SRM VALLIAMMAI ENGINEERING COLLEGE

(An Autonomous Institution)

SRM Nagar, Kattankulathur – 603 203

DEPARTMENT OF CIVIL ENGINEERING

QUESTION BANK

III SEMESTER

CE3363 - SURVEYING AND LEVELLING

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UNIT I - FUNDAMENTALS OF CONVENTIONAL SURVEYING

Definition – Classifications – Principles – Equipment and accessories for ranging and chaining – Methods of ranging – Well conditioned triangles – Chain traversing – Compass – Basic principles – Types – Bearing – System and conversions – Sources of errors and Local attraction – Magnetic declination – Dip – compass traversing – Plane table and its accessories – Merits and demerits.

PART - A

Q. No	Questions	BT	Competence
1.	Define surveying.	BT-1	Remember
2.	List the uses of surveying.	BT-1	Remember
3.	Tell the length of one link in engineer's chain and Gunter's chain.	BT-1	Remember
4.	Name the instruments/accessories needed to carry out a chain surveying.	BT-1	Remember
5.	Discuss the applications of surveying.	BT-1	Remember
6.	Discuss the term ranging. Mention its types.	BT-1	Remember
7.	What are the primary divisions of surveying?	BT-2	Understand
8.	Distinguish between Magnetic Dip and Declination.	BT-2	Understand
9.	Distinguish between true bearing and magnetic bearing.	BT-2	Understand
10.	Discuss the term bearings and its types.	BT-2	Understand
11.	Calculate the reduced bearing values for the whole circle bearings 150°and 270°.	BT-3	Apply
12.	Change the following whole circle bearing to reduced bearing: (a) 151° 20' (b) 332° 40'.	BT-3	Apply
13.	List the types of Cross Staffs?		
14.	Discuss the methods of surveying based on instrument.	BT-1	Remember
15.	Discuss the differences between Plan and Map.	BT-2	Understand
16.	List the different cumulative errors in chain surveying.	BT-1	Remember
17.	What do you mean by geodetic surveying?	BT-2	Understand
18.	What is the purpose of an Optical Square?	BT-2	Understand
19.	Under what circumstances the reciprocal ranging is used?	BT-1	Remember
20.	Define compensating error.	BT-1	Remember
21.	The length of a line measured with a 20m chain was found to be 250 metres. Calculate the length of the line if the chain was 10 cm too long.	BT-3	Apply
22.	What do you understand by the term plotting?	BT-1	Remember
23.	How will you correct errors occurring due to change in temperature in a tape?	BT-2	Understand

<table>
<tr><td>24.</td><td>Draw a neat sketch to show a) base line b) check line c) tie line</td><td>BT-1</td><td>Remember</td></tr>
<tr><td>25.</td><td>What is meant by sag correction?</td><td>BT-1</td><td>Remember</td></tr>
<tr><td colspan="4">PART – B</td></tr>
<tr><td>1.</td><td>(i) Discuss the basic principles of surveying. Elaborate it. (8)
(ii) Discuss about the methods of taking a linear measurement. (8)</td><td>BT-2</td><td>Understand</td></tr>
<tr><td>2.</td><td>(i) Describe the field and office work in chain surveying? (8)
(ii) Explain in detail the errors that arise in chaining. (8)</td><td>BT-2</td><td>Understand</td></tr>
<tr><td>3.</td><td>Discuss about ranging and explain the types of ranging in detail.</td><td>BT-3</td><td>Apply</td></tr>
<tr><td>4.</td><td>Explain the methods of chaining on uneven or sloping ground with neat sketches.</td><td>BT-2</td><td>Understand</td></tr>
<tr><td>5.</td><td>(i) Prepare a list of accessories required for a chain survey? Explain the functions of each. (8)
(ii) Explain the steps adopted for chain surveying. (8)</td><td>BT-3</td><td>Apply</td></tr>
<tr><td>6.</td><td>The following bearing were observed with a compass. Calculate the interior angles.
<table>
<tr><th>Line</th><th>Fore Bearing</th></tr>
<tr><td>AB</td><td>60˚30’</td></tr>
<tr><td>BC</td><td>122˚0’</td></tr>
<tr><td>CD</td><td>46˚0’</td></tr>
<tr><td>DE</td><td>205˚30’</td></tr>
<tr><td>EA</td><td>300˚0’</td></tr>
</table></td><td>BT-4</td><td>Analyze</td></tr>
<tr><td>7.</td><td>Evaluate the working principle of prismatic compass in detail.</td><td>BT-3</td><td>Apply</td></tr>
<tr><td>8.</td><td>The following are bearings taken on a closed compass traverse:
<table>
<tr><th>Line</th><th>F.B.</th><th>B.B.</th></tr>
<tr><td>AB</td><td>80˚10’</td><td>259˚0’</td></tr>
<tr><td>BC</td><td>120˚20’</td><td>301˚50’</td></tr>
<tr><td>CD</td><td>170˚50’</td><td>350˚50’</td></tr>
<tr><td>DE</td><td>230˚10’</td><td>49˚30’</td></tr>
<tr><td>EA</td><td>310˚20’</td><td>130˚15’</td></tr>
</table>
Calculate the interior angles and correct them for observational errors. Assuming the observed bearing of the line CD to be corrected adjust the bearing of the remaining sides.</td><td>BT-4</td><td>Analyze</td></tr>
<tr><td>9.</td><td>Explain the classification of surveying in detail.</td><td>BT-3</td><td>Apply</td></tr>
</table>

<table>
<tr><td>10.</td><td>The following bearings were observed while traversing with a compass.
<table><tr><th>Line</th><th>F.B.</th><th>B.B.</th></tr><tr><td>AB</td><td>45˚45’</td><td>226˚10’</td></tr><tr><td>BC</td><td>96˚55’</td><td>277˚5’</td></tr><tr><td>CD</td><td>29˚45’</td><td>209˚10’</td></tr><tr><td>DE</td><td>324˚48’</td><td>144˚48’</td></tr></table>Mention which stations were affected by local attraction and determine the corrected bearing.</td><td>BT-5</td><td>Evaluate</td></tr>
<tr><td>11.</td><td>The bearings of the sides of a traverse ABCDE are as follows :
<table><tr><td>Line</td><td>F.B</td><td>B.B</td></tr><tr><td>AB</td><td>$107^0 15'$</td><td>$287^0 15'$</td></tr><tr><td>BC</td><td>$22^0 0'$</td><td>$202^0 0'$</td></tr><tr><td>CD</td><td>$281^0 30'$</td><td>$101^0 30'$</td></tr><tr><td>DE</td><td>$189^0 15'$</td><td>$9^0 15'$</td></tr><tr><td>EA</td><td>$124^0 45'$</td><td>$304^0 45'$</td></tr></table>Compute the interior angle of the traverse</td><td>BT-4</td><td>Analyze</td></tr>
<tr><td>12.</td><td>(i) List out the various objectives of surveying? (6)
(ii) Explain in detail about the primary divisions of surveying. (10)</td><td>BT-4</td><td>Analyze</td></tr>
<tr><td>13.</td><td>(i) Explain about cumulative errors and compensating errors in survey. (8)
(ii) Describe the various methods to obtain direct measurements in survey. (8)</td><td>BT-4</td><td>Analyze</td></tr>
<tr><td>14.</td><td>(i) A 20 m chain was found to be 10 cm too long after chaining a distance of 1500 m. It was found to be 18 cm too long at the end of day’s work after chaining a total distance of 2900 m. Find the true distance if the chain was correct before the commencement of the work. (8)

(ii) A 20 m chain used for a survey was found to be 20.10m at the beginning and 20.30 m at the end of the work. The area of the plan drawn to a scale of 1cm = 8m was measured with the help of a planimeter and was found to be 32.56 sq.cm. Find the true area of the field. (8)</td><td>BT-5</td><td>Evaluate</td></tr>
<tr><td>15.</td><td>(i) A tape 20 m long of standard length at 84ºF was used to measure a line, the mean temperature during measurement being 65º. The measured distance was 882.10 metres, the following being the slopes.

2º10’ for 100 m
4º12’ for 150 m
1º6’ for 50 m
7º48’ for 200m
3º0’ for 300 m</td><td>BT-4</td><td>Analyze</td></tr>
</table>

	5º10’ for 82.10 m Find the true length of the line if co-efficient of expansion is $65x10^{-7}$ per 1º (10) (ii) Calculate the sag correction for a 30 m steel under a pull of 100 N in three equal spans of 10 m each. Weight of one cubic cm of steel = 0.078 N. Area of cross-section of tape = 0.08 sq.cm. (6)		
16.	Write notes on: (i) Magnetic declination (6) (ii) Variations in declination (6) (iii) Local attraction (4)	BT-2	Understand
17.	(i) List out the various tape corrections applied to calculate the correct length of the base. (6) (ii) Write down the formula to compute the corrections for absolute length, temperature, pull in tape and sag in tape. (10)	BT-2	Understand
18.	A compass survey was carried out around a closed transverse ABCD and the following reading were obtained. Identify which station were affected by local attraction and determine the corrected bearing. Line | F.B | B.B AB | 74º 30’ | 256º10’ BC | 107º30’ | 286º10’ CD | 225º10’ | 45º10’ DE | 306º 50’ | 126º 10’	BT-5	Evaluate

UNIT II- LEVELLING

Level line – Horizontal line – Datum – Benchmarks – Levels and staves – Temporary and permanent adjustments – Methods of leveling – Fly leveling – Check leveling – Procedure in leveling – Booking – Reduction – Curvature and refraction – Reciprocal leveling – Precise leveling - Contouring.

Q.No	Questions	BT	Competence
1.	Define levelling.	BT-1	Remember
2.	What is meant by sensitiveness of level tube?	BT-1	Remember
3.	List the different types of leveling staves.	BT-1	Remember
4.	List out the types of levelling instruments.	BT-1	Remember
5.	Write about datum.	BT-1	Remember
6.	Define Benchmark and give its types.	BT-1	Remember
7.	Evaluate the reduction in levelling? Name the methods.	BT-2	Understand
8.	What is fly levelling?	BT-2	Understand
9.	What are the types of errors in levelling?	BT-2	Understand

10.	List the methods of booking a reduced level?	BT-2	Understand
11.	What is meant by Turning Point in Levelling?	BT-3	Remember
12.	Define vertical plane.	BT-3	Remember
13.	Differentiate between internal focusing telescope and external focusing telescope.	BT-3	Understand
14.	Define fore sight.	BT-2	Understand
15.	Compare simple levelling and differential levelling.	BT-1	Remember
16.	Distinguish between level line and horizontal line.	BT-2	Understand
17.	What is dumpy level?	BT-2	Understand
18.	What is meant by height of collimation?	BT-1	Remember
19.	What is meant by check levelling?	BT-2	Understand
20.	Discuss about ball and socket arrangement in level.	BT-1	Remember
21.	List out the methods of levelling.	BT-2	Understand
22.	Define back sight.	BT-1	Remember
23.	What is reciprocal levelling?	BT-2	Understand
24.	What is contour? State the uses of contour.	BT-1	Remember
25.	Summarize the methods of locating contouring	BT-1	Remember
	PART-B		
1.	Describe the different sources of error in leveling and explain them in detail.	BT-3	Apply
2.	Explain the different types of levels and different methods of levelling.	BT-2	Understand
3.	Describe the profile leveling and cross sectional leveling.	BT-3	Apply
4.	Discuss the various characteristics and uses of contours with suitable examples.	BT-5	Evaluate
5.	The following staff readings were observed successively with a level, the instrument having been moved after third, sixth and eighth readings 2.228, 1.606, 0.988, 2.090, 2.864, 1.262, 0.602, 1.982, 1.044, 2.684 meters. Enter the above readings in a page of a level book and evaluate the R.L. of points if the first reading was taken with a staff held on a bench mark of 432.384 m.	BT-4	Analyze
6.	Following are the successive staff readings taken in a levelling continuously on sloping ground at common interval of 25m. 0.605, 1.235, 2.575, 0.735, 1.430, 1.925, 2.875, 0.875, 1.825, 2.720. Reduced level of the first point is 160m.Rule out a level book page and enter the above readings. Calculate the reduces levels of the points and also the gradient of the line joining the first point and last point.	BT-4	Analyze
7.	Write short notes on levelling instruments.	BT-3	Apply
8.	The following consecutive readings were taken with a level and 5 meter levelling staff on continuously sloping ground at a common interval of 20 metres: 0.385, 1.030, 1.925, 2.825, 3.730, 4.685, 0.625, 2.005, 3.110 and 4.485. The reduced level of the first point was 208.125 m. Calculate the reduced levels of the points by rise and fall method and also the gradient of the line joining the first and the last point.	BT-5	Evaluate

<table>
<tr><td>9.</td><td>Explain different Methods of Contouring in Surveying.</td><td>BT-3</td><td>Apply</td></tr>
<tr><td>10.</td><td>The following figures were extracted from a level field book, some of the entries being illegible owing to exposure to rain. Insert the missing figures and check your results. Rebook all the figures by the ‘rise’ and ‘fall’ method.
<table>
<tr><th>Station</th><th>B.S</th><th>I.S.</th><th>F.S.</th><th>Rise</th><th>Fall</th><th>R.L.</th><th>Remarks</th></tr>
<tr><td>1</td><td>2.285</td><td></td><td></td><td></td><td></td><td>232.460</td><td>B.M. 1</td></tr>
<tr><td>2</td><td>1.650</td><td></td><td>x</td><td>0.020</td><td></td><td></td><td></td></tr>
<tr><td>3</td><td></td><td>2.105</td><td></td><td></td><td>x</td><td></td><td></td></tr>
<tr><td>4</td><td>x</td><td></td><td>1.960</td><td>x</td><td></td><td></td><td></td></tr>
<tr><td>5</td><td>2.050</td><td></td><td>1.925</td><td></td><td>0.300</td><td></td><td></td></tr>
<tr><td>6</td><td></td><td>x</td><td></td><td>x</td><td></td><td>232.255</td><td>B.M. 2</td></tr>
<tr><td>7</td><td>1.690</td><td></td><td>x</td><td>0.340</td><td></td><td></td><td></td></tr>
<tr><td>8</td><td>2.865</td><td></td><td>2.100</td><td></td><td>x</td><td></td><td></td></tr>
<tr><td>9</td><td></td><td></td><td>x</td><td>x</td><td></td><td>233.425</td><td>B.M. 3</td></tr>
</table></td><td>BT-5</td><td>Evaluate</td></tr>
<tr><td>11.</td><td>The following staff readings were observed successively with a level, the instrument having been moved after third, sixth and eighth readings 0.675, 1.230, 0.750, 2.565, 2.225, 1.935, 1.835, 3.220, 3.115 and 2.875.Enter the above readings in a page of a level book and evaluate the R.L. of points if the first reading was taken with a staff held on a bench mark of 100.00 m.</td><td>BT-4</td><td>Analyze</td></tr>
<tr><td>12.</td><td>(i) List out advantages and disadvantages of internal focusing telescope.(10)
(ii) Mention the essential parts of a telescope and the optical defects of a single lens (6)</td><td>BT-3</td><td>Apply</td></tr>
<tr><td>13.</td><td>Describe the effects of curvature and refraction in Levelling.</td><td>BT-3</td><td>Apply</td></tr>
<tr><td>14.</td><td>Write short notes on the following terms
a)Horizontal plane b) Vertical line c) Benchmark d) Line of collimation e)Height of instrument f) Datum</td><td>BT-2</td><td>Understand</td></tr>
<tr><td>15.</td><td>(i) Discuss the various uses of contour maps. (8)
(ii) Explain the characteristic features of contour. (8)</td><td>BT-3</td><td>Apply</td></tr>
<tr><td>16.</td><td>Explain in detail the three principal sources of errors in levelling.</td><td>BT-3</td><td>Apply</td></tr>
<tr><td>17.</td><td>Discuss in detail about the various characteristics and uses of contours with suitable examples.</td><td>BT-5</td><td>Evaluate</td></tr>
<tr><td>18.</td><td>The following consecutive readings were taken with a dumpy level and 4 m levelling staff on a continuously sloping ground at 30 m intervals. 0.680, 1.455, 1.855, 2.330, 2.885, 3.380, 1.055, 1.860, 2.265, 3.540, 0.835, 0.945, 1.530 and 2.250. R.L of the starting point was 80.750 m.
(i) Rule out a page of a level book and enter the above readings.
(ii) Determine the RL of various staff stations. Estimate average gradient of ground measured.</td><td>BT-4</td><td>Analyze</td></tr>
<tr><td colspan="4">UNIT III - THEODOLITE SURVEYING
Horizontal and vertical angle measurements – Temporary and permanent adjustments – Heights and distances – Tacheometric surveying – Stadia Tacheometry – Tangential Tacheometry – Trigonometric leveling – Single Plane method – Double Plane method.</td></tr>
</table>

<table>
<tr><td colspan="4">PART A</td></tr>
<tr><td>1.</td><td>What is meant by theodolite surveying?</td><td>BT-1</td><td>Remember</td></tr>
<tr><td>2.</td><td>Define transit theodolite.</td><td>BT-1</td><td>Remember</td></tr>
<tr><td>3.</td><td>List out the steps in temporary adjustments of theodolite surveying.</td><td>BT-1</td><td>Remember</td></tr>
<tr><td>4.</td><td>What is the permanent adjustments of theodolite surveying?</td><td>BT-1</td><td>Remember</td></tr>
<tr><td>5.</td><td>Label the fundamental axis of Theodolite.</td><td>BT-1</td><td>Remember</td></tr>
<tr><td>6.</td><td>Define Tacheometry and its use</td><td>BT-1</td><td>Remember</td></tr>
<tr><td>7.</td><td>Differentiate between latitude and departure.</td><td>BT-2</td><td>Understand</td></tr>
<tr><td>8.</td><td>Define analytic lens</td><td>BT-2</td><td>Understand</td></tr>
<tr><td>9.</td><td>Summarize the methods of interpolating contours.</td><td>BT-2</td><td>Understand</td></tr>
<tr><td>10.</td><td>Discuss few points on contour gradient.</td><td>BT-2</td><td>Understand</td></tr>
<tr><td>11.</td><td>Differentiate face left and face right observations.</td><td>BT-3</td><td>Apply</td></tr>
<tr><td>12.</td><td>Illustrate the location and function of plate bubble in a theodolite.</td><td>BT-3</td><td>Apply</td></tr>
<tr><td>13.</td><td>Illustrate the contour lines for hill and a depression</td><td>BT-3</td><td>Apply</td></tr>
<tr><td>14.</td><td>What do you infer about centering of a theodolite?</td><td>BT-2</td><td>Understand</td></tr>
<tr><td>15.</td><td>Compare theodolite and tacheometer.</td><td>BT-1</td><td>Remember</td></tr>
<tr><td>16.</td><td>How will you analyze the capacity of the reservoir.</td><td>BT-2</td><td>Understand</td></tr>
<tr><td>17.</td><td>List out the fundamental lines of a transit.</td><td>BT-2</td><td>Understand</td></tr>
<tr><td>18.</td><td>List the errors which are eliminated in measurement of horizontal angles by repetition method.</td><td>BT-1</td><td>Remember</td></tr>
<tr><td>19.</td><td>Summarize the principle of stadia method.</td><td>BT-2</td><td>Understand</td></tr>
<tr><td>20.</td><td>Summarize the systems of Tacheometric survey.</td><td>BT-1</td><td>Remember</td></tr>
<tr><td>21.</td><td>What is Trigonometric leveling?</td><td>BT-2</td><td>Understand</td></tr>
<tr><td>22.</td><td>Defines topographic maps.</td><td>BT-1</td><td>Remember</td></tr>
<tr><td>23.</td><td>Define contour interval and horizontal equivalent</td><td>BT-1</td><td>Understand</td></tr>
<tr><td>24.</td><td>List the types of theodolite.</td><td>BT-2</td><td>Remember</td></tr>
<tr><td>25.</td><td>Define level book.</td><td>BT-1</td><td>Understand</td></tr>
<tr><td colspan="4">PART B</td></tr>
<tr><td>1.</td><td>Two observations were taken upon a vertical staff by means of a theodolite, the reduced level of its trunnion axis being 160.95. In the case of the first, the angle of elevation was 4°36’ and the staff reading 0.75. In the case of second observation, the staff reading was 3.45 and the angle of elevation 5°48’. Calculate the reduced level of the staff station.</td><td>BT-3</td><td>Apply</td></tr>
<tr><td>2.</td><td>
<table>
<tr><td>Instrumentation Station</td><td>Reading in BM</td><td>Angle of elevation</td><td>Remarks</td></tr>
<tr><td>A</td><td>0.862</td><td>18º 36’</td><td>RL of BM=421.380m</td></tr>
<tr><td>B</td><td>1.222</td><td>10º 12’</td><td>Distance B=50m</td></tr>
</table>
i) Collect the elevation of the top of a chimney from the following data. Stations A and B and top of chimney are in the same vertical plane. (12)
ii) Describe the temporary adjustments of theodolite. (4)</td><td>BT-4</td><td>Analyze</td></tr>
<tr><td>3.</td><td>Find the Elevation and distance of the Staff Station from the Instrument station when the angle of Elevation is 8°20’ and the staff is held vertically. The readings are 2.60, 3.80 and 5.00. Elevation of Instrument =500.1 m , h=1.235m,Calculate the Reduced Level of the points if K=100 and C= 0.2</td><td>BT-4</td><td>Analyze</td></tr>
</table>

<table>
<tr><td>4.</td><td>Explain the different between tangential and stadia tachometry. How will you determine the stadia constants?</td><td>BT-3</td><td>Apply</td></tr>
<tr><td>5.</td><td>
<table>
<tr><th>Instrument Station</th><th>Staff station</th><th>Target</th><th>Vertical Angle</th><th>Staff. Reading</th><th>Remarks</th></tr>
<tr><td>A</td><td>BM</td><td>Elevation
Depression</td><td>-10°00’
-7°00’</td><td>0.655
2.655</td><td>RL of Instrument : 510.50</td></tr>
<tr><td></td><td>B</td><td>Elevation
Depression</td><td>-5°00’
-4°00’</td><td>1.250
3.200</td><td></td></tr>
</table>
(i) Calculate the RL of station B, two observations are taken by a theodolite from station A. Find the RL of B. distance between BM and B.
</td><td>BT-3</td><td>Apply</td></tr>
<tr><td>6.</td><td>A tacheometer was setup at a station C and the following readings were obtained on a staff vertically held K = 100 and C = 0.15
<table>
<tr><th>Inst. Station</th><th>Staff station</th><th>Vertical angle</th><th>Hair Reading</th><th>Remarks</th></tr>
<tr><td>C</td><td>B.M.</td><td>-5˚20’</td><td>1.150, 1.800, 2.450</td><td>R.L. of B.M.</td></tr>
<tr><td>C</td><td>D</td><td>+8˚12’</td><td>0.750, 1.500</td><td>2.250</td></tr>
</table>
Calculate the horizontal distance CD and RL of D.
</td><td>BT-3</td><td>Apply</td></tr>
<tr><td>7.</td><td>Derive the expressions for Horizontal and vertical distances in Fixed hair method.</td><td>BT-4</td><td>Analyze</td></tr>
<tr><td>8.</td><td>Explain in detail about various methods employed in Tacheometric Surveying?</td><td>BT-3</td><td>Apply</td></tr>
<tr><td>9.</td><td>The following observations were taken with a tacheometer fitted with an anallactic lens the staff being held vertically. The constant of the tachometry is 100 and C = 0. Calculate R.L. of B and the distance between A and B.
<table>
<tr><th>Inst. Station</th><th>Height of Instrument</th><th>Staff station</th><th>Vertical angle</th><th>Staff Readings</th><th>Remarks</th></tr>
<tr><td>P</td><td>1.255</td><td>BM</td><td>-4˚20’</td><td>1.325,
1.825,
2.325</td><td></td></tr>
<tr><td>P</td><td>1.255</td><td>A</td><td>+6˚30’</td><td>0.850,
1.600,
2.350</td><td>255.750</td></tr>
<tr><td>B</td><td>1.450</td><td>A</td><td>-7˚24’</td><td>1.715,
2.315,
2.915</td><td></td></tr>
</table>
</td><td>BT-4</td><td>Analyze</td></tr>
<tr><td>10.</td><td>Derive the formulas for calculating the horizontal and vertical distances by trigonometrical levelling.</td><td>BT-4</td><td>Analyze</td></tr>
<tr><td>11.</td><td>Explain how the vertical angle is measured by using theodolite.</td><td>BT-3</td><td>Apply</td></tr>
<tr><td>12.</td><td>Explain in detail the essential parts of transit theodolite.</td><td>BT-3</td><td>Apply</td></tr>
<tr><td>13.</td><td>Explain which method is applicable when the line of sight is inclined, but staff is held vertically and considering the angle of elevation.</td><td>BT-3</td><td>Apply</td></tr>
</table>

14.	Recommend the various methods of horizontal angle using a theodolite.	BT-3	Apply
15.	Explain in detail about Fixed hair method of Tachometry.	BT-3	Apply
16.	Explain in detail about Movable hair and Tangential method of Tacheometry.	BT-3	Apply
17.	How to determine the Constants of a Tachometer?	BT-4	Analyze
18.	Explain the station adjustments made in theodolite?	BT-3	Apply

UNIT IV - CONTROL SURVEYING AND ADJUSTMENT

Horizontal and vertical control – Methods – Triangulation – Traversing – Gale‘s table – Trilateration – Concepts of measurements and errors – Error propagation and Linearization – Adjustment methods - Least square methods – Angles, lengths and levelling network.

S.No	**PART A**		
1.	List the equipment’s used for base line measurement.	BT-1	Remember
2.	Define Base net.	BT-1	Remember
3.	Examine satellite station.	BT-3	Apply
4.	Define most probable value	BT-1	Remember
5.	State the principle of least square.	BT-2	Understand
6.	List the types of signals used in triangulation.	BT-2	Understand
7.	Distinguish the sag correction and temperature correction	BT-3	Apply
8.	Summarize the specifications of first order triangulation.	BT-2	Understand
9.	Distinguish between the observed value and the most probable value of a quantity.	BT-2	Understand
10.	Write the characteristics of Gales table.	BT-2	Understand
11.	How to apply the figure adjustment in triangulation?	BT-2	Understand
12.	Name the different corrections to be applied to the length of a baseline.	BT-1	Remember
13.	Write note on Accidental errors.	BT-2	Understand
14.	Distinguish between conditional and Normal equations.	BT-2	Understand
15.	Explain normal equations.	BT-1	Remember
16.	Compare the Horizontal and Vertical controls in hydrographic surveying.	BT-2	Understand
17.	Define trigonometrical levelling	BT-2	Understand
18.	How do you prepare the figure adjustments in triangulation?	BT-1	Remember
19.	What is levelling network?	BT-2	Understand
20.	Write about Trilateration process and mention its application.	BT-1	Remember
21.	What is Most probable error?	BT-1	Remember
22.	Define Residual Error.	BT-2	Understand
23.	State Law of Accidental errors.	BT-2	Understand
24.	Give the classification of triangulation system.	BT-1	Remember
25.	What is systematic errors?	BT-1	Remember

PART B

1.	In measuring angles from a triangulation station B, it was found necessary to set the instrument at a satellite station S, due south of the main station B and at a distance of 12.2 metres from it. The line BS approximately bisects the exterior angle ABC. The angles ASB and BSC were observed to be 30˚20’30” and 29˚45’6” respectively. When the station B was observed, the angles CAB and	BT-4	Analyze

<table>
<tr><td></td><td>ACB were observed to be 59˚18’26” and 60˚26’12” respectively. The side AC was computed to be 4248.5 metres from the adjacent triangle. Determine the correct value of the angle ABC.</td><td></td><td></td></tr>
<tr><td>2.</td><td>(i) Describe the satellite station and reduction to centre?
(ii) Show the expression for reducing the angles measured at the satellite station to centre.</td><td>BT-3</td><td>Apply</td></tr>
<tr><td>3.</td><td>Two triangulation stations A and B are45 km apart and have elevations 244.45 m and 275 m. The intervening ground may be assumed to have mean elevation of 222 m Identify the minimum height of signal required at B so that the line of sight may not pass the ground than 3 meters.</td><td>BT-4</td><td>Analyze</td></tr>
<tr><td>4.</td><td>Examine the most probable values of the angles A, B, C from the following observations at a station P.
<table>
<tr><td>A =38° 25’20”</td><td>Weight 1</td></tr>
<tr><td>B=32° 36’12”</td><td>Weight 1</td></tr>
<tr><td>A+B =71° 01’29”</td><td>Weight 2</td></tr>
<tr><td>A+B+C =119° 10’43”</td><td>Weight 1</td></tr>
<tr><td>B+C =80° 45’ 28”</td><td>Weight 2</td></tr>
</table></td><td>BT-5</td><td>Evaluate</td></tr>
<tr><td>5.</td><td>The following angles were measured at a station O so as to close the horizon.
AOB = 83°42’28”.75 Weight 3
BOC =102°15’45”.26 Weight 2
COD = 94°38’27”.22 Weight 4
DOA = 79°23’27”.77 Weight 2
Adjust the angles.</td><td>BT-4</td><td>Analyze</td></tr>
<tr><td>6.</td><td>What are signals? Classify them, enumerate the requirements to be fulfilled by signal.</td><td>BT-3</td><td>Apply</td></tr>
<tr><td>7.</td><td>After measuring the length of a base line, the correct length of the line is computed by applying various applicable corrections. Discuss the following corrections and provide expressions for
a) Correction for temperature.
b) Correction for pull.
c) Correction for sag
d) Correction for absolute length
e) Correction for slope
f) Correction for alignment
g) Correction for the reduction to mean sea level</td><td>BT-3</td><td>Apply</td></tr>
</table>

8.	What is base line? Explain the accessories used to measure the baseline.	BT-4	Analyze
9.	(i) How the triangulation systems are classified and how triangulation survey will be carried out? (8) (ii) Write down the different sources of error in levelling and explain them in detail (8)	BT-3	Apply
10.	Form the normal equations for x, y and z in the following equations of equal weight: $3x + 3y + z - 4 = 0$ $x + 2y + 2z - 6 = 0$ $5x + y + 4z - 21 = 0$ Also form normal equations for x, y and z, if the weight of the above equations are 2, 3 and 1.	BT-4	Analyze
11.	Describe the Triangulation adjustment and explain the different cases with sketches.	BT-5	Evaluate
12.	Explain the concept of base line and accessories that are used to measure the baseline.	BT-3	Apply
13.	The following are mean value observed in the measurement of three angles α, β and γ at one station; α = 76˚42'46".2 with weight 4 α + β = 134˚36'32".6 with weight 3 β + γ = 185˚35'24".8 with weight 2 α + β + γ = 262˚18'10".4 with weight 1 Calculate the most probable value of each angle.	BT-3	Apply
14.	The following observations of the three angles A, B and C were taken at one station: A = 75°32'46".3 with weight 3 B = 55°09'53".2 with weight 2 C = 108°09'28".8 with weight 2 A + B = 130°42'41".6 with weight 2 B + C = 163°19'22".5 with weight 1 A + B + C = 238°52'9".8 with weight 1 Determine the most probable value of each angle.	BT-4	Analyze
15.	Explain the various cases for the determination of most probable value.(8) Write down the various laws of weight. derive it (8)	BT-3	Apply
16.	The following are the observed values of A, B and C at a station, the angles being subject to the condition that A + B = C: A = 30°12'28".2 B = 35°48'12".6 C = 66°0'44".4 Find the most probable values of A, B and C.	BT-4	Analyze
17.	The following are the three angles P, Q and R observed at a station O Closing the horizon along with standard errors.	BT-4	Analyze

	Angle A =78°12'12"± 2" Angle B =136°48'30"±4" Angle C =144°59'08"±5" Predict the corrected angles.		
18.	(i) Write the Procedure to be followed for the selection of Triangulation stations (8) (ii) Explain Theory of Least squares in detail.	BT-5	Evaluate
	UNIT V- MODERN SURVEYING Total Station: Digital Theodolite, Electronic Distance Measurer –- Coordinate Geometry functions – Field procedure and applications. Geographical positioning system: Advantages – System components – Signal structure – Selective availability and anti-spoofing receiver components and antenna – Planning and data acquisition – Data processing – Errors – Field procedure and applications.		
	PART A		
1.	Define total station.	BT-1	Remember
2.	List the classifications of total stations.	BT-1	Remember
3.	What is GPS?	BT-1	Remember
4.	State the applications of total station surveying.	BT-1	Remember
5.	List the different segments of GPS	BT-1	Remember
6.	State the principles of EDM.	BT-1	Remember
7.	Discuss about accuracy of total station.	BT-2	Understand
8.	List the types of Error in Electronic Distance Measurement Instruments.	BT-2	Understand
9.	Discuss few points on GPS navigation.	BT-2	Understand
10.	What are the types of EDM instruments?	BT-2	Understand
11.	Demonstrate the components of satellite signals.	BT-1	Remember
12.	Write about anti-spoofing.	BT-1	Remember
13.	Write about selective availability?	BT-1	Remember
14.	Explain in short about Satellite Configuration.	BT-1	Remember
15.	State the applications of GPS.	BT-1	Remember
16.	Explain the term signal structure?	BT-2	Understand
17.	Write the principles of GPS	BT-1	Remember
18.	State uses of total station.	BT-1	Remember
19.	What are the sources of errors in GPS?	BT-2	Understand
20.	Formulate steps for GPS data processing for establishment of control Points.	BT-2	Understand
21.	What is EDM in survey?	BT-1	Remember
22.	How does electronic distance measurement work?	BT-2	Understand
23.	List the advantages in Total station surveying?	BT-1	Remember
24.	Discuss about the dis advantages in Total station surveying?	BT-1	Remember
25.	What is GPS data processing?	BT-2	Understand
	PART B		
1.	What are the space, control and user segments of GPS and their functions?	BT-3	Apply

2.	List out the various measurements of GPS. Explain them.	BT-3	Apply
3.	Briefly explain the Characteristics of GPS Navigation and Satellite navigation?	BT-3	Apply
4.	Explain the working principle of total station with merits and demerits.	BT-3	Apply
5.	(i) What are the types of GPS receivers? (8) (ii) Explain the task of control segment in GPS (8)	BT-3	Apply
6.	(i)Describe briefly about sources of errors in GPS (8) (ii)Explain the hand held receiver and geodetic receiver of GPS. (8)	BT-3	Apply
7.	Write short notes on (i) Robotic total station (4) (ii) Semi - automatic total station (4) (iii) Automatic total station (4) (iv) Servo - driven total station (4)	BT-3	Apply
8.	Classify the main components of GPS receiver and explain them briefly	BT-3	Apply
9.	Illustrate the fundamental measurement system of total station.	BT-3	Apply
10.	Explain in detail about Electronic Distance Measurement (EDM).	BT-3	Apply
11.	Describe in detail about Anti-spoofing and Selective Availability	BT-3	Apply
12.	Summarize the Requirements of GPS Signals and explain in brief.	BT-3	Apply
13.	Write down the steps involved in GPS data processing.	BT-3	Apply
14.	What is Field procedure? Describe the field procedure to running traverse using total station.	BT-4	Analyze
15.	Explain the working of a modern Total Station with neat sketch.	BT-4	Analyze
16.	Explain various components of GPS and its working principles	BT-3	Apply
17.	**Write Short notes on :** i) Anti spoofing (4) ii) Task of control segment (4) iii) Geodetic receivers (4) iv) Data processing (4)	BT-3	Apply
18.	Explain the various types of GPS devices and their uses.	BT-3	Apply