

SUBJECT CODE:CE 2254

SUBJECT NAME: SURVEYING-II

UNIT I

TACHEOMETRIC SURVEYING

PART-A

(1 MARKS)

1. An instrument used for ranging is

(i) Optical square (ii) line ranger (iii) clinometers (iv) pedometer.

2. Survey plotting can be done with an accuracy of a

(a) 0.25mm (b) 0.5mm (c) 1mm (d) 1cm

3. A chain may get elongated due to

(a) Change in temperature (b) difference in full (c) opening of ring (d) kinks in links

4. A chain is made up of steel iron wire of diameter

(a)1mm (b)4mm (c)5mm (d) 1cm

5. Handles of chains are made up of

(a) Mild steel (b) galvanized iron (c) brass (d) copper

6. Handles are connected to the link by

(a) Flexible joint (b) rigid joint (c) ball and socket joint (d) swivel joint

7. Distance between two neighboring brass rings is

(a)less than 20 cm (b)20cm (c)1m (d)5m

8. The length of an engineer's chain is

(a)20m (b)33 feet (c)66 feed (d)199 feed

9. The length of a link of Gunter chain is

(a)20 cm (b)1' (c)0.66' (d)2.065;

10. Indirect ranging is adopted when the two ends of chain line are

(a) Mutually invisible (b) too distant (c)on a sloping ground (d)separate a valley.

11. Drop arrow is used in

(a) Convectional chain survey (b) measurements along slopes (c) measurement by

12. Hypotenusal allowance for a length of 50mm when the slope is

(a)17.32m (b)25m (c)37.5m (d)50m

13. Correction for slope is

(a) $h/2l$ (b) $h/2l$ (c) $2h/l$ (d) h/l

14. Distance between two station a&b is 200m whereas their difference in elevation is 2m. Hence horizontal distance bwtweena&b

(a)199m (b)199.9m (c)199.99m (d)199.999m

15. Correctlengthof a 50m tape weighting 1.2kg when a pull of 12 kg is applied at the end and is freely suspended is

(a)49.98m (b)49.96 (c)50.02m (d)50.04

16. Correction for pull is

(a) $(p-p)/ae$ (b) $(p-p)axl$ (c) $(p-p)eal$ (d) $(p-p)a/ie$

17. Pick up the most accurate statement from the following

- (a) Survey lines in an area should be many as possible
- (b) Number of base lines in an area is limited to one
- (c) Main chain lines should from well conditions triangles
- (d) Oblique offsets are inferior to perpendicular offsets

18. When a chain line encounters a river

- (a) Chaining is obstruction but ranging is free (b) ranging is obstruction but chaining is free
(c) both ranging and chaining are obstructed (d) both ranging and chaining are free

19. Reciprocal ranging is adopted when the following is encountered

- (a) a dense forest (b) a hillock (c) a river (d) a tall building

20. Isogonic lines are the lines having the same

- (a) elevation (b) bearing (c) declination (d) dip

ANSWERS :

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
b	a	c	c	c	d	c	d	c	a	b	c	d	a	c	a	a	c	a	B

PART-B

(2 MARKS)

21. Define Tacheometer.

It is an ordinary transit theodolite fitted with an extra lens called analytic lens. The purpose of fitting the analytic lens is to reduce the additive constant to zero.

22. Define Substance bar:

A Substance bar is manufactured by Mr. Kern. The length of the substance bar is 2m (6ft) for measurement of comparatively short distance in a traverse. A Substance bar may be used as a substance base. The length of the bar is made equal to the distance between the two targets.

23. What do you mean by Fixed hair method:

In this method, the stadia wires are fixed (or) fitted at constant distance apart.

24. State Stadia intercept:

The difference of the distance between the top and bottom cross hairs is called as staff intercept.

25. What do you mean by tangential method:

In this method, the stadia hairs are not for taking readings. The readings being taken against the horizontal cross hair.

26. What is tangential method:

In this method, the stadia hairs are not for taking readings. The readings being taken against the horizontal cross hair.

27. What is the principle of stadia method?

The method is based on the principle that the ratio of the perpendicular to the base is constant to similar isosceles triangle.

28. What are the systems of tacheometry measurements?

The stadia system
The tangential system
Measurement by means of special instrument.

29. Define Sub tense method:

In this method stadia interval is variable. The staff intercept is kept fixed while the stadia interval is variable lines.

30 State Staff intercept:

The difference of the reading corresponding to the top and bottom stadia wires.

31. What are the merits and demerits of movable hair method?

Merits:

Long sights can be taken with greater accuracy than stadia method

The error obtained is minimum.

Demerits:

The computations are not quicker

Careful observation is essential

32. Define Analytic lens:

Analytic lens is an additional lens placed between the diaphragm and the objective at a fixed distance from the objective. This lens will be fitted in ordinary transit theodolite. After fitting this additional lens the telescope is called as external focusing analytic telescope. The purpose of fitting the analytic lens is to reduce the additive constant to zero.

33. Define Tacheometry:

Tacheometry is a branch of angular surveying in which the horizontal and vertical distances (or) points are obtained by optional means as opposed to the ordinary slower process of measurements by chain (or) tape.

PART-C

(16 MARKS)

34. Calculate the horizontal and vertical distances using tangential tacheometry when both the observed angles are angle of elevation and angle of depression.

35. Explain the procedure of estimating the horizontal and vertical distances where the line of collimation is inclined to the horizontal and the staff is held normal to the line of collimation.

36. The following readings were taken on a vertical staff with a tacheometer fitted with an anallatic lens and having a constant of 100

Staff station	Bearing	Staff readings			Vertical Angles
A	$47^{\circ}10'$	0.940	1.500	2.060	$8^{\circ}0'$
B	$227^{\circ}10'$	0.847	2.000	3.153	$-5^{\circ}0'$

37. Explain the procedure of estimating the horizontal and vertical distances where the line of collimation is inclined to the horizontal and the staff is held normal to the line of collimation.

38. A tacheometer is setup at an intermediate point at on a traverse course PQ. The following observations are made on the vertically held staff.

Staff station	Vertical angle	Staff intercept	Arcial hair reading
P	$8^{\circ}36'$	2.350	2.105
Q	$6^{\circ}6'$	2.055	1.895

39. Tacheometer was setup at a Station A and readings are taken on vertically held staff at B were 2.255, 2.605 and 2.955. The line of sight being at an inclination $8^{\circ}24'$. Another set of observation on the vertically held staff at B.M gave the readings 1.640, 1.920 and 2.200 respectively. The inclination of the line of sight being $2^{\circ}15'$. Calculate the horizontal distance between A + B and the elevation of B if the R.C of B.M is 418.685 M. The constants of the instruments were 100 & 0.30.

Inst. Station	Height of axis	Staff Stations	Vertical Angle	Hair readings	Remarks
P	1.5	B.M	$-6^{\circ}12'$	0.963,1.515,2.067	R.L of B.M.
P	1.5	Q	$+7^{\circ}5'$	0.819,1.341,1.863	= 460.65 m
Q	2.0	R	$+12^{\circ}27'$	1.860,2.445,3.030	staff held vertically.

40. The following notes refer to a line leveled tacheometrically with an anallatic tacheometer, the multiplying constant being 100.

UNIT II CONTROL SURVEYING

PART-A

(1 MARKS)

41. The method of surveying in which field work and plotting work are done simultaneously, is called
- (a) Compass surveying (b) leveling (c) plane table (d) chain survey
42. In plane table the instrument used to measure horizontal and vertical distance directly is known as
- (a) Plane alidade (b) telescopic alidade (c) tachometers (d) clinometers
43. The plane surveying is
- (a) most suitable for preparing small scale map (b) particularly advantageous in magnetic area (c) less costly than a theodolite (d) all the above
44. The operation of turning the table so that all the lines on the paper are parallel to the corresponding lines on the ground is called
- (a) leveling (b) centering (c) setting (d) orientation

45. The plotting of small area which can be commanded from a single station is usually done on the plane table by the method of

- (a) radiation (b) intersection (c) traversing (d) resection

46. The method of intersection in plane table is commonly used for

- (a) locating the distance and inaccessible points (b) locating the Brocken boundaries
(c) locating the points which may used subsequently as the instrument station only is a
(d) all of the above

47. The index glass in an optical square is

- (a) method of radiation (b) method of intersection (c) method of traversing (d) method of resection.

48. An open cross staff is commonly used for setting out

- (a) short offsets (b) long offsets (c) oblique offsets (d) none of these

49. The index glass in an optical square is

- (a) Wholly silvered (b) wholly unsilvered (c) one fourth silver (d) half silvered

50. In a prismatic compass the zero of the graduated ring is located at

- (a) north end (b) south end (c) east end (d) west end

51. The true geographic meridian through the various stations

- (a) Parallel (b) converge to the poles (c) converge from north poles
(d) converge from South Pole

52. The line in which the plane passing through the given point and the north and south poles intersect the surface of the earth is called

- (a) Arbitrary meridian (b) magnetic meridian (c) true meridian (d) none of these

53. In whole circle bearing system N25°15'W corresponds

- (a) 115° 15' (b) 154° 45' (c) 205° 15' (d) 334° 45'

54. If the fore bearing of a line is 36° 15' its back bearing will be

- (a) 36° 15' (b) 126° 15' (c) 143° 45' (d) 216° 45'

55. The angle between the reflection surfaces of a prism square is

- (a) 30° (b) 45° (c) 60° (d) 75°

56. The obstacle which obstructs vision but not chaining is a

- (a) river (b) pond (c) hill (d) all of these

57. The obstacle which obstructs chaining but not vision is a

- (a) river (b) hill (c) rising ground (d) all of these

58. The instrument belonging to a class of reflecting instrument is

- (a) line ranger (b) box sextant (c) prismatic compass (d) all of these

59. In an optical square the angle between the first incident ray and the last reflected ray is

- (a) 60° (b) 90° (c) 120° (d) 150°

60. At the equator the amount of dip is

- (a) 0° (b) 45° (c) 60° (d) 90°

ANSWERS:

41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60
c	b	d	d	a	d	d	c	c	c	d	d	b	a	a	d	b	a	c	d

PART-B

(2 MARKS)

61 Define Permanent Bench mark:

These are established by different government departments like PWD, Railways, Irrigation etc., The RL of these points are determined with reference to G.T.S Benchmarks. Points on rocks, culvert, gate, pillars etc.

62. Define: Arbitrary Bench Mark:

When the RL of some fixed Points are assumed, they are termed a arbitrary Bench mark

63.

State

Trigonometrical levelling:

Trigonometrical levelling is the process of determining the differences of elevation of the given station from observed vertical angles and known distance.

64. Define Geodetic Surveying :

In this surveying, the shape of the earth is taken into account and all the lines lying in the surface are curved lines. It is used for area greater than 250km². It is accurate. It is conducted by great geometrical survey of India.

65. Define Laplace Station :

At certain station, astronomical observations for azimuth & longitude are also made on the station is called Laplace station

66. What do you mean by Satellite Station ?

A subsidiary station is established as near the true or principal station as possible, the station so established is called a satellite station or eccentric station or false station.

67. Define Base net:

A series of triangles connecting the baseline to the main triangulation is called base net.

68. Write the various types of Bench Mark:

Y Great Trigonometric survey Bench mark

Y Permanent Bench mark

Y Arbitrary Bench mark

Y Temporary Bench mark

69. Write the various methods used to measure baseline.

Y Rigid bar method

Y Wheeler' s method

Y Jaderin' s method

Y Hunter' s short base method

Y Tacheometric method.

70. list the Apparatus used in Baseline:

Y Rigid Bars

Y Flexible apparatus.

71. What are the Corrections made while calculation of true length?

Y Correction for absolute length

- Y Correction for temperature
- Y Correction for pull or tension
- Y Correction for Sag
- Y Correction for Slope.

72. Define Temporary Bench mark:

These are established temporarily whenever required. These are generally chosen to close the day's work and to start the next days. Points on roofs, walls, basements etc

73. State the Extension of baseline:

The length of baseline is usually not greater than 10 to 20 km. As it is not a often possible to sewed a favorable sight for a longer base. They usually practice is therefore to use short base & Extend it by means. Of forming well conditioned triangles.

74 DefineAxis Signal correction :

If the height of the signed is not the same as that of height of the instrument axis above the station, a correction known as the axis signal correction or eye & objective correction is to be applied.

75. State Baseline :

The Base line is laid down with great accuracy of measurement & alignment as it forms the basis for the computations of triangulation system the length of the base line depends upon the grades of the triangulation.

76. Define Triangulation :

Triangulation is nothing but the system consists of not of interconnected triangles. In this method, knowing the length of one side and three angles, the length of other two sides of each triangle can be computed.

77. What do you mean by Reduction to centre:

If the true station were occupied by computing the corrections and apply them algebraically to the observed values is generally known as reduction of centre

78. What are the Equipments used for base line measurement:

- Y Marking stakes or tripod
- Y Straining device
- Y Supporting stakes or tripod
- Y Steel tape
- Y Six number of thermometer.

79. What are the Two types of Trigonometrically leveling:

Plane Trigonometrical levelling
Geodetic Trigonometrical leveling.

80. Define Laplace Station :

At certain station, astronomical observations for azimuth & longitude are also made on the station is called Laplace station

PART-C

(16 MARKS)

81. What are the methods of measurement of the base line and explain any two with neat sketch.
82. From an eccentric Station S, 12.25 metres to the west of the main station B, the following angles were measured $\angle BSC = 76^{\circ}25'$; $\angle CSA = 54^{\circ}32'$ 2011.
The stations S and C are to the opposite sides of the line AB. Calculate the correct angle ABC if the lengths AB and BC are 5286.5 and 4932.2m respectively.
83. What is meant by a “satellite station”? Explain briefly.
84. What are the different corrections to be applied while measuring baseline in geodetic surveying?
85. A steel tape 30m long, standardized at 10°C with a pull of 100N was used for measuring a baseline. Find the correction per tape length, if the temperature at the time of measurement was 20°C and pull applied was 150 N. Density of steel = 3000 kg/m^3 . Weight of tape = 5.88N.
86. In a trigonometrical measurement of the difference in level of two stations P and Q, 480 m apart, the following data were obtained.
Instrument at P, angle of elevation of Q = $0^{\circ} 15''$
Instrument at Q, angle of depression of P = $3^{\circ} 33''$
Height of instrument at P = 1.42 m.
Height of instrument at Q = 1.45 m.
Height of signal at P = 3.95 m. Height of signal at Q = 3.92 m.
Find the difference in level between P and Q and the curvature and refraction correction. Take $R \sin 1'' = 30.38\text{m}$.
- 87 A steel tape is 30 m long at a temp of 15°C when lying horizontal on the ground. Its c/s area is 0.08 cm^2 and weight of 18.kg (18N) and. Co-eff of expansion is $117 \times 10^{-7}/^{\circ}\text{C}$. The tape is stretched over 3 supports which are at the same level and at equal intervals. Calculate the actual length between the end graduations under the following conditions. Temp = 25°C , Pull = 180 kgt, $E = 2.1 \times 10^5\text{ N/cm}^2$.
88. Draw a neat sketch and explain the prismatic compass
89. What is a two point problem? How it is solved.

UNIT III

SURVEY ADJUSTMENTS

PART-A

(1 MARKS)

90. The vertical distance above or below the datum is called
(a) Reduced level of the point (b) elevation of the point (c) height of the instrument (d) either (a) (b)
91. A fixed point of reference of known elevation is called
(a) Change point (b) station point (c) bench mark (d) datum
92. An imaginary line tangential to the longitudinal curve of the bubble tube at its middle point is called.
(a) Axis of telescope (b) axis of level tube (c) level line (d) line of collimation
93. A staff reading taken on a point whose elevation is to be determined as a change point is called
(a) Fore sight reading (b) back sight reading (c) intermediate sight (d) none one of these

94. A staff reading taken on a point whose elevation is to be determined as on a change point is called

- (a) Fore sight reading (b) back sight reading (c) intermediate sight (d) none one of these

95. To find the true difference of level between two points, the level should be kept

(a) At either of the two points (b) exactly midway between the two points (c) at any point on the line joining the two points (d) none of the above

96. The height of instrument is equal to

(a) reduced level of bench mark+ back sight (b)reduced level of bench mark+force sight (c)reduced level of bench mark+intermediate sight (d) back sight+ fore sight

97. A method of differential leveling is used in order to find the difference in elevation between two points when

(a) They are too far apart (b) there are obstacles between them (c) the difference in elevation between them is too great (d) all of the above

98. The collimation method for obtaining the reduced levels of points does not provide a check on

- (a) Force sight (b) back sight (c) change point (d) intermediate sights

99. The rise and fall method for obtaining the reduced level of points does not provide a check on

- (a) fore sight only (b) back sight only (c)intermediate sight only (d)all of these

100. Collimation method is used in

- (a)profile leveling (b) differential leveling (c)check leveling (d) both (a)and (b)

101. Rise and fall method is used in

- (a) profile leveling (b) differential leveling (c) check leveling (d)none of these

102The method of leveling in which the height of mountain are found by observing the temperature at which water boils is known as

- (a) Barometric leveling (b) reciprocal leveling (c) longitudinal leveling (d) hypsometry

103In leveling the effect of refraction may be taken as of that due to curvature.

- (a)one –half (b) one- third (c) one –fifth (d) one- seventh

104. In leveling the correction for curvature

- (a) 0.0078 (b) 0.0785 (c) 0.0112 (d) 0.0673

105. In leveling the correction for combined curvature and refraction is equal to

- (a) 0.0078 (b) 0.0785 (c) 0.0112 (d) 0.0673

106. The error which is not completely eliminated in reciprocal leveling is

(a)error due to curvature (b) error due to non- adjustment of the line of collimation (c)error due to refraction (d) error due to non- adjustment of bubble tube.

107. The spacing of cross- section in a hilly country is usually

- (a)5m (b)10m (c)15m (d)20m

108. The reduced level of a point on the ground is called

- (a) Spot level (b) spot height (c) either (a) (b) (d) none of these

109. A staff reading taken on a point whose elevation is to be determined as on a change point is called

- (a) Fore sight reading (b) back sight reading (c) intermediate sight (d) none one

ANSWERS:

90	91	92	93	94	95	96	97	98	99	100	101	102	103	104	105	106	107	108	109
d	c	b	b	a	c	a	d	d	d	a	b	D	d	b	d	b	b	b	d

PART-B

(2 MARKS)

110. Define Systematic Errors:

The systematic error is an error that under the same conditions will always be of the same size and sign. It is simply due to the error in instrument. These errors may be regarded as positive or negative according with whether they make the result too small (or) too great. This effect is cumulative.

111.State Accidental Errors:

The Accidental Errors are those which remain after mistakes and systematic errors have been eliminated and are caused by the combination of reasons beyond the ability of the observer to control.

112. Write the classification of Observer Quantity:

An observer quantity may be classified as

- Y Independent Quantity
- Y Conditioned Quantity.

113.What do you mean by Conditioned Quantity:

It is the one whose value is dependent upon the values of one (or) more quantities. Its values bear a rigid relation to some other quantities. It is also called “dependent quantities”

114.What do you mean by Direct Observation:

A direct observation is the one made directly on the quantity being determined. Eg: Measurement of base line.

115.State Weight of an Observation:

The weight of an observation is a number giving an indication of its precision and trust worthiness, when making a comparison between several quantities of different worth.

If a certain observation of weight 4 it means that it is 4 times as much reliable as an observation of weight 1.

When two quantities (or) observations are assumed to be equally reliable, the observed values are said to be of equal weight (or) of unit weight.

116. What do you mean by Observed value of a Quantity:

An observed value of a quantity is a value obtained when it is corrected for all the known errors. Observed value = Measured value \pm errors (or) corrections.

117. Define Normal Equation:

It is the equation which is formed by the multiplying each equation by the coefficient of the unknown, whose normal equation is to be formed out by adding the equation thus formed.

Axis of telescope is an imaginary line passing through the optical centre of the object glass and the optical centre of the eye-piece.

118. Define Most probable Errors:

It is defined as the quantity which added to and subtracted from the most probable value, fixes the limit within which it is an even chance the true value of the measured quantity must lie.

119. Explain Declination:

The declination of a celestial body is angular distance from the plane of the equator, measured along the star's meridian generally called the declination circle. Declination varies from 0° to 90°, and is marked + or – according as the body is north or south of the equator.

120. State hour angle:

The hour angle of a heavenly body is the angle between the observer's meridian and the declination circle passing through the body. The hour angle is always measured westwards.

121. What is Celestial Horizon:

It is also called true or Rational horizon or geocentric horizon. It is the great circle traced upon the celestial sphere by that plane which is perpendicular to the zenith –Nadir line and which passes through the centre of the earth.

122. What are the celestial poles and equator :

If the earth's axis of rotation is produced indefinitely, it will meet the celestial sphere in two points called the North & South celestial poles (P and P'). The celestial equator is the great circle of the celestial sphere in which it is intersected by the plane or terrestrial equator.

123. Define Sensible horizon:

It is a circle in which a plane passing through the point of observation and tangential to the earth's surface intersects with celestial sphere. The line of sight of an accurately leveled telescope lies in this plane.

124. The Observers Meridian:

The meridian of any particular point is that circle which passes through the zenith and nadir of the point as well as through the poles.

125. How will you distinguish between a summit and a depression by studying the nature of the contour?

A closed contour line indicates either a summit or a depression according as the Higher or lower values are inside them. In summit the higher values are inside the closed contour and the lower values on the outer. In the depression the lower value is at the inside of the closed contour and the higher values on the outside.

126. How earthwork required is calculated using contours.

For computation of earthwork areas of cross-sections of successive cross-sections are considered. The average area, multiplied by the spacing between cross-sections gives the volume of earthwork. For this trapezoidal or prismoidal rules can be used.

127. Why the horizontal equivalent is not constant?

Horizontal equivalent is the horizontal distance between any two consecutive contours. Depending on the steepness or plain nature of the ground the horizontal equivalent depends. For steeper slope the horizontal equivalent is less than a plain ground for the same difference in elevation. As the slope of the ground between two contour is not constant in all directions, the horizontal equivalent is not constant.

128. In some contours the lines are closer in some they are wider for the same contour interval what does it mean.

Contours running close together indicate a slope for a given contour interval. For the same contour interval, they run wider in plain flat terrain.

129. What is contour gradient? Where it is used?

The gradient between any two contours is called the contour gradient. This is got by dividing the difference in elevation between two contours, at a point and the horizontal stance between them. This is used in route surveying.

130. Explain the object of preparing a contour map.

Generally topography of an area is depicted by a contour which are very useful for various engineering projects. As a matter of fact every civil engineering work has to be started (with a contour map). Contour maps are prepared for alignment of highway, railway, waterway, sewer line, etc and to decide the catchments, area of the reservoir and the location of a dam or reservoir.

PART-C

(16 MARKS)

131. What are the temporary adjustments of dumpy level? How is it done?

132. Following consecutive staffs reading were taken with a level along a sloping ground line AB at a regular distance of 20m by using 4 m leveling staff

0.352,0.787,1.832,2.956,3.758,0.953,1.766,2.738,3.872,0.812,2.325 and 3.137. Rule out a page of level field book, enter the above reading RL of point A is 320.288 Calculate RL of all points by rise fall system, and work out the gradient of line AB.

133. Following is pages of spoiled field book complete it and show necessary Check. Find the values in the 'X' marked column

B.S	I.S	F.S	RISE	FALL	R.L
2.430					150.000
	X			0.320	X
3.210		1.040	1.710		X
	2.415		X		X
	3.575			X	X
2.150		X	2.615		X
	3.670			X	X
			X	2.550	X

134. The following consecutive reading were taken with a level and 4m leveling staff ground at common interval of 30m as

0.725 on A,0.935,2.845,3.745,3.935,0.965,1.135,1.785,2.625,3.845,0.965,1.575 and 2.015 on B. The elevation of point A is 220.50m. Makeup level book page, apply usual check and calculate the reduced levels of points. Also calculate the gradient of line AB.

135. The following is the extract of a page level field book. Fill in the missing reading

and calculate R.Ls. Apply usual check :-

S.NO	B.S	I.S	F.S	H.C	R.L	REMARKS
1.	X			102.500	100.000	B.M
2.		3.205			X	
3.		X			101.255	
4.	2.815		1.970		X	
5.		1.820			X	
6.		X			99.825	
7.			X		101.420	

136. The following reciprocal levels were taken with one level: -

INSTRUMENT STATION	READING ON STAFF HELD AT	
	A	B
A	2.180	2.715
B	1.300	1.615

Distance between A and B was 900 m. If R.L. of A is 230.00m Determine i) the true level of B ii) the combined correction for curvature and refraction.

137. What do you understand by sensitivity of bubble tube? How is it determined? In a leveling work, following are the observation taken at every 30m interval

along a survey line. First reading was taken on zero chainage having R.L. =176.500 Enter these observations in proper tabular form, compute reduced levels and show necessary check. Determine the general gradient of ground from first point and the last point neglecting other points. 1.750, 1.370, 1.150, 2.315, 0.950, 1.415, 2.040 and 3.590 Instrument was shifted after 4th observation.

138. The following reading were taken with a dumpy level 1) when the instrument is midway between two pegs A and B, 100mts apart. The staff reading on A= 3.345m The staff reading on B= 2.025m 2) When the instrument is kept very near A The staff reading on A= 2.950m The staff reading on B= 2.000m Is the instrument in adjustment or not? When the instrument is very near A, What should be the correct reading on staff B?

139. Find the radius of curvature of the bubble tube if the length of one division is 2mm and if the angular value of one division is:
i) 20Second ii) 1minute.

140. What is reciprocal leveling and why is it employed? What errors will be eliminated? by this?

141. Explain with neat sketches the characteristics of contours.

142. Show contour to represent the following with neat sketches.

1) Valley 2) A Saddle 3) Vertical cliff 4) Hill

143. What are the methods of "Interpolation" of contour? Explain.

144. Write Characteristics of Contour lines.

145. What do you understand by Sensitivity of bubble tube? How is it determined? Find the radius of curvature of bubble tube if the length of one division is 2mm and if the angular value of division is:

1) 20 Second 2) 1minute.

UNIT I V
ASTRONOMICAL SURVEYING

PART-A

(1 MARKS)

146. When the centers of the arcs lie on the opposite sides of the common tangent at the junction of the two curves it is known as a

- (a) Simple curve (b) vertical curve (c) compound curve (d) reverse curve

147. A simple circular curve is designated by the

(a) Radius of the curve (b) curvature of the curve (c) angle subtended at the centre by a chord of any length (d) angle subtended at the center by a chord of particular length

147. The degree of the curve is the angle subtended by a chord of length

- (a) 15m (b) 20m (c) 25m (d) 30m

148. When R is the radius of the curve D is the degree of curve and length of the chord is 30m then the relation between R and D is

- (a) $R=1520/D$ (b) $R=1720/D$ (c) $R=4500/D$ (d) $R=5400/D$

149. The angle between the back tangent deflects from the back tangent of a curve is called

- (a) Deflection angle (b) central angle (c) angle of intersection (d) none of these.

150. A deflection angle is

(a) less than 90° (b) equal to the difference between the angle of intersection and 180° (c) more than 90° but less than 180° (d) equal to the difference between the angle of intersection and 360°

151. The length of peg interval for flat curve is

- (a) 15m (b) 20m (c) 25m (d) 30m

152. When the length of a chord is less than the peg interval, it is known as

- (a) Small chord (b) short chord (c) sub-chord (d) normal chord

153. The total length of the curve is equal to

- (a) $R=1520/D$ (b) $R=1720/D$ (c) $R=4500/D$ (d) $R=5400/D$

154. Which the curve is to be set out over rough ground the method used is

(a) rankings method (b) two theodolite method (c) tachometric method (d) either b or c

155. Two theodolite method of setting out a curve involves

(a) linear measurements only (b) angular measurements only (c) both linear and angular measurements (d) none of these

156. A curve of varying radius is known as

- (a) Simple curve (b) compound curve (c) reverse curve (d) transition curve

157. A transition curve when interred between the tangent and the circular curve

(a) should meet the original straight tangentially (b) should meet the circular curve tangentially
 (c) the rate of increase of curvature along the transition curve should be same as that of increase of super elevation (d) all of the above

158. The amount of super elevation on railway is equal to

(a) gv/GR (b) Gv/gR (c) GR/gv (d) gR/Gv

159. The expression v/gR is called

(a) radial acceleration (b) centrifugal force (c) centrifugal ratio (d) super –elevation

160. The curve used for ideal transition curve is a

(a) Cubic parabola (b) clothed spiral (c) cubic spiral (d) lemniscates

161. The perpendicular offset from a tangent to the junction of transition curve and circular is equal to

(a) $L/6R$ (b) $L/24R$ (c) $L/6R$ (d) $L/24R$

162. The shift of a curve is equal to

(a) $L/6R$ (b) $L/24R$ (c) $L/6R$ (d) $L/24$

163. The shift of a curve is the perpendicular offset from a tangent to the junction of transition curve and circular curve.

(a) equal to (b) one –half (c) one –third (d) one –fourth

164. The autogeneous curve of an automobile corresponds to a

(a) Cubic parabola (b) clothed spiral (c) true spiral

165. The amount of super elevation on railway is equal to

(a) gv/GR (b) Gv/gR (c) GR/gv (d) gR/Gv .

ANSWERS:

146	147	148	149	150	151	152	153	154	155
d	d	d	b	c	a	b	c	c	b
156	157	158	159	160	161	162	163	164	165
b	d	d	b	b	d	c	d	d	d

PART-B

(2 Marks)

166. What are consecutive coordinates and independent coordinates?

Consecutive coordinates are those in which the latitude and departures of a point are calculated with reference to the point. These coordinates may be positive or negative on the quadrant on which, it falls. Independent coordinates are those in which the latitude and departures of a point are calculated with respect to origin. The origin may be a survey station or a point outside the traverse.

167. Define latitude and departure.

The latitude of a line is the distance measured parallel to the North-South line. Similarly the distance measured parallel to the East-West line is the departure. If the reduced bearing of a line and its length are known then the latitude and departure can be computed.

168. What is Transit Rule?

In theodolite traversing the angular measurements are more accurately done compared to linear measurements. The transit rule is applicable only in such situations. As per this rule the correction to latitude or departure is considered as a factor of latitude or departure of the side instead of the length of the side. Accordingly the transit rule is Total error in latitude Correction to departure.

169. What is Bowditch rule?

Bowditch rule is applied for corrections in latitude and departure. As per this rule, the error is proportional to the length of the side. Therefore the corrections to the latitude and departure are given as closing error in latitude

170. Which method you prefer for open-traverse using theodolite?

The deflection angle method is mostly suitable for open-traverse in the survey of rivers, coast lines, roads, railways, etc. A deflection angle may be defined as the angle between the 'preceding survey line and the following line. The angle may be a right-hand deflection angle or the left-hand deflection angle based on the observation.

171. How traversing is done by adopting included angle method?

This method may be used for both open-traverse and closed-traverse. It is more suitable for closed-traverse. Although traverse may be done in clockwise or anticlockwise direction. For closed-traverse the traverse is generally taken in the anti-clockwise direction. It is necessary to note down whether the angle is interior angle or exterior angle.

172. Explain reiteration Method.

In this method all the horizontal angles are measured successively and finally the horizon is closed the angle the last and first station is measured. The final reading vernier should be the same as its initial reading. If it does not coincide, the 'difference is equally 'distributed in the measured angles.

173. Explain the repetition method.

In this method the angle is added continuously and the total angle is divided into the number of repetitions to get the angle. Generally six repetitions are made, out of which half of the repetitions are made with the telescope normal and half with the telescope inverted. By this process very accurate measurement of angles can be made.

174. What is called spire test?

The test conducted to bring the horizontal axis perpendicular to vertical axis is called the spire test. This condition ensures that the motion of telescope is in a vertical plane.

175. What do you understand by the name transit theodolite?

Theodolites are primarily classified as (i) Transit and (ii) Non-transit theodolite. Transit theodolite is one in which the telescope can be revolved through a complete revolution about its horizontal axis in a vertical plane. Transit theodolite is mostly used nowadays.

176. Define standards in theodolite.

This is shaped like letter 'A' and also called as A frame which is the supporting telescope, top of the standards are provided with the bearings for the pivots of the telescope. About these pivots the telescope can rotate freely in the vertical plane.

177. List the essential qualities of a theodolite telescope.

Internally focusing telescope is used in theodolites. In this telescope, the objective and eye-piece do not move when the focusing screw is tuned. There is a double concave lens fitted with rack and pinion arrangement between eye-piece and objective. This lens moves in and out when the focusing is done and a real image is formed on the plane of cross-hairs.

178. List the essential parts of a theodolite.

A transit theodolite consists of the following parts:

- Y Leveling head
- Y Plate levels
- Y Lower plate
- Y Telescope
- Upper plate
- Altitude bubbles

179. What is a prismoidal formula for computation of volume?

$$V = \frac{d}{3} [A_1 + A_n + 4(A_2 + A_4 + \dots) + 2(A_3 + A_5 + \dots)]$$

180. What is prismoidal correction for Trapezoidal Rule?

In general volumes between successive areas are found on the average of end areas and a prismoidal correction. Prismoidal correction is deducted from the volume computed using average end areas. It varies with the type of, n involved.

181. What is a planimeter?

Planimeter is an instrument used for finding out the area plotted, plan. It is a mechanical device which is fast. The polar planimeter is the one which is widely used.

182. State Trapezoidal rule? What are the limitations?

The trapezoidal rule may be stated as, the sum of the first and last ordinates; twice the sum of the intermediate ordinates and the total sum is multiplied by half of the common distance. Here the boundaries between the end of ordinates are assumed to be straight lines.

This can be applied to any number of ordinates. There is no limitation.

183. State Simpson's rule? What are the limitations?

The Simpson's rule may be stated as: The sum of the first and last ordinates, four times the sum of the even ordinates twice the sum of the odd ordinates, multiplied by the common distance and divided by three. The boundaries between the ordinates are assumed to be an arc of a parabola. The limitation of this rule is that it can be applied when number of ordinates is odd.

184. How area is calculated from a plan by dividing into squares?

A square chart of convenient size is plotted on a tracing paper, with each square representing a definite area namely are cm. or square meter.

The tracing paper is placed on the drawing sheet or map. The number of full squares are first counted. The portion the squares on the boundary are broken which are estimated terms of fractional squares. The required area is calculated.

185. What is called area of skeleton? Give examples.

In the process of surveying the whole area is divided to some geometrical figures, such as triangles, rectangles, squares, and trapeziums and then the areas are calculated by e known geometric formulae.

PART-C

(16 Marks)

186. Describe the process of repetition and reiteration method of Theodolite traversing.

187. What are the different fundamental axes of theodolite and list out the relation between them?

188. Explain, how to determine R.L. of the Elevated object as base of the object inaccessible and instrument station are in the same vertical plane as that of the elevated object and also instrument axes at the same level in case of trigonometric leveling.

189. An observer standing on the deck of a ship just sees a light house. The top of the light house is 40mts above the sea level and height of the observer's eye is 5mt above the sea level. Find the distance of the observer from the light house.

190. Compute the length and bearing of the line DA.

Line	Length (m)	Bearings
AB	76.80	140 ⁰ 12
BC	195.60	36 ⁰ 24
CD	37.30	338 ⁰ 48
DA	?	?

191. A traverse was made along three lines AB,BC, CD And the result tabulated as follows:-

Line	W.C.B	Incl.Angle	Length (m)
AB	167 ⁰ 0'		216.7
BC		126 ⁰ 0'	176
CD		115 ⁰ 0'	295.5
DA		?	?

Calculate the length and bearing of DA.

192. Due to certain obstruction in running a traverse ABCDEA, the length and bearing of the line CD could not be taken. The following measurements were taken. Calculate the length and bearing of the line CD:-

UNIT V

HYDROGRAPHIC AND ADVANCE SURVEYING

PART-A

(1 MARKS)

193. Which the curve is to be set out over rough ground the method used is

(a)rankings method (b)two theodolite method (c)tachometric method (d)either b or c

194. Two theodolite method of setting out a curve involves

(a)linear measurements only (b)angular measurements only (c)both liner and angular measurements (d)none of these

195. A curve of varying radius is known as

(a) Simple curve (b) compound curve (c) reverse curve (d) transition curve

196. A transition curve when interred between the tangent and the circular curve

(a) should meet the original straight tangentially (b) should meet the circular curve tangentially
(c) the rate of increase of curvature along the transition curve should be same as that of increase of super elevation (d) all of the above

197. The amount of super elevation on railway is equal to

(a) gv/GR (b) Gv/gR (c) GR/gv (d) gR/Gv

198. A method of differential leveling is used in order to find the difference in elevation between two points when

(a) They are too far apart (b) there are obstacles between them (c) the difference in elevation between them is too great (d) all of the above

199. The collimation method for obtaining the reduced levels of points does not provide a check on

(a) Force sight (b) back sight (c) change point (d) intermediate sights

200. The rise and fall method for obtaining the reduced level of points does not provide a check on

(a) fore sight only (b) back sight only (c) intermediate sight only (d) all of these

201. Collimation method is used in

(a) profile leveling (b) differential leveling (c) check leveling (d) both (a) and (b)

202. Rise and fall method is used in

(a) profile leveling (b) differential leveling (c) check leveling (d) none of these

203. The method of leveling in which the height of mountain are found by observing the temperature at which water boils is known as

(a) Barometric leveling (b) reciprocal leveling (c) longitudinal leveling (d) hypsometry

204. In leveling the effect of refraction may be taken as of that due to curvature.

(a) one-half (b) one-third (c) one-fifth (d) one-seventh

205. In leveling the correction for curvature

(a) 0.0078 (b) 0.0785 (c) 0.0112 (d) 0.0673

206. In leveling the correction for combined curvature and refraction is equal to

(a) 0.0078 (b) 0.0785 (c) 0.0112 (d) 0.0673

207. The error which is not completely eliminated in reciprocal leveling is

(a) error due to curvature (b) error due to non-adjustment of the line of collimation (c) error due to refraction (d) error due to non-adjustment of bubble tube.

208. The spacing of cross-section in a hilly country is usually

(a) 5m (b) 10m (c) 15m (d) 20m

209. The reduced level of a point on the ground is called

(a) Spot level (b) spot height (c) either (a) (b) (d) none of these

210. A staff reading taken on a point whose elevation is to be determined as on a change point is called

(a) Fore sight reading (b) back sight reading (c) intermediate sight (d) none one

211. Reciprocal ranging is adopted when the following is encountered

(a) a dense forest (b) a hillock (c) a river (d) a tall building

212. Isogonic lines are the lines having the same

(a) elevation (b) bearing (c) declination (d) dip

ANSWERS :

193	194	195	196	197	198	199	200	201	202
d	d	d	b	c	a	b	c	c	b
203	204	205	206	207	208	209	210	211	212
b	d	d	b	b	d	c	d	d	d

PART-B

(2 MARKS 213.

Define Photographic Survey:

It is also called photogrammetry. It is a method of surveying in which plans or maps are prepared from photographs taken from suitable camera station. It is divided into two.

Terrestrial photography

Aerial photography.

2. What do you mean by Equilibrium Theory :
The earth is covered all around by the ocean of uniform depth. The ocean is capable of assuming the equilibrium.

214. What is the use of Fathometer :

A fathometer is used for ocean sounding where the depth of water is too much and to make a continuous and accurate record of depth of water below the boat or ship at which it is installed.

215. Define Hydrographic Survey:

Hydrographic Survey is that branch of surveying which deals with the measurement of bodies of water. It is the art of delineating the submarine levels, contours and features of seas, gulfs, rivers and lakes.

216. What are Tides:

All celestial bodies exert a gravitational force on each other. These forces of attraction between earth & other celestial bodies cause periodical variations in the level of water surface, known as tides.

217. What is Stereoscopic fusion:

If a pair of photographs is taken of an object from two slightly different positions of the camera and then viewed by an apparatus which ensures that the left eye sees only the left-hand picture & right eye is directed to the right hand picture, the two separate images of the object will fuse together in the brain to provide the observer with spatial impression. This is known as a Stereoscopic fusion.

218. Define Parallax bar:

A parallax bar used to measure difference of two points, consists of a bar which holds a fixed plate of transparent material near the left end and a movable plate to the right end.

219. List the types of EDM instrument :

Y Tellurimeter

Y Geodimeter

220. What do you mean by Cadastral survey :

Cadastral means, "Registration concern Land Survey". It is of one of based on national land survey based on land survey law.

221. Explain Modulation :

Amplitude modulation

Frequency modulation

In amplitude modulation, the carrier wave has constant frequency & the modulating wave (the measurement wave) in formation is conveyed by the amplitude of the carrier wave. In the frequency modulation the carrier wave has constant amplitude, while the frequency varies in proportion to the amplitude of the modulation wave.

221. Define Cadastral survey :

Cadastral means, "Registration concern Land Survey". It is of one of based on national land survey based on land survey law.

222. Define Stereo pair:

The pair of two such photographs is known as stereo pair. The effect of distortions exist in a single photograph may be eliminated through a large extend of stereo pairs.

223. What is an Parallax bar:

A parallax bar used to measure difference of two points, consists of a bar which holds a fixed plate of transparent material near the left end and a movable plate to the right end. increase of centrifugal force at a constant rate.

224. Define Mean sea level :

Mean sea level may be defined as the mean level of the sea, obtained by taking the mean of all the height of the tide as measured at hourly intervals over some states period covering a whole number of complete tides.

225. What is Angle of Parallax?

It is the angle of convergence of the two rays of vision.

226. What is floating mark?

In parallax bar, when the two dots are viewed properly under a stereoscope they fuse into a single dot called floating mark.

227. What is a transition curve and where such provided?

A curve having a gradual varying radius is called a transition curve. For example a curve with infinite radius in the beginning and varying gradually to a finite radius. Transition curves are provided in railway tracks to ensure safe running of the trains without overturning or derailment. This curves provide comfort to passengers both on roads and on railways.

228. What is a reverse curve? Where it is used?

When two curves of different or equal radii are bending in opposite directions then it is called a reverse curve, Reverse curves have one common tangent.

Such curves are preferred in situations where the straights have their angle of intersection is too acute. This is used in roads and railways where a low speed is anticipated.

229. What is a compound curve? Where it is used?

Then a curve consists of more than one radius connecting two intersecting straights it is called a compound curve. The direction of change of curvature is on the same side.

It is used in situation where it is not possible to connect the two tangents by one circular curve, it becomes necessary, to take a common tangent, and set out two curves of different radii to connect the rear and forward tangents.

PART-C

(16 Marks)

- 230.a. Define lift and lead. (4)**
b. Explain the operations involved in tunnel alignment and setting of tunnel. (12)
- 231. A simple curve is to have a radius of 300m. The tangents intersect at chainage of 1192.00m, and the deflection angle at intersection is 50.5° . Find the Tangent distance, change at beginning and a length of long chord, degree of curve and the number of full and sub chords.**
- 232. a. What is a need for super elevation (4)**
b. A transition curve is required for a circular curve of radius 400m, the gauge (12)
being 1.5m between rail centers and maximum curve super elevation is restricted to 12cm. The transition curve is to be designed for a velocity such that no lateral pressure is impressed on the rails and the rate of gain of radial and the rate of gain of radial acceleration is 30 cm/sec^2 . Calculate the required length of transition curve and the design period.
- 234. a. Distinguish between a compound curve and a reverse curve. (4)**
b. A parabolic vertical curve is to be set out connecting two uniform grades +0.8% (12)
The transition curve is to be designed for a velocity such that no lateral pressure is impressed on rail and the rate of gain of radial acceleration is 30 cm/sec^2 . Calculate the length of transition curve and the design period.
- 235. a. A transition curve of 100m length is introduced on either side of a circular curve of radius 500m. Calculate the shift and spiral angle. (10)**
b. What are the factors to be considered in mine surveying? (6)
- 236.a. Explain the procedure of setting out foundation trenches for buildings with masonry walls**
b. Briefly explain the method of setting out a simple curve by offset from the chords produced.
- 237. Draw a simple circular curve and mark the salient points. Explain the setting out of curve by two theodolite method.**
- 238. Compare the difficulties involved in mine surveying with a normal surveying Work or ground.**
- 239. Distinguish between a compound curve and a reverse curve.**
- 240. Explain any linear two linear methods of setting out circular curve.**