each)</p>	4														
	b)	<p>Differentiate between plane surveying and geodetic surveying on any four points.</p> <p>Ans.</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 50%;">Plane surveying</th> <th style="width: 50%;">Geodetic surveying</th> </tr> </thead> <tbody> <tr> <td>1. The area covered is less than 260km²</td> <td>1. The area covered is more than 260km²</td> </tr> <tr> <td>2. The distance between two ground points is straight.</td> <td>2. The distance between two ground points is curve.</td> </tr> <tr> <td>3. Simple survey instruments are useful like chain, compass, level etc.</td> <td>3. advance survey instruments are necessary like theodolite, total station, GIS, GPS etc.</td> </tr> <tr> <td>4. Carried out by state Govt. Agencies.</td> <td>4. Carried out by central Govt. of India in collaboration with GTS Dept.</td> </tr> <tr> <td>5. Cartesian co-ordinate formulae are useful.</td> <td>5. Spherical trigonometrical formulae are useful.</td> </tr> <tr> <td>6. Less accurate because no correction is applied.</td> <td>6. More accurate because correction for curvature and refraction is applied.</td> </tr> </tbody> </table>	Plane surveying	Geodetic surveying	1. The area covered is less than 260km ²	1. The area covered is more than 260km ²	2. The distance between two ground points is straight.	2. The distance between two ground points is curve.	3. Simple survey instruments are useful like chain, compass, level etc.	3. advance survey instruments are necessary like theodolite, total station, GIS, GPS etc.	4. Carried out by state Govt. Agencies.	4. Carried out by central Govt. of India in collaboration with GTS Dept.	5. Cartesian co-ordinate formulae are useful.	5. Spherical trigonometrical formulae are useful.	6. Less accurate because no correction is applied.	6. More accurate because correction for curvature and refraction is applied.	<p>(1 mark each for any four of these)</p>	4
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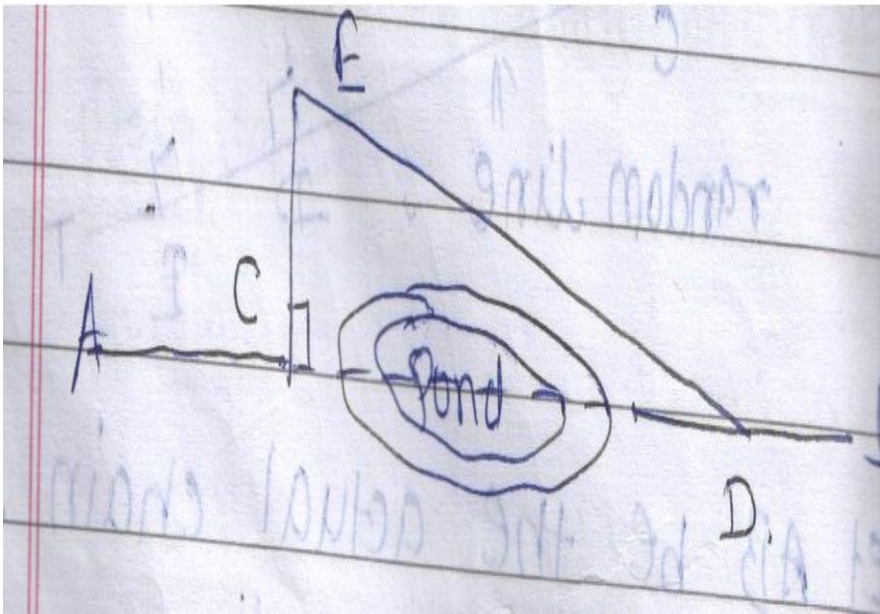
Que. No.	Sub. Que.	Model Answers	Marks	Total Marks
1)	c)	<p>Describe method of measuring distances on ground using chain and arrows.</p> <p>Ans: Method of measuring distances on ground.</p> <ol style="list-style-type: none"> 1. Mark the position of survey stations whose distance is to be measured using wooden peg. (say A and B) 2. now, ranging is done if distance is more than one chain length(say C) to locate intermediate point. 3. Unfold the chain by taking both handles in a hand and throw it along line AB. 4. Remove peg and fix arrow at starting station A. fix arrow in groove of handle tightly. 5. Now, give jerks to the chain to open connected ring and links. Also, keep another arrow at far end of chain 6. Measure the distance using brass ring and brass Talley's provided at each 1m and 5m resp. 7. To measure further distance, chain is pulled longitudinally and fixed the handle in groove. 8. Repeat the procedure till chain reaches at station B. Thus total horizontal distance will be equal to addition of distances measured of each parts. 	4	4
2)	a)	<p>Attempt any <u>FOUR</u> of the following:</p> <p>a) Describe the procedure of indirect ranging.</p> <p>Ans:</p>  <p style="text-align: center;">Fig. 3 : Indirect Ranging</p>	1	

Que. No.	Sub. Que.	Model Answers	Marks	Total Marks
2)	a)	<p>Procedure of indirect ranging.</p> <ol style="list-style-type: none"> 1. If two stations i.e. A and B are not visible, then two intermediate points M_1 and N_1 are selected such that both stations will be intervisible from it. 2. Now, bisect the ranging rod at N_1 from A and direct the rodman to move in line of AN_1 to get a new position as N_2 3. Similarly, bisect the rod at M_1 from B and move the rod at N to N_1 to N_2 4. Again, by observing N_2 and M_2 from A and B respectively, find the new position of intermediate points N_3 and N_4. 5. This should be continued till final points M and N are in line with AB, thus, ranging is said to be completed. 	3	4
	b)	<p>Draw a neat labeled sketch of 30 metric surveying chain.</p>		
	Ans:		(2 marks for diagram & 2 marks for labelling)	4
	c)	<p>State and describe the types of offsets.</p>		
	Ans:	<ol style="list-style-type: none"> 1. Perpendicular offset- When the offset is taken at 90° to the survey line, then it is known as perpendicular offset. 2. Oblique offset- When the offset is taken at an angle other than 90° (say 30° or 120°) to the survey line, then it is known as Oblique offset. 3. Long offset- When the offset is taken at a distance more than 15 m from the survey line, then it is known as Long offset. 	(1 mark each for any four of these)	

Que. No.	Sub. Que.	Model Answers	Marks	Total Marks
2)	c)	<p>4. Short offset- When the offset is taken at a distance less than 15 m from the survey line, then it is known as Short offset.</p> <p>5. Swing offset- when offset is set by swinging chain or tape to survey line, such formed offset is called Swing offset.</p>		4
	d)	<p>Describe stepping method of chaining on sloping ground.</p> <p>Ans:</p>  <p><i>Fig.5 : Stepping method</i></p> <ol style="list-style-type: none"> 1. If A and B are the two points on sloping ground, for which horizontal distance is to be measured. 2. Unfold the chain. By touching handle to station A, stretch it up to maximum possible distance (without sag). 3. Suspend the plumb-bob from that stretched point and mark the point C on ground. 4. Now measure the distance L_1 on chain by counting brass rings, brass talleys and links accurately. 5. Now, from point C, repeat steps 2,3 and 4 up to station B and note down corresponding horizontal distances L_2, L_3 etc. 6. Thus total horizontal distance on sloping ground is calculated as $d(AB) = L_1 + L_2 + L_3$ in meters. 	1	3
				4

Que. No.	Sub. Que.	Model Answers	Marks	Total Marks
2)	e)	<p>A 20 m chain was found to be 0.05m too long after chaining 800 m. it was found to be 0.10 m too long chaining 2000m. if the chain was correct before commencement of work, find true distance.</p> <p>Ans:</p> <p>Standard length of chain= $L = 20\text{m}$, $e_1 = 0\text{ m}$</p> <p>Measured length of chain = $ML = 800\text{ m}$, $e_2 = 0.05\text{m}$</p> <p>Measured length of chain = $ML = 1200\text{ m}$, $e_3 = 0.10\text{m}$</p> <p>To find- True length</p> <p>For 800 m distance</p> <p>Incorrect length = $20 + (0+0.05)/2 = 20.025\text{ m}$</p> <p>$TL_1 = L^1/L \times ML_1$</p> <p>$TL_1 = 20.025/20 \times 800$</p> <p>$TL_1 = 801\text{ m}$</p> <p>Now, for 1200 m distance</p> <p>Incorrect length = $20 + (0.05+0.10)/2 = 20.075\text{ m}$</p> <p>$TL_2 = L^1/L \times ML_1$</p> <p>$TL_2 = 20.075/20 \times 1200$</p> <p>$TL_2 = 1204.5\text{ m}$</p> <p>$TL = TL_1 + TL_2$</p> <p>$TL = 801 + 1204.5$</p> <p>$TL = 2005.5\text{ m}$</p>	<p>$\frac{1}{2}$</p> <p>1</p> <p>$\frac{1}{2}$</p> <p>1</p> <p>1</p>	4
	f)	<p>Draw a neat labelled sketch of optical square. Explain its working.</p>		
	Ans:	<p>Fig. 6 : Optical square and its working</p>	2	



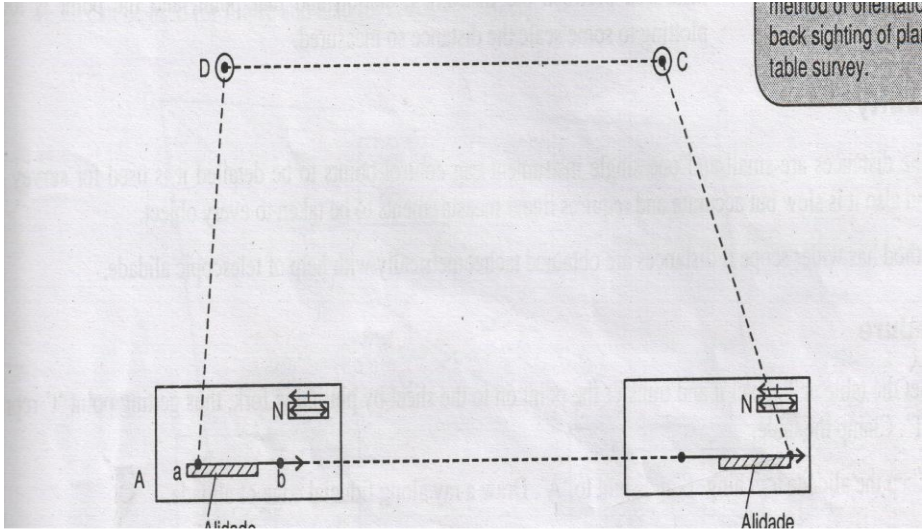
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2)	f)	<p>Working of optical square-</p> <ol style="list-style-type: none">1. Optical square works on principle of optical square to set perpendicular offset2. Keep ranging rods at point B and C as shown in fig.3. Observe the both rods through eye vane of optical square as in figure 6(b) i.e. one direct image and other reflected image.4. Now, move the along survey line AB with looking through optical square, till both rods coincided as in figure 6(c)5. Once, both rods matched each other point D can be marked on ground and distance CD is measured as perpendicular offset.	2	4
3)	a)	<p>Attempt any FOUR of the following:</p> <p>Describe any one method to overcome an obstacle in chaining, where vision is free but only chaining is obstructed.</p> <p>Ans:</p> <ol style="list-style-type: none">1. Suppose AB is chain line. Two points C & D are selected on it, on opposite banks of pond.2. Perpendicular are erected at point C and draw a line CE.3. Then join the point C and D.3. The pond may be crossed by forming a triangle as shown in figure.4. then , by rule, $CD = \sqrt{CE^2 + CD^2}$	16	
			3	
			1	
		<p>(Note- Other method should be considered)</p>		4

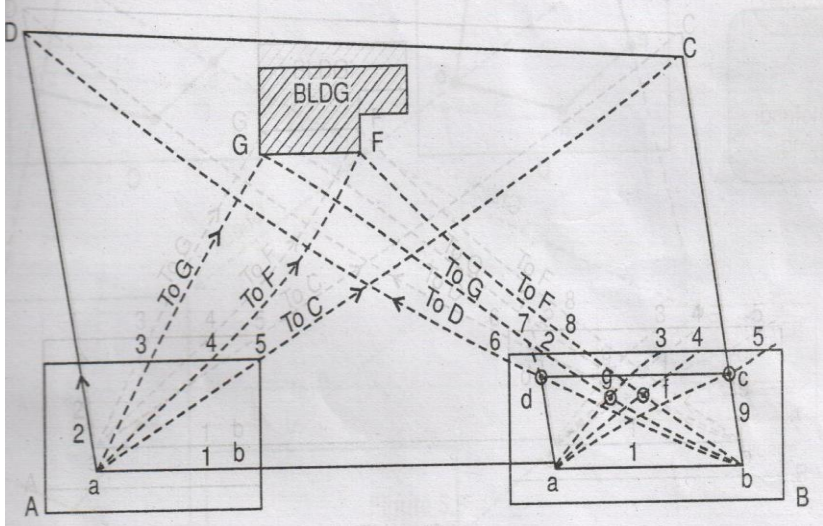


Que. No.	Sub. Que.	Model Answers	Marks	Total Marks								
3)	b)	<p>List any four component parts of prismatic compass and state its function.</p> <p>Ans: Component parts of prismatic compass are as follows.</p> <table><tr><td>1. Break pin</td><td>5. Adjustable Mirror</td></tr><tr><td>2. Lifting pin</td><td>6. Sun Glasses</td></tr><tr><td>3. Sight vane</td><td>7. Magnetic needle</td></tr><tr><td>4. Graduated ring</td><td>8. Pivot</td></tr></table> <p>1. Break pin - It is used to stop the oscillation of aluminum ring. 2. Lifting pin – It lifts the magnetic needle when sight vane is folded. 3. Sight vane – It is used to observe object. 4. Graduated ring – It is used to observe the angle. 5. Adjustable Mirror – to bisect the object when it is too high or too low from the line of collimation. 6. Sun Glasses - Used bisect the luminous object to reduce strain on eyes. 7. Magnetic needle- To direct magnetic north. 8. Pivot- To support the magnetic needle.</p>	1. Break pin	5. Adjustable Mirror	2. Lifting pin	6. Sun Glasses	3. Sight vane	7. Magnetic needle	4. Graduated ring	8. Pivot	<p>(½ Mark each any four)</p> <p>(½ Mark each any four)</p>	4
1. Break pin	5. Adjustable Mirror											
2. Lifting pin	6. Sun Glasses											
3. Sight vane	7. Magnetic needle											
4. Graduated ring	8. Pivot											
	c)	<p>Describe quadrantal bearing system. State the purpose it is used.</p> <p>Ans: Quadrantal Bearing –</p> <ol style="list-style-type: none">1. The magnetic bearing of line measured clockwise or anticlockwise from north or south pole whichever is nearer.2. These bearings are also called as reduced bearings.3. These are observed by surveyors compass4. Its value is between 0^0 to 90^0.5. It consists of four quadrants - N-E, S-E, S-W, N-W. <p>Purposes-</p> <ol style="list-style-type: none">1. It is used to measure bearing of survey lines in a closed traverse.2. It is used to calculate back bearing for respective quadrants.	<p>3</p> <p>1</p>	4								
	d)	<p>Define true bearing and magnetic bearing.</p> <p>Ans:</p> <p>1. True bearing – (i) The angle between true meridian or geographical north and any line known as true bearing.</p> <p>2. Magnetic bearing-(i)The angle between magnetic meridian and any line is known as magnetic bearing.</p>	<p>2</p> <p>2</p>	4								



Que. No.	Sub. Que.	Model Answers	Marks	Total Marks
3)	e)	Following are fore bearings: State back bearings for the same: i. 130°45' ii. N 50°W iii. 195°30' iv. S 75°45'E		
	Ans:	i. $130^{\circ}45' = 130^{\circ}45' + 180^{\circ} = 310^{\circ}45'$	1	
		ii. N 50°W = S 50°E	1	
		iii. $195^{\circ}30' = 195^{\circ}30' - 180^{\circ} = 15^{\circ}30'$	1	4
		iv. S 75°45'E = N 75°45'W	1	
	f)	State any four sources of errors in compass survey.		
	Ans:	Following are the sources of errors in compass survey-		
		1. Instrumental survey-		
		a. Needle may not be perfectly straight and might not be balanced properly over the station.		
		b. Graduations of the rings may not be uniform.		
		c. The ring may not rotate freely, due to head of the pivot being broken or may be eccentric.	2	
		d. The sight vane may not be vertical		
		e. Horse hair may not be straight or vertical.		
		2. Personal errors-		
		a. centering may not be done perfectly over the station.		
		b. Graduated ring may not be leveled.	1	
		c. The object might not be bisected properly.		
		d. Observer may be carrying magnetic substances.		
		3. Other sources of substances-		
		a. There may be attraction due to the presence of magnetic substances near the station.	1	4
		b. Magnetic field may vary on account of some natural causes.		
4)		Attempt any FOUR of the following:		16
	a)	What is open traverse and closed traverse?		
	Ans:	a) Open traverse –		
		1. When starting point of survey does not coincide with last point of the survey, it is known as open traverse.	2	
		2. It is used for the survey roads, rivers coastal line railways. etc.		
		b) Closed traverse –		
		1. When the finishing point of survey coincides with the starting point of the survey, it is known as closed traverse.		
		2. It is suitable for the survey of boundaries of ponds, forests, estate, etc.	2	4

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4)	b)	<p>Describe back sighting method of orientation of plane table surveying.</p> <p>Ans: Backsight method of orientation-</p> <ol style="list-style-type: none"> 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. 	3	
			1	4
	c)	<p>List the different accessories with their use for plane table survey.</p> <p>Ans: Accessories in plane table survey-</p> <ol style="list-style-type: none"> 1. Alidade- it is used to bisect the object and draw a ray on drawing sheet. 2. Spirit level-It is used for levelling of plane table 3. Trough compass-It is used to mark north direction 4. U fork and plumb bob – It is used for centering if plane table. 	(1 mark each any four of these)	4
	d)	<p>Describe intersection method of plane table with a neat sketch.</p> <p>Ans: Intersection method of plane tabling-</p> <ol style="list-style-type: none"> 1. Lay out a base line AB and measure it and Plot a distance 'ab' on sheet using any scale. 2. Set up instrument at 'A' with 'a' over 'A' 3. Orient the table by placing alidade 'ab' and turn table until ranging rod at 'B' is bisected and clamp it. 	3	

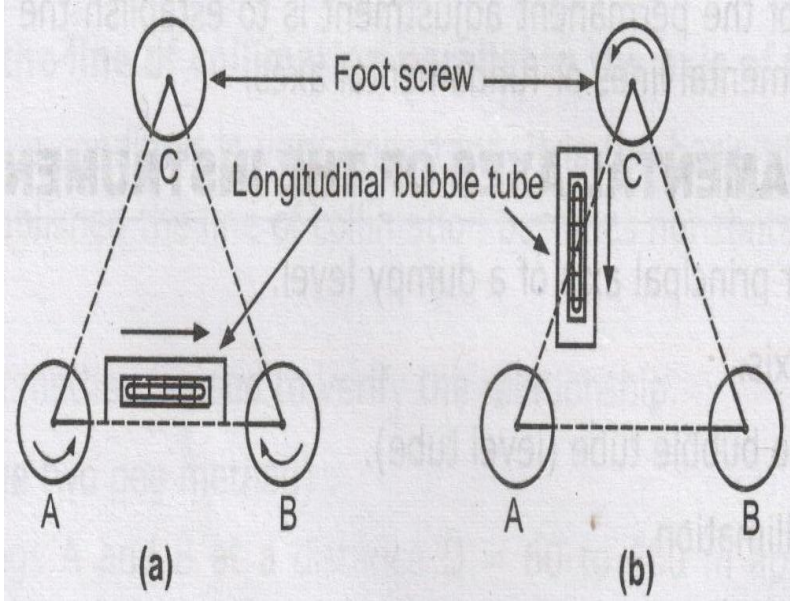
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4)	d)	<p>4. With alidade touching point 'a' draw rays 1, 2,3,4,5 of indefinite length as shown in figure below.</p> <p>5. The table is then moved to station 'B' orient by back sighting on 'A'. Draw rays towards points previously sighted i.e. 6,7,8,9 rays are drawn to determine points intersection, d, g, f, c.</p> 	1	4
	<p>e)</p> <p>State any four advantages of plane table surveying.</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>(1 mark each any four of these)</p>	4
	<p>f)</p> <p>Define 1. Level surface 2. Line of collimation 3. Axis of bubble tube 4. Fore sight</p> <p>Ans:</p>	<ol style="list-style-type: none"> 1. Level surface- The curved surface which is parallel to the mean spheroidal earth surface, is known as level surface. 2. Line of collimation- It is the imaginary line joining optical center of the objective glass and intersection of cross hairs. 3. Axis of bubble tube – An imaginary line tangential to the longitudinal curve of the bubble at its midpoint is known as axis of bubble tube. 4. Foresight – It is last staff reading taken before shifting the instrument. 	<p>1</p> <p>1</p> <p>1</p> <p>1</p>	4



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5)				16										
	a)	<p>Attempt any FOUR of the following: What are the fundamental lines of dumpy level? State their relationships.</p> <p>Ans: Following are fundamental lines of dumpy level.</p> <ol style="list-style-type: none"> 1. Line of collimation 2. Axis of telescope 3. Axis of bubble tube 4. Vertical axis of instrument. <p>Relationship-</p> <ol style="list-style-type: none"> 1. When the bubble is exactly in the Centre of its run , the axis of bubble tube is considered horizontal. 2. Line of collimation and axis of bubble tube should be parallel to each other. 3. Line of collimation should be perpendicular to vertical axis of instrument. 4. Axis of telescope and line of collimation should coincide. 	2											
	b)	<p>What is bench mark? State the types of bench mark and explain any one type.</p> <p>Bench Mark- It is fixed reference point of known or assumed elevation.</p> <p>Ans: Types of bench mark-</p> <ol style="list-style-type: none"> 1. Great trigonometrical survey bench mark 2. Permanent bench mark 3. Arbitrary bench mark 4. Temporary bench mark <p>1.Great trigonometrical survey bench mark-</p> <ol style="list-style-type: none"> a. These are the bench marks established with very high precision at regular intervals by survey of India Dept. all over the country b. Their positions and bench mark values with respect to the mean sea level at Karachi are given in catalogue formed by department. They are also known as G.T.S. Bench mark <p>(Note- Explanation of any other type of Bench Mark from the above should be considered.)</p>	1											
	c)	<p>Compare rise and fall method with height of plane collimation method for any four points.</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 50%; text-align: center;">Height of plane of collimation method</th> <th style="width: 50%; text-align: center;">Rise and fall method</th> </tr> </thead> <tbody> <tr> <td>1.The method is more rapid ,less tedious and simple as it involves less calculations.</td> <td>This method is more laborious as it involves more calculations.</td> </tr> <tr> <td>2. There is no check on calculation of R.L'S of intermediate sights. Hence mistake made remain unchecked.</td> <td>2.There is complete check on all calculation work.</td> </tr> <tr> <td>3.The error in calculating the R.L of any point is carried forward as the R.L'S are calculated from the respective plane of collimation.</td> <td>3.the mistake made in calculating the R.L of any point will be carried forward.</td> </tr> <tr> <td>4.It is used for calculating R.L.'S of profile leveling operations.</td> <td>4.It is It is used for calculating R.L's of precise levelling work.</td> </tr> </tbody> </table>	Height of plane of collimation method	Rise and fall method	1.The method is more rapid ,less tedious and simple as it involves less calculations.	This method is more laborious as it involves more calculations.	2. There is no check on calculation of R.L'S of intermediate sights. Hence mistake made remain unchecked.	2.There is complete check on all calculation work.	3.The error in calculating the R.L of any point is carried forward as the R.L'S are calculated from the respective plane of collimation.	3.the mistake made in calculating the R.L of any point will be carried forward.	4.It is used for calculating R.L.'S of profile leveling operations.	4.It is It is used for calculating R.L's of precise levelling work.	1 mark each	
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Que. No.	Sub. Que.	Model Answers	Marks	Total Marks
5)	d)	What is fly levelling? When it is carried out?		
	Ans.	Fly levelling- It is the levelling operation in which only BS and FS are taken and no intermediate sights are observed. It is carried out when <ol style="list-style-type: none">1. To connect the BM to the starting point of any project.2. To establish the BM.3. To determine approximate reduced levels of points carried out with more speed and less accurate.	2 2	4
	e)	State temporary adjustments of Dumpy Level.		
	Ans.	1. Setting up the level. <ol style="list-style-type: none">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 purposed. 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. 2. Levelling up the level. <ol style="list-style-type: none">a. The base of the tripod is already leveled with the help of cross bubble.b. To make accurate adjustment of the level, the longitudinal level is adjusted in the Centre of its run, with the help of three foot screws.c. Make the bubble parallel to the any selected pair of foot screws. Now; turn both the foot screws either inward or outward with the help of foot screws till the bubble appears in the center.d. Turn the telescope through 90^0 as shown in fig. below and now with the help of third screw bring the bubble of levelling tube in the center.	1 1	

Que. No.	Sub. Que.	Model Answers	Marks	Total Marks
5)	e)	 <p>3. Focusing the Eye piece.</p> <ol style="list-style-type: none"> Hold a sheet of white paper in front of the objective glass 4 to 6 cm away from objective glass and see through the eye piece. Turn the eye piece inwards or outwards in the socket so that the cross hair on the diaphragm appears sharp and clear. <p>4. Focusing the Object glass.</p> <ol style="list-style-type: none"> Direct the telescope towards any object, say a levelling staff in the field which is kept at a distance. See through eyepiece whether the staff is visible, distinct or not. If not, then turn the focusing screw till the image is distinct and clear. The cross hair on the diaphragm should also be seen clearly. 	<p>1</p> <p>1</p>	<p>4</p>



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5)	f)	<p>Fill up marked X missing readings in level page of field book apply usual check.</p> <p>Ans:</p> <table border="1"> <thead> <tr> <th>Station point</th> <th>BS</th> <th>IS</th> <th>FS</th> <th>HI</th> <th>RL</th> <th>Remark</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>3.210</td> <td></td> <td></td> <td><u>303.21</u></td> <td>300.00</td> <td>BM</td> </tr> <tr> <td>2</td> <td></td> <td>2.635</td> <td></td> <td></td> <td><u>300.575</u></td> <td></td> </tr> <tr> <td>3</td> <td><u>2.350</u></td> <td></td> <td>1.820</td> <td>303.74</td> <td><u>301.39</u></td> <td>CP</td> </tr> <tr> <td>4</td> <td></td> <td><u>2.865</u></td> <td></td> <td></td> <td>300.875</td> <td></td> </tr> <tr> <td>5</td> <td></td> <td>3.850</td> <td></td> <td></td> <td><u>299.89</u></td> <td></td> </tr> <tr> <td>6</td> <td></td> <td></td> <td>3.900</td> <td></td> <td><u>299.84</u></td> <td>TBM</td> </tr> </tbody> </table> <p>Sample calculation- $HI = RL + BS = 300.00 + 3.210 = 303.210$</p> <p>Arithmetic check- $\sum BS - \sum FS = LAST RL - First RL$ $5.56 - 5.72 = 299.84 - 300.00$ $0.16 = 0.16$</p>	Station point	BS	IS	FS	HI	RL	Remark	1	3.210			<u>303.21</u>	300.00	BM	2		2.635			<u>300.575</u>		3	<u>2.350</u>		1.820	303.74	<u>301.39</u>	CP	4		<u>2.865</u>			300.875		5		3.850			<u>299.89</u>		6			3.900		<u>299.84</u>	TBM	(1/2 mark for each missing reading)	4
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6)	a)	<p>Attempt any TWO of the following:</p> <p>Calculate the area of field.</p> <p>Ans:</p>	16	1																																																	



Que. No.	Sub. Que.	Model Answers					Marks	Total Marks			
6	a)	Sr. No.	Fig.	Chainage	Base	Offset	Mean Offset	Area	2 2 2 1	8	
		1	PRr	0 & 10	10	0 & 10	5	50			
		2	RrsS	10 & 30	20	10 & 25	17.5	350			
		3	SstT	30 & 70	40	25 & 40	32.5	1300			
		4	TtuU	70 & 95	25	40 & 10	25	625			
		5	UuQ	95 & 110	15	10 & 0	5	75			
		6	QvV	80 & 110	30	15 & 0	7.5	225			
		7	vVWw	55 & 80	25	15 & 35	25	625			
		8	xXWw	15 & 55	40	20 & 35	27.5	1100			
		9	xXp	0 & 15	15	0 & 20	10	150			
							Total	4500m²			
		(Note- For every three areas - 2 marks; Total- 1 marks)									
	b)	The following consecutive readings were recorded with dumpy level and 4 m levelling staff: 2.505,2.875,3.150,0.950,3.515,3.150,0.870,1.240,1.450,0.810 The level was shifted after fourth and seventh reading. The first reading was taken on BM having RL. as 200.00 m. Calculate the reduced level of stations. Using rise and fall method. Apply arithmetical check. Also calculate the difference of level between 1st station and last station.									
	Ans:	Last RL- First RL= 204.63- 200.00 = 4.63									



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6)	b)	<table border="1" style="width: 100%; border-collapse: collapse; margin-bottom: 10px;"> <thead> <tr> <th style="width: 10%;">Station point</th> <th style="width: 10%;">BS</th> <th style="width: 10%;">IS</th> <th style="width: 10%;">FS</th> <th style="width: 10%;">Rise</th> <th style="width: 10%;">Fall</th> <th style="width: 10%;">RL</th> <th style="width: 10%;">Remark</th> </tr> </thead> <tbody> <tr><td style="text-align: center;">1</td><td style="text-align: center;">2.505</td><td></td><td></td><td></td><td></td><td style="text-align: center;">200.00</td><td style="text-align: center;">BM</td></tr> <tr><td style="text-align: center;">2</td><td></td><td style="text-align: center;">2.875</td><td></td><td></td><td style="text-align: center;">0.37</td><td style="text-align: center;">199.63</td><td></td></tr> <tr><td style="text-align: center;">3</td><td></td><td style="text-align: center;">3.15</td><td></td><td></td><td style="text-align: center;">0.275</td><td style="text-align: center;">199.355</td><td></td></tr> <tr><td style="text-align: center;">4</td><td style="text-align: center;">3.515</td><td></td><td style="text-align: center;">0.950</td><td style="text-align: center;">2.2</td><td></td><td style="text-align: center;">201.555</td><td style="text-align: center;">CP-1</td></tr> <tr><td style="text-align: center;">5</td><td></td><td style="text-align: center;">3.15</td><td></td><td style="text-align: center;">0.365</td><td></td><td style="text-align: center;">201.92</td><td></td></tr> <tr><td style="text-align: center;">6</td><td style="text-align: center;">1.240</td><td></td><td style="text-align: center;">0.870</td><td style="text-align: center;">2.28</td><td></td><td style="text-align: center;">204.2</td><td style="text-align: center;">CP-2</td></tr> <tr><td style="text-align: center;">7</td><td></td><td style="text-align: center;">1.450</td><td></td><td></td><td style="text-align: center;">0.21</td><td style="text-align: center;">203.99</td><td></td></tr> <tr><td style="text-align: center;">8</td><td></td><td></td><td style="text-align: center;">0.810</td><td style="text-align: center;">0.64</td><td></td><td style="text-align: center;">204.63</td><td></td></tr> </tbody> </table> <p> $BS = 7.26 \quad FS = 2.6 \quad \sum Rise = 5.485 \quad \sum Fall = 0.855$ $\sum BS - \sum FS = \sum Rise - \sum Fall = Last RL - First RL$ $7.26 - 2.63 = 5.485 - 0.855 = 204.63 - 200$ $4.63 = 4.63 = 4.63$ </p> <p>Note: Entry of Correct readings = 02 Marks, Correct Calculations = 04 Marks and Exact check = 02 Marks.</p>	Station point	BS	IS	FS	Rise	Fall	RL	Remark	1	2.505					200.00	BM	2		2.875			0.37	199.63		3		3.15			0.275	199.355		4	3.515		0.950	2.2		201.555	CP-1	5		3.15		0.365		201.92		6	1.240		0.870	2.28		204.2	CP-2	7		1.450			0.21	203.99		8			0.810	0.64		204.63		8	
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	c)	<p>The following bearings were taken in traverse survey conducted with a prismatic compass at a place where local attraction was suspected. Plot the traverse. At what station do you suspect local attraction? Find corrected fore bearings and back bearings of the lines.</p>																																																																										
	Ans:	<p>Station B and C are free from local attraction.</p> <table border="1" style="width: 100%; border-collapse: collapse; margin-bottom: 10px;"> <thead> <tr> <th rowspan="2" style="width: 10%;">Line</th> <th rowspan="2" style="width: 10%;">F.B.</th> <th rowspan="2" style="width: 10%;">B.B.</th> <th rowspan="2" style="width: 10%;">Diff.</th> <th colspan="2" style="width: 20%;">Corrected</th> <th rowspan="2" style="width: 10%;">Correction</th> </tr> <tr> <th style="width: 10%;">F.B.</th> <th style="width: 10%;">B.B.</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">AB</td> <td style="text-align: center;">$156^0 0'$</td> <td style="text-align: center;">$335^0 30'$</td> <td style="text-align: center;">$179^0 30'$</td> <td style="text-align: center;">$155^0 30'$</td> <td style="text-align: center;">$335^0 30'$</td> <td style="text-align: center;">0</td> </tr> <tr> <td style="text-align: center;">BC</td> <td style="text-align: center;">$237^0 30'$</td> <td style="text-align: center;">$57^0 30'$</td> <td style="text-align: center;">$180^0 0'$</td> <td style="text-align: center;">$237^0 30'$</td> <td style="text-align: center;">$57^0 30'$</td> <td style="text-align: center;">0</td> </tr> <tr> <td style="text-align: center;">CD</td> <td style="text-align: center;">$335^0 0'$</td> <td style="text-align: center;">$153^0 45'$</td> <td style="text-align: center;">$181^0 15'$</td> <td style="text-align: center;">$335^0 0'$</td> <td style="text-align: center;">$155^0 0'$</td> <td style="text-align: center;">$+1^0 15'$</td> </tr> <tr> <td style="text-align: center;">DA</td> <td style="text-align: center;">$54^0 15'$</td> <td style="text-align: center;">$236^0 0'$</td> <td style="text-align: center;">$181^0 45'$</td> <td style="text-align: center;">$55^0 30'$</td> <td style="text-align: center;">$235^0 30'$</td> <td style="text-align: center;">$-0^0 30'$</td> </tr> </tbody> </table> <p>(Note- for corrected FB- 1 Mark & for corrected BB- 1 Mark)</p>	Line	F.B.	B.B.	Diff.	Corrected		Correction	F.B.	B.B.	AB	$156^0 0'$	$335^0 30'$	$179^0 30'$	$155^0 30'$	$335^0 30'$	0	BC	$237^0 30'$	$57^0 30'$	$180^0 0'$	$237^0 30'$	$57^0 30'$	0	CD	$335^0 0'$	$153^0 45'$	$181^0 15'$	$335^0 0'$	$155^0 0'$	$+1^0 15'$	DA	$54^0 15'$	$236^0 0'$	$181^0 45'$	$55^0 30'$	$235^0 30'$	$-0^0 30'$	2	2																																			
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