273. A lemniscate curve between the trangents is transitional throughout, if the polar deflection angle of its apex is equal to (ϕ is the deflection angle between the initial and final tangents)

(a) $\dfrac{\phi}{2}$

(b) $\dfrac{\phi}{4}$

(c) $\dfrac{\phi}{6}$

(d) ϕ

274. Which one of the following methods would give accurate results in determining the direction of the observer's meridian ?

(a) observation of circumpolar stars on the same vertical

(b) observation of circumpolar stars at culmination

(c) extra-meridian observation of a circumpolar star

(d) observation of the sun at equal altitudes

275. For a chord of 60 m, the mid-ordinate for a circular curve of 50 m radius will be

(a) 10 m

(b) 12.5 m

(c) 15 m

(d) 18.75 m

276. If an overlapping pair of vertical photographs taken with a 150 mm focal length camera has an air base of 2100 m and the elevation of the control point "A" on it is 900 m above M.S.L. and the parallax of the point is 75 mm, the then the flying height above M.S.L. of the stereopair will be

(a) 3000 m

(b) 3150 m

(c) 5100 m

(d) 5250 m

277. Given that d denotes declination, 6 the latitude of the place of observation and a the altitude of a star at the prime vertical

(a) $\sin \alpha = \sin \delta \cos \theta$

(b) $\sin \theta = \sin \delta \, \text{cosec} \, \alpha$

(c) $\text{con} \, \alpha = \cos \delta \sin \theta$

(d) $\sin \delta = \sin \alpha \cos \theta$

278. The declination of a star is 12°15 'N at a latitude of 43° 30 'N. The zenith distance at the upper culmination is

(a) 22° 15'

(b) 21° 15'

(c) 64° 45'

(d) 23° 30'

279. The true bearing of a line 34° 20' 40 "and the magnetic declination at the place of observation is 2° 00'20''W on the date of observation. The magnetic bearing of the line is

(a) 36° 21' 00"

(b) 34° 20'20"

(c) 32° 20'20"

(d) 32°00'20"

280. To determine the length of a bridge proposed to be built across a wide river, the surveying method of choice would be

(a) tacheometry

(b) chain surveying

(c) hydrographic surveying

(d) triangulation

281. Heliograph is a type of

(a) instrument used for recording the movement of sun

(b) instrument used for contouring an area

(c) electronic distance measuring device

(d) sun signal used in triangulation work.

282. The coordinate of two end-points A and B of a traverse line AB are

$$X_A = 1000.00 \text{ m},$$
$$Y_A = 1000.00 \text{ m}$$
$$X_B = 2000.00 \text{ m},$$
$$Y_B = 1000.00 \text{ m}$$

The bearing of the line AB will be

(a) 0°0'00"

(b) 60°0'00"

(c) 90°0'00"

(d) 180° 0'00"

283. The following equipments can be used to lay out horizontal angles in field

1. microptic theodolite

2. chain and metallic tape

3. vernier theodolite

4. prismatic compass

The correct sequence of the decreasing order of their accuracies is

(a) 2, 4, 3, 1

(b) 2, 3, 4,1

(c) 1, 4, 3, 2

(d) 1, 3, 4, 2

284. ABCD is a regular parallelogram plot of land, whose angle BAD is 60°. If the bearing of the line AB is 30°, then the bearing of the line CD is

(a) 90°

(b) 120°

(c) 210°

(d) 270°

285. Declination and Right Ascension will be 0. and 12 hours for the sun, when it lies over

(a) first point of libra

(b) first point of aries

(c) summer solstice

(d) winter solstic

286. If the declination of a star is 70° 10′N and the latitude of the observer is 49° 50 ′then the values of the zenith distance and the altitude of the star of the lower culmination will be respectively

(a) 60° and 30°   (b) 109° 50′ and 40° 10′

(c) 120° 60′ and 60°   (d) 20° 20′ and 30° 00′

287. Which one of the following closely represents the shape of the earth ?

(a) spheroid   (b) ellipsoid

(c) oblate spheroid   (d) prolate spheroid

288. If the staff intercept on a staff located at 100 m from the level for five division deviation of the bubble is 0.050 m and if the length of one division of the bubble is 2 mm, then the radius of curvature of the bubble tube is

(a) 2.02 m   (b) 2.20 m

(c) 20.00 m   (d) 20.20 m

289. A and B are two traverse stations free from local attraction errors. If the true bearing of a line AB is 89°, and the magnetic declination at point A is 1° west, then the magnetic bearing of the line BA would be

(a) 88°   (b) 90°

(c) 268°   (d) 270°

290. Contour interval on amap sheet denotes

(a) vertical distance of contour lines above the datum plane

(b) vertical distance between two successive contour lines

(c) slope distance between two successive contour lines

(d) horizontal distance between two successive contour lines

291. The radius of curvature of an ideal transition curve should be

(a) inversely proportional to its length from the beginning

(b) directly proportional to its length from the beginning

(c) proportional to the speed of the vehicle

(d) proportional to the superelevation

292. For a simple circular curve, which one of the following gives the correct relation between the radius, R and degree of curve D, for 20 m arc length ?

(a) R = 5729.6/D   (b) R = 1718.9/D

(c) R = 1145.9/D   (d) R = 572.9/D

293. The number of independent conditions required to be satisfied for the adjustment of a braced quadrilateral in triangulation survey is

(a) 2   (b) 4

(c) 6   (d) 8

294. A star is observed at its western elongation. If the latitude of place of observation is θ, the declination of star is δ, altitude of star at elongation is α, then the hour angle of star is given by

(a) $\cos H = \cos \delta \times \sec \theta$ (b) $\cos H = \tan \delta \times \cot \theta$

(c) $\cos H = \tan \theta \times \cot \alpha$ (d) $\cos H = \tan \delta \times \cot \theta$

295. In photogrammetric surveying, the image of the top of the hill is 90 mm from the principal point of the photograph. If the elevation of the top of the hill is 500 m and the flying height is 5000 m above datum, then the relief displacement is

(d) 0.9 mm   (b) 9 mm

(c) 90 mm   (d) 900 mm

296. The representative fraction 1/2500 means that the scale is 1 cm equal to

(a) 0.25 m   (b) 2.5 m

(c) 25 m   (d) 2.5 m

297. Which one of the following specifications for length of base line refers to "Third Order Triangulation system ?

(a) 0.5 to 3 km   (b) 1.5 to 5 km

(c) 5 to 15 km   (d) 10 to 20 km

298. If R is the radius of the main curve, θ the angle of deflection, S the shift and L the length of the transition curve, then the total tangent length of the curve is given by

(a) $(R - S) \tan\theta/2 - L/2$ (b) $(R + S) \tan\theta/2 - L/2$

(c) $(R + S) \tan \theta/2 + L/2$ (d) $(R - S) \tan \theta/2 + L/2$

299. The length of a transition curve for a circular curve of radius 300 m and for a design speed of 15 m/s, when the rate of change of centrifugal acceleration is 0.3 m/ss, is

(a) 30 m   (b) 37.5 m

(c) 45 m   (d) 60 m

300. A sewer is laid from a manhole A to a manhole B, 250 m apart along a downward gradient ofl in 125. If the reduced level of the invert at A is 205.75m and the height of the boning rod is 3m then, reduced level of the sight rail at B,is

(a) 202.75 m   (b) 206.75 m

(c) 208.75 m   (d) 211.75 m

EXERCISE - II
(Questions From Previous SSC CPWD Exams)

2008

1. The quadratic bearing of a line is S 30°0'0"W, its value in whole circle bearing is
   - (a) 30°
   - (b) 40°
   - (c) 100°
   - (d) 210°

2009

2. A plate load test is used to determine:
   - (a) Bearing capacity of foundations.
   - (b) Settlement of foundations.
   - (c) Both (a) and (b)
   - (d) None of the above.

3. Levelling deals with measurement in
   - (a) Horizontal plane
   - (b) Vertical plane
   - (c) Both horizontal and vertical planes
   - (d) Inclined plane

4. The rise and fall method of levelling provides a complete check on
   - (a) Back sight
   - (b) Intermediate sight
   - (c) Fore sight
   - (d) All the above

5. The two point and three point problem are method of
   - (a) Radiation
   - (b) Intersection
   - (c) Traversing
   - (d) Resection

6. In surveying compass the bearing observed are in
   - (a) Whole circle bearing
   - (b) Reduced bearing
   - (c) Both (a) and (b)
   - (d) None of the above

7. The survey in which the curvature of the earth is taken into account is called
   - (a) Geodetic survey
   - (b) Plane survey
   - (c) Hydrographical survey
   - (d) Topographical survey

2010

8. The accuracy of measurement in chain surveying does not depend upon:
   - (a) Length of the offset
   - (b) Scale of the plotting
   - (c) Importance of the features
   - (d) General layout of the chain lines

9. The 'fix' of a plane table from three known points, is good, if
   - (a) Middle station is nearest
   - (b) Middle station is farthest
   - (c) Either the right or left station is nearest
   - (d) None of these

10. The bubble tube parallel to the telescope of a theodolite should be more sensitive, since it controls
    - (a) Vertical axis
    - (b) Horizontal axis
    - (c) Axis of bubble tube
    - (d) None of these

11. For determining the ultimate bearing capacity of soil the recommended size of square bearing plate used in plate load test is 30-75 cm with a minimum thickness of:
    - (a) 20 mm
    - (b) 5 mm
    - (c) 50 mm
    - (d) None of the above.

12. Cross-staff is used for
    - (a) Setting out right angle
    - (b) Measuring horizontal angle
    - (c) Both (a) and (b)
    - (d) None of these

13. In levelling operation
    - (a) The first sight on any change point is a back sight
    - (b) The second sight on any change point is a fore sight
    - (c) The line commences with a fore sight and closes with a back sight
    - (d) The line commences with a back sight and close with a fore sight

14. The difference between face left and face right observation of a theodolite is 3'. The error is
    - (a) 45"
    - (b) 1'30"
    - (c) 3'
    - (d) 0'

2011

15. The correction for slope in chaining is proportional to
    - (a) $\sqrt{h}$
    - (b) h
    - (c) h^2
    - (d) h^3

16. The fixed point whose elevation is known, is called
    - (a) benchmark
    - (b) change point
    - (c) reduced level
    - (d) station

2013

17. Ranging is defined as
   (a) measuring the distance from starting point
   (b) establishing intermediate points on a chain line
   (c) the distance between end points
   (d) a point on a chain line

18. Compute the angle between the lines AB and AC, If their respective bearings are 52°30′ and 328°45′
   (a) 276°15′   (b) 6°15′
   (c) 111°15′   (d) 83°45′

19. A line joining some fixed points on the main survey lines is called
   (a) check line   (b) tie line
   (c) chain line   (d) base line

20. Which of the following methods of contouring is most suitable for hilly terrain?
   (a) Direct method
   (b) Square method
   (c) Cross-section method
   (d) Tacheometric method

21. A level line is a
   (a) line parallel to the mean spheroidal surface of the earth
   (b) line passing through centre of cross hairs and centre of eye-piece
   (c) line passing through objective lens and the eye-piece
   (d) horizontal line

22. 'Offsets' are
   (a) Lateral measurements from chain line
   (b) Ties or check lines which are perpendicular to chain line
   (c) Sets of minor measurements in chain surveying
   (d) Chain lines which go out of alignment

23. The fore bearings of the lines AB and BC are 40° and 120° respectively. The included angle between AB and BC is
   (a) 40°   (b) 60°
   (c) 80°   (d) 100°

24. If the sum of northings of traverse exceeds the sum of southings by 1 m and sum of eastings exceeds the sum of westings by 1 m, the resultant closing error and its true bearing are respectively,
   (a) $\sqrt{2}$ m, N 45° E   (b) 1 m, N 45° E
   (c) 2 m, N 45° W   (d) 2 m, N 45° E

25. If in a closed traverse, the sum of the north latitudes is more than the sum of the south latitudes and also the sum of west departures is more than the sum of east departures, the bearing of the closing line is in the
   (a) SE quadrant   (b) NE quadrant
   (c) NW quadrant   (d) SW quadrant

26. The angle between true meridian and the magnetic meridian at the time of observations is known as
   (a) Orientation   (b) Magnetic declination
   (c) Magnetic bearing   (d) Dip

2014

27. When R is the radius of the curve (in meters), D is the degree of curve (in degrees) and length of the chord is 30m, then the relation between R and D is:
   (a) R = 5400/D   (b) R = 1520/D
   (c) R = 1720/D   (d) R = 4500/D

28. In the quadrantal bearing system, a whole circle bearing of 293°30′ can be expressed as :
   (a) N 23°30′W   (b) W 23°30′N
   (c) N 66°30′W   (d) S 113°30′N

29. The type of surveying which requires least office work is (least calculation) :
   (a) Theodolite surveying
   (b) Tacheometry
   (c) Trigonometrical levelling
   (d) Plane table surveying

30. When 1 cm on a map represents 10 m on the ground, the representative fraction of the scale is :
   (a) $\dfrac{1}{10000}$ (b) $\dfrac{1}{10}$
   (c) $\dfrac{1}{100}$ (d) $\dfrac{1}{1000}$

31. The quantity of wood for the shutters of doors and windows its calculate in :
   (a) m^3 (b) lump-sum
   (c) m   (d) m^2

32. The plane of a building is in the form of square with centreline dimensions of outer walls as 14.7 m × 14.7 m. If the thickness of the wall in superstructure is 0.30m , then its plinth area is :
   (a) 234 m²   (b) 150 m²
   (c) 216 m²   (d) 225 m²

33. The counter lines can cross one another on map only in the case of :
(a) an overhanging cliff
(b) a vertical cliff
(c) a valley
(d) a ridge

34. When the magnetic bearing of the sun at noon is 185°20′, the magnetic declination will be
(a) 5°20′ south
(b) 5°20′ east
(c) 5°20′ west
(d) 5°20′ north

35. The height of instrument is equal to :
(a) Reduced level of bench mark − back sight
(b) Reduced level of bench mark + back sight
(c) Reduced level of bench mark + fore sight
(d) Reduced level of bench mark + Intermediate sight

36. Intersection method in plane table surveying is most suitable for :
(a) Plains
(b) Forests
(c) Urban areas
(d) Hilly areas

37. The fundamental principle of surveying is to work from the
(a) whole to part
(b) part to whole
(c) lower level to higher level
(d) higher level to lower level

2015

38. Mean sea level (MSL) adopted by Survey of India for reference, is located at
(a) Kolkata
(b) Mumbai
(c) Karachi
(d) Delhi

39. For building project estimate which method is generally used in PWD ?
(a) Long wall and short wall method
(b) Centre line method
(c) Crossing method
(d) Short wall method

40. An estimate is
(a) cost of the structure using thumb rules
(b) random guess of cost of structue
(c) probable cost arrived at before construction
(d) actual cost of construction

41. When two points of surveying are mutually invisible the following method of ranging is adopted
(a) Direct ranging
(b) Indirect ranging
(c) Horizontal ranging
(d) Vertical ranging

42. The distance between two brass rings in a surveyor's chain is
(a) 20 cm
(b) 40 cm
(c) 75 cm
(d) 1 m

43. The sum of the interior angles of a closed traverse is equal to
(a) $(2n-4)\,90°$
(b) $(3n-4)\,90°$
(c) $(2n-4)\,180°$
(d) $(3n-4)\,180°$

44. Survey line provided to verify the accuracy of the framework is known as
(a) Tie line
(b) Base line
(c) Subsidieary line
(d) Check line

45. The total number of links provided in a Gunter's chain is
(a) 132
(b) 100
(c) 66
(d) 50

46. If the fore bearing of a line is observed to be AB 12°24′, the back bearing of line AB should be
(a) 102°24′
(b) 77°36′
(c) 167°36′
(d) 192°24′

47. The direction of a line relative to a given meridian is known as
(a) Angle of line
(b) Direction of line
(c) Bearing of line
(d) Relative meridian

48. When compared with chain surveying plane table is
(a) more accurate
(b) less accurate
(c) not accurate
(d) accurate

49. Number of satellites involved in the orbit for the GPS survey technique
(a) 14
(b) 24
(c) 34
(d) 44

50. Estimate for electrical wiring is prepared on the basis of
(a) Voltage
(b) Power
(c) Number of appliances
(d) Number of points

ANSWERS

EXERCISE - I

1. (a)	2. (a)	3. (b)	4. (b)	5. (d)	6. (a)	7. (c)	8. (b)	9. (b)	10. (b)
11. (d)	12. (a)	13. (c)	14. (a)	15. (a)	16. (b)	17. (d)	18. (d)	19. (d)	20. (c)
21. (c)	22. (b)	23. (b)	24. (b)	25. (a)	26. (b)	27. (a)	28. (b)	29. (a)	30. (c)
31. (d)	32. (d)	33. (a)	34. (b)	35. (b)	36. (b)	37. (a)	38. (a)	39. (b)	40. (a)
41. (a)	42. (c)	43. (a)	44. (a)	45. (a)	46. (b)	47. (b)	48. (a)	49. (b)	50. (b)
51. (d)	52. (a)	53. (b)	54. (a)	55. (b)	56. (a)	57. (d)	58. (b)	59. (d)	60. (c)
61. (a)	62. (c)	63. (c)	64. (d)	65. (c)	66. (b)	67. (b)	68. (b)	69. (d)	70. (c)
71. (b)	72. (c)	73. (d)	74. (c)	75. (d)	76. (b)	77. (b)	78. (d)	79. (d)	80. (c)
81. (b)	82. (c)	83. (a)	84. (b)	85. (c)	86. (a)	87. (b)	88. (d)	89. (a)	90. (a)
91. (d)	92. (b)	93. (d)	94. (b)	95. (b)	96. (c)	97. (d)	98. (a)	99. (b)	100. (c)
101. (a)	102. (a)	103. (b)	104. (c)	105. (d)	106. (b)	107. (b)	108. (c)	109. (d)	110. (d)
111. (a)	112. (b)	113. (d)	114. (b)	115. (b)	116. (a)	117. (b)	118. (d)	119. (d)	120. (d)
121. (d)	122. (c)	123. (a)	124. (b)	125. (b)	126. (d)	127. (d)	128. (d)	129. (c)	130. (c)
131. (a)	132. (b)	133. (b)	134. (b)	135. (a)	136. (b)	137. (a)	138. (a)	139. (a)	140. (c)
141. (b)	142. (c)	143. (c)	144. (b)	145. (a)	146. (a)	147. (a)	148. (b)	149. (b)	150. (c)
151. (a)	152. (b)	153. (c)	154. (d)	155. (c)	156. (a)	157. (d)	158. (c)	159. (a)	160. (b)
161. (c)	162. (d)	163. (b)	164. (a)	165. (b)	166. (d)	167. (a)	168. (b)	169. (b)	170. (d)
171. (c)	172. (b)	173. (b)	174. (c)	175. (b)	176. (c)	177. (d)	178. (c)	179. (d)	180. (b)
181. (b)	182. (a)	183. (c)	184. (c)	185. (c)	186. (b)	187. (b)	188. (b)	189. (c)	190. (d)
191. (d)	192. (c)	193. (a)	194. (b)	195. (c)	196. (c)	197. (a)	198. (a)	199. (b)	200. (a)
201. (b)	202. (b)	203. (b)	204. (c)	205. (d)	206. (d)	207. (d)	208. (b)	209. (d)	210. (d)
211. (a)	212. (c)	213. (c)	214. (a)	215. (a)	216. (c)	217. (b)	218. (b)	219. (b)	220. (d)
221. (b)	222. (a)	223. (d)	224. (d)	225. (c)	226. (b)	227. (c)	228. (d)	229. (d)	230. (c)
231. (b)	232. (b)	233. (b)	234. (a)	235. (b)	236. (d)	237. (a)	238. (a)	239. (d)	240. (c)
241. (a)	242. (b)	243. (d)	244. (d)	245. (d)	246. (c)	247. (b)	248. (b)	249. (a)	250. (a)
251. (b)	252. (c)	253. (a)	254. (b)	255. (c)	256. (b)	257. (c)	258. (b)	259. (a)	260. (c)
261. (c)	262. (a)	263. (a)	264. (c)	265. (c)	266. (a)	267. (b)	268. (b)	269. (a)	270. (c)
271. (c)	272. (b)	273. (c)	274. (a)	275. (a)	276. (c)	277. (b)	278. (a)	279. (a)	280. (d)
281. (d)	282. (c)	283. (d)	284. (c)	285. (a)	286. (a)	287. (c)	288. (c)	289. (d)	290. (b)
291. (a)	292. (c)	293. (c)	294. (b)	295. (b)	296. (c)	297. (a)	298. (c)	299. (b)	300. (b)

EXERCISE - II

1. (d)	2. (c)	3. (b)	4. (d)	5. (d)	6. (b)	7. (a)	8. (d)	9. (a)	10. (b)
11. (d)	12. (a)	13. (a)	14. (b)	15. (c)	16. (a)	17. (b)	18. (d)	19. (b)	20. (d)
21. (a)	22. (a)	23. (d)	24. (a)	25. (c)	26. (b)	27. (c)	28. (c)	29. (d)	30. (d)
31. (d)	32. (d)	33. (a)	34. (c)	35. (b)	36. (d)	37. (a)	38. (c)	39. (b)	40. (c)
41. (b)	42. (a)	43. (a)	44. (d)	45. (b)	46. (d)	47. (c)	48. (b)	49. (b)	50. (d)

EXPLANATIONS

EXERCISE - II

1. When QSB ,S θ' W; Then WSB, θ = 180+30 = 210°

2. Plate Load Test

- It is used to determine the ultimate bearing capacity of soil as well as the probable settlement of the soil for a given loading and for a given depth.

- It is a field test, which is generally performed on uniform sandy soil.

3. Levelling deals with measurement in a vertical plane.

5. The two point and three point problems are method of resection.

Methods of plane tabling:

Methods of plane tabling is divided into two category.

1. For locating details:

For locating details can be classified into two parts :

(a) Radiation Method:

In radiation method, a ray is drawn towards the point with the help of the Alidade. With the help of Chain or Tape the horizontal distance is measured from the Plane Table to the point. This point is located on the sheet by plotting it into the scale of the map. Hence with the help of chain or tape the horizontal distance is measured from the plane table.

(b) Intersection Method:

In this method two instrument stations are used but no chain or tape is required. Intersecting rays are drawn from these two stations whose location is already plotted (by measuring the distance between them), the point of intersection is the location of the point.

2. For locating Plane Table Stations:

(a) Traversing:

In this method the location of the Plane Table station is located in the following manner:

(1) At previous station a ray is drawn in the forward direction (Toward next station). In this method point is plotted by measuring the horizontal distance and plotting it to scale.

So, in this case ray is drawn in forward direction and is plotted by measuring the horizontal distance.

(2) Instrument is shifted to next station (which is just located in first step) and the previous station is back-sighted to orient the plane table. Hence, traverse is a method in the field of surveying to establish control networks. It is also used in geodesy.

(b) Resection:

Resection is the process of finding the position of a station where plane table, is placed, with the help of sights taken towards known and visible points whose location has already been plotted.

Hence, resection is a method for determining an unknown position measuring angles with respect to known positions. Measurements can be made with a compass and topographic map or with a total station and benchmarks.

First of all the plane table is oriented correctly by one of the four given methods:

(1) Orientation by trough compass

(2) Orientation by back sighting

(3) Orientation by two point problem

(4) Orientation by three point problem

6. In surveying compass, The graduations are in Quadrantal Bearing (Q.B.) or Reduced bearing system, having 0° at North and Sourth and 90° at East and West.

So, in surveying compass the direction is measured at 0° and 90°.

In Prismatic compass, The graduations are in Whole Circle Bearing (W.C.B.) system, having 0° at south end, 90° at North and 270° at East.

7. Plane surveying is that type of surveying in which the mean surface of the earth is considered as a plane and its spheroidal shape is neglected. In this type of surveying plane surface is determined.

Geodetic surveying is that type of surveying in which the shape of the earth is taken into account. In geodetic surveying actual shape of the earth is surveyed.

Hydrographical survey is also called marine survey. It deals with bodies of water for purpose of navigation, water supply, harbour works or for determination of mean sea level. In hydrographical survey the whole survey of water is surveyed

Topographical survey consists of horizontal surface and vertical location of certain points by linear and angul measurement. It is made to determine the natural features of a country such as rivers, streams, lakes, woods, hills, etc. Such artificial features are roads, railways, canals, towns and villages.

8. The accuracy of measurement in chain surveying does not depend upon general layout of the chain lines.

9. **Fix of a plane table from three known points**

   The accuracy with which a plane table station can be located through three point problem is known as its fix.

   The fix is good when instrument station T is within the triangle, and particularly when it is at the orthocentre and the middle station is much nearer than the others. On the other hand, the fix is bad or poor when the instrument station T is near the circumference of the circumscribing circle.

   So, the accuracy of fix depends on the relative positions of the plotted points and that of location of the plane table station. Thus the choice of plotted objects and location of table should be made to get a strong fix.

10. The bubble tube parallel to the telescope of a theodolite should be more sensitive, since it controls the horizontal axis.

11. In plate load test, the rigid bearing plate to be used is square in section, of minimum size 30cm × 30cm, and maximum size 75cm × 75cm. The plate thickness should be sufficient to withstand effectively the bending stresses likely to be caused by the maximum anticipated load. It should generally **not be less than 1 cm (10 mm).**

12. **Cross staff**

   It is essentially an instrument used for setting put right angles. In its simplest form it is known as open cross-staff. It consists of two pair of vertical slits providing two lines of sight mutually at right angles.

   So cross-staff is used for finding right angles.

(a)	(b)	(c)
Open cross-staff	French cross-staff	Adjustable cross-staff
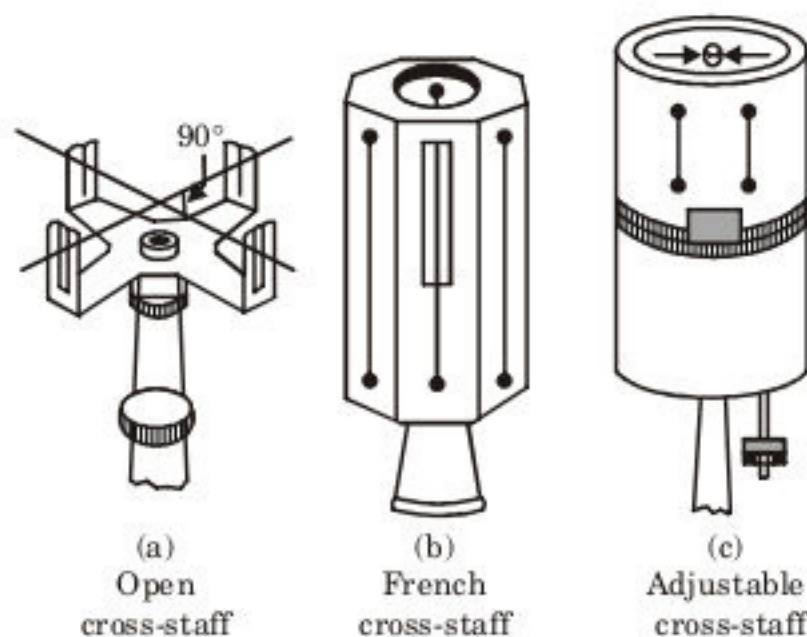
13. **Back Sight**

   First reading taken after setting up an instrument or any change point is called Back sight.

   Fore sight

   Last reading taken after from any instrument station after which instrument shall be shifted or reading is taken at the end of survey work is called Fore sight.
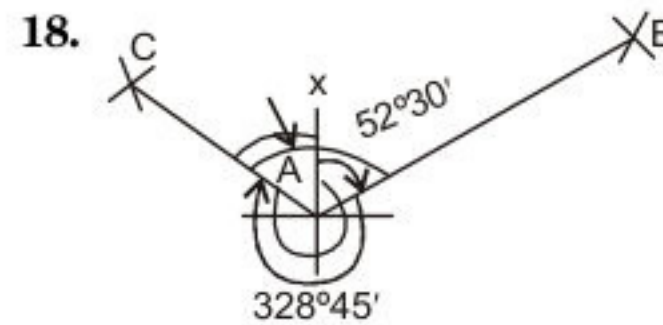
Intermediate sight

All other readings except back sight and fore sight is called intermediate sight.

14. The difference between face left and face right observation of a theodolite is 3′. So the error is 1′30″.

15. Correction for slope in chainage (c)

$$c = \frac{h^2}{2L}$$

So correction for slope is proportional to h^2

17. Establishing the intermediate point in chain line.

18.

   We have to find out angle between AB and AC

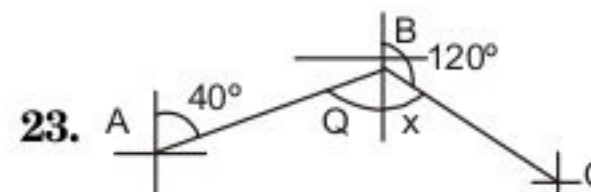   First calculate x i.e.

   $\Rightarrow \quad 360° - 328°45'$

   $\Rightarrow \quad 31°15'$

   Now angle between AB and AC

   $\Rightarrow \quad 52°30' + 31°15'$

   $\Rightarrow \quad 83°45'$

21. Line parallel to the mean spheroidal surface of earth is called level line.

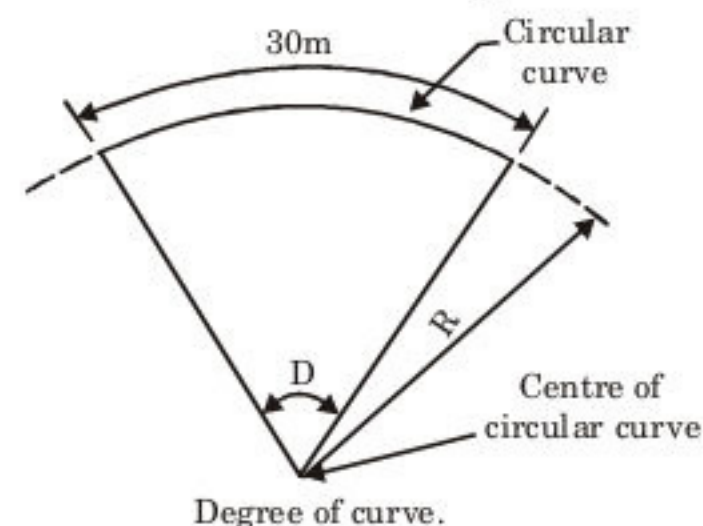22. Sets of minor measurement in chain surveying. lateral measurement from chain line.

23.

   $x \Rightarrow 180° - 120° = 60°$

   $\theta \Rightarrow 40°$

   Included angle

   $x + \theta \Rightarrow 60° + 40° \Rightarrow 100°$

27. **Radius of curve (R) and degree of curve (D)**

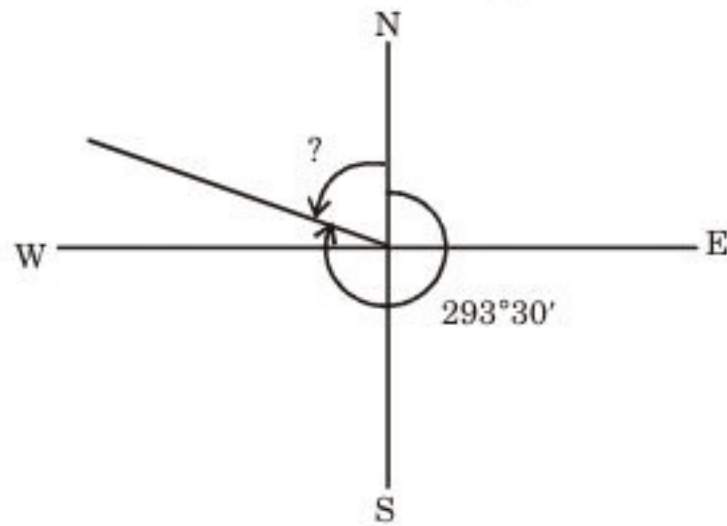Degree of curve.

$$\frac{D°}{360} = \frac{l}{2\pi R}$$

- For 30 m chain length (l = 30 m)

  Degree of curve, $D° = \dfrac{30 \times 360}{2\pi R} = \dfrac{1718.9}{R}$

  Radius of curve, $R = \dfrac{30 \times 360}{2\pi D°} = \dfrac{1718.9}{D°}$

- For 20 m chain length (l = 20 m)

  $D° = \dfrac{20 \times 360}{2\pi R} = \dfrac{1145.9}{R}$

  $R = \dfrac{20 \times 360}{2\pi D°} = \dfrac{1145.9}{D°}$

28.

Reduced bearing or Quadrantal bearing is the angle which a line makes from North or South Pole whichever may be near. It's value is from 0° to 90°.

Hence, In the quadrantal bearing system, a whole circle bearing of 293°30′ can be expressed as N66°30′W.

29. Plane table surveying requires least office work and least calculation.

30. R.F. (Representative Fraction) which is always written with the map distance as 1 and is independent of any unit of measure.

Hence 1 cm on a map represents 10 m on the ground, the representative fraction of the scale is

$RF = \dfrac{1}{1000}$

31. The quantity of wood for the shutters of doors and windows is calculated in m^2

32. The Plinth area should be calculated for the covered area by taking external dimension of the building at the floor level.

Hence Plinth area $= (14.7 + 0.3)\,m \times (14.7 + 0.3)\,m$

$= 225\ m^2$

34. True Bearing = Mag. Bearing ± Mag. Declination

+ ve for eastern declination

– ve for western declination

Now, Magnetic declination

$= 185°20′ - 180° = 5°20′\ W$

35. The height of instrument is equal to Reduced level of bench mark + back sight.

38. Before independence is Karachi, but after independence Mumbai is M.S.L. of India.

Mean sea level is a reference datum as established by permanent service for mean sea level. Used for Buildings and Railway Platforms.

39. Centre line method estimates prepared or most accurate and quick.

41. When ends of a line are not visible as in case of hill ground or distance between the stations are so large then use 2-Point resection method.

42. It is the standard distance.

43. $(2n - 4) \times 90° \rightarrow$ For correct bearing

$n \rightarrow$ Number of angles.

44. Check line $\rightarrow$ It is a proof line is a line joining apex of a triangle to some fixed points on any 2 sides of a triangle. It measured the accuracy of frame work.

Tie/Subsiding lines $\rightarrow$ A tie line joints 2 fixed points on main survey lines helps checking accuracy of surveying and locate interior details.

Base line $\rightarrow$ Main longest line, which posses through the centre of fields shown the details of work w.r.t. line.
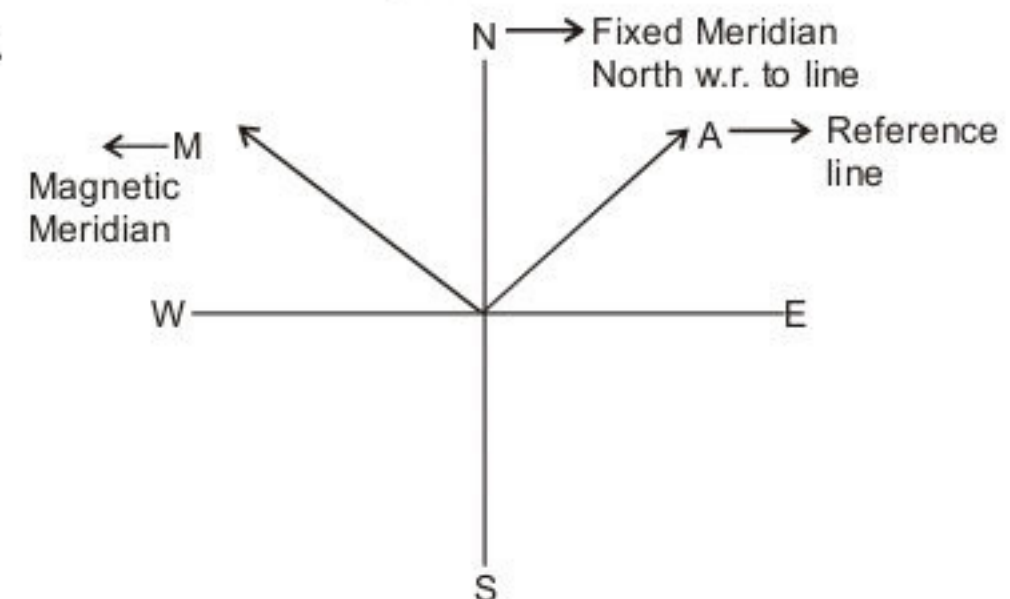
45. It is a standard chain.

46. $\boxed{\text{F.B.} \perp 180 = \text{B.B.}}$

Fore Bearing Back Bearing

Back Bearing $= 12°24′ + 180°$

$= 192°24′$

47.

48. Chain surveying is practically work find out with standard chain.

■■