2

Surveying

1. Which of the following scales is largest one ?
   a) 1 cm = 50 m
   b) 1 :42000
   c) R.F. = $\frac{1}{300000}$
   d) 1 cm = 50 km

2. If the probable error in single observation is ±0.04 m and that of the mean is ±0.01 m, then the number of observations are
   a) 4
   b) 10
   c) 16
   d) 64

3. Theory of probability is applied to
   a) accidental errors only
   b) cumulative errors only
   c) both accidental and cumulative errors
   d) none of the above

4. A survey is conducted with a view to prepare the map of an area to a scale of 1 : 1000. If a scale with least count of 0.1 mm is used for plotting, what would be the accuracy in length measurement in the field ?
   a) 0.325 m
   b) 0 01 m
   c) 0.1 m
   d) 1 m

5. The difference between the most probable value of a quantity and its observed value is
   a) true error
   b) weighted observation
   c) conditional error
   d) residual error

6. Geodetic surveying is different from plane surveying because of
   a) the curvature of the earth
   b) the large difference of elevations between various points
   c) coverage of very large area
   d) undulations of the topography

7. The error due to bad ranging is
   a) cumulative; positive
   b) cumulative; negative
   c) compensating
   d) cumulative; positive or negative

8. 'Offsets' are
   a) short measurements from chain line
   b) ties or check lines which are perpendicular to chain line
   c) sets of minor instruments in chain surveying
   d) chain lines which go out of alignment

9. Which of the following instruments is generally used for base line measurements ?
   a) chain
   b) metallic tape
   c) steel tape
   d) invar tape

10. An invar tape is made of an alloy of
    a) copper and steel
    b) brass and nickel
    c) brass and steel
    d) nickel and steel

11. Number of links in a 30 m metric chain is
a) 100
b) 150
c) 180
d) 200

12. 'Ranging' is the process of
a) fixing ranging rods on the extremities of the area
b) aligning the chain in a straight line between two extremities
c) taking offsets from a chain line
d) chaining over a range of mountains

13. The principle of 'working from whole to part' is used in surveying because
a) plotting becomes easy
b) survey work can be completed quickly
c) accumulation of errors is prevented
d) all of the above

14. Figure 2.1 shows one of the brass tallies of a 30 m chain. Distance of this tally from the nearest end of the chain is

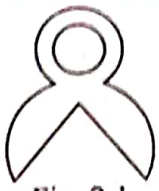

Fig. 2.1

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

*15. During chaining along a straight line, the leader of the party has 4 arrows in his hand while the follower has 6. Distance of the follower from the starting point is
a) 4 chains
b) 6 chains
c) 120 m
d) 180m

16. A metallic tape is made of
a) steel
b) invar
c) linen
d) cloth and wires

17. For a well-conditioned triangle, no angle should be less than
a) 20°
b) 30°
c) 45°
d) 60°

*18. Figure 2.2 shows the entries in a field book for a chain line AB. What is the angle between chain line and railway line ?

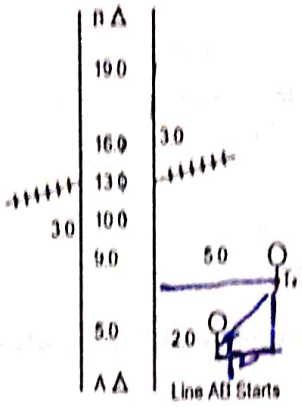

Fig. 2.2

a) 26° 34'
b) 30°
c) 45°
d) 60°

*19. What is the distance between trees T_1 and T_2 shown in Figure 2.2 ?
a) 4 m
b) 5m
c) 7m
d) 12m

20. The position of a point can be fixed more accurately by
a) cross staff
b) optical square
c) oblique offsets
d) perpendicular offsets

21. The main object of running a tie line is
a) to check accuracy of work
b) to take details of nearby objects
c) to take offsets for detailed surveying
d) none of the above

22. Which of the following is an obstacle to chaining but not to ranging ?
a) river
b) hillock
c) building
d) none of the above

23. A building is an obstacle to
a) chaining but not ranging
b) ranging but not chaining
c) both chaining and ranging
d) neither chaining nor ranging

24. The main difference between an optical square and a prism square is
a) difference in principle of working
b) that optical square is more accurate than prism square

c) that no adjustment is required in a prism square since the angle between the reflecting surfaces cannot be changed
d) all of the above

25. The angle of intersection of the two plane mirrors of an optical square is
a) 30°
b) 45°
c) 60°
d) 90°

26. The allowable length of an offset depends upon the
a) degree of accuracy required
b) method of setting out the perpendiculars and nature of ground
c) scale of plotting
d) all of the above

27. Which of the following angles can be set out with the help of French cross staff?
a) 45° only
b) 90° only
c) either 45° or 90°
d) any angle

28. Which of the following methods of offsets involves less measurement on the ground?
a) method of perpendicular offsets
b) method of oblique offsets
c) method of ties
d) all involve equal measurement on the ground

29. The permissible error in chaining for measurement with chain on rough or hilly ground is
a) 1 in 100
b) 1 in 250
c) 1 in 500
d) 1 in 1000

30. The correction for sag is
a) always additive
b) always subtractive
c) always zero
d) sometimes additive and sometimes subtractive

31. Cross staff is an instrument used for
a) measuring approximate horizontal angles
b) setting out right angles
c) measuring bearings of the lines
d) none of the above

32. Normal tension is that pull which
a) is used at the time of standardising the tape
b) neutralizes the effect due to pull and sag
c) makes the correction due to sag equal to zero
d) makes the correction due to pull equal to zero

33. Which of the following is not used in measuring perpendicular offsets ?
a) line ranger
b) steel tape
c) optical square
d) cross staff

34. If the length of a chain is found to be short on testing, it can be adjusted by
a) straightening the links
b) removing one or more small circular rings
c) closing the joints of the rings if opened out
d) all of the above

35. The maximum tolerance in a 20 m chain is
a) ±2 mm
b) ±3 mm
c) ±5 mm
d) ±8 mm

36. For accurate work, the steel band should always be used in preference to chain because the steel band
a) is lighter than chain
b) is easier to handle
c) is practically inextensible and is not liable to kinks when in use
d) can be easily repaired in the field

37. The length of a chain is measured from
a) centre of one handle to centre of other handle
b) outside of one handle to outside of other handle
c) outside of one handle to inside of other handle
d) inside of one handle to inside of other handle

38. Select the incorrect statement.
a) The true meridians at different places are parallel to each other.
b) The true meridian at any place is not variable.

c) The true meridians converge to a point in northern and southern hemispheres.
d) The maps prepared by national survey departments of any country are based on true meridians.

39. If the true bearing of a line AB is 269° 30′, then the azimuth of the line AB is
a) 0° 30′
b) 89° 30′
c) 90° 30′
d) 269° 30′

40. In the prismatic compass
a) the magnetic needle moves with the box
b) the line of the sight does not move with the box
c) the magnetic needle and graduated circle do not move with the box
d) the graduated circle is fixed to the box and the magnetic needle always remains in the N-S direction

41. For a line AB
a) the forebearing of AB and back bearing of AB differ by 180°
b) the forebearing of AB and back bearing of BA differ by 180°
c) both (a) and (b) are correct.
d) none is correct

42. Local attraction in compass surveying may exist due to
a) incorrect levelling of the magnetic needle
b) loss of magnetism of the needle
c) friction of the needle at the pivot
d) presence of magnetic substances near the instrument

43. If the quadrantal bearing of a line is N 25° W, then the whole circle bearing of the line is
a) S 25° E
b) 205°
c) 335°
d) 295°

44. If the forebearing of a line AB is 35° and that of line BC 15°, then the included angle between the lines is
a) 20°
b) 50°
c) 160°
d) 230°

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

46. The prismatic compass and surveyor's compass
a) give whole circle bearing (WCB) of a line and quadrantal bearing (QB) of a line respectively
b) both give QB of a line and WCB of a line
c) both give QB of a line
d) both give WCB of a line

47. The horizontal angle between the true meridian and magnetic meridian at a place is called
a) azimuth
b) declination
c) local attraction
d) magnetic bearing

48. A negative declination shows that the magnetic meridian is to the
a) eastern side of the true meridian
b) western side of the true meridian
c) southern side of the true meridian
d) none of the above

49. If the magnetic bearing of the sun at a place at noon in southern hemisphere is 167°, the magnetic declination at that place is
a) 77° N
b) 23° S
c) 13° E
d) 13° W

50. The graduations in prismatic compass
i) are inverted
ii) are upright
iii) run clockwise having 0° at south
iv) run clockwise having 0° at north
The correct answer is
a) (i) and (iii)
b) (i) and (iv)
c) (ii) and (iii)
d) (ii) and (iv)

51. Agate cap is fitted with a
a) cross staff
b) level
c) chain
d) prismatic compass

*52. The following bearings were observed while traversing with a compass :

Line	F.B.	B.B.
AB	104° 30'	284° 30'
BC	48° 15'	226° 0'
CD	290° 30'	115° 15'
DA	180° 15'	357° 15'

Which stations were affected by local attraction ?

a) A and B
b) B and C
c) C and D
d) A and D

53. The temporary adjustments of a prismatic compass are

i) Centering
ii) Levelling
iii) Focusing the prism

The correct order is

a) (i), (iii), (ii)
b) (i), (ii), (iii)
c) (ii), (iii), (i)
d) (iii), (i), (ii)

54. Which of the figures shown in Fig.2.3 represents the correct graduation in a surveyor's compass?

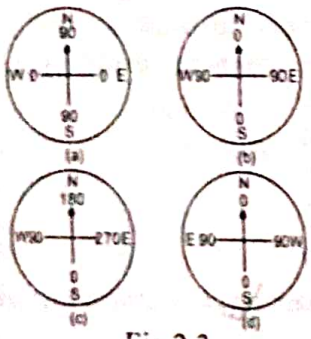

Fig.2.3

55. Theodolite is an instrument used for

a) tightening the capstan-headed nuts of level tube
b) measurement of horizontal angles only
c) measurement of vertical angles only
d) measurement of both horizontal and vertical angles

56. The process of turning the telescope about the vertical axis in horizontal plane is known as

a) transiting
b) reversing
c) plunging
d) swinging

57. Size of a theodolite is specified by

a) the length of telescope
b) the diameter of vertical circle
c) the diameter of lower plate
d) the diameter of upper plate

58. Which of the following is not the function of levelling head ?

a) to support the main part of the instrument
b) to attach the theodolite to the tripod
c) to provide a means for levelling the theodolite
d) none of the above

*59. If the lower clamp screw is tightened and upper clamp screw is loosened, the theodolite may be rotated

a) on its outer spindle with a relative motion between the vernier and graduated scale of lower plate
b) on its outer spindle without a relative motion between the vernier and graduated scale of lower plate
c) on its inner spindle with a relative motion between the vernier and the graduated scale of lower plate
d) on its inner spindle without a relative motion between the vernier and the graduated scale of lower plate

60. A telescope is said to be inverted if its

a) vertical circle is to its right and the bubble of the telescope is down
b) vertical circle is to its right and the bubble of the telescope is up
c) vertical circle is to its left and the bubble of the telescope is down
d) vertical circle is to its left and the bubble of the telescope is up

61. The cross hairs in the surveying telescope are placed

a) midway between eye piece and objective lens
b) much closer to the eye-piece than to the objective lens
c) much closer to the objective lens than to the eye piece
d) anywhere between eye-piece and objective lens

*62. For which of the following permanent adjustments of theodolite, the spire test is used ?

a) adjustment of plate levels
b) adjustment of line of sight
c) adjustment of horizontal axis
d) adjustment of altitude bubble and vertical index frame

63. The adjustment of horizontal cross hair is required particularly when the instrument is used for
a) levelling
b) prolonging a straight line
c) measurement of horizontal angles
d) all of the above

64. Which of the following errors is not eliminated by the method of repetition of horizontal angle measurement ?
a) error due to eccentricity of verniers
b) error due to displacement of station signals
c) error due to wrong adjustment of line of collimation and trunion axis
d) error due to inaccurate graduation

*65. The error due to eccentricity of inner and outer axes can be eliminated by
a) reading both verniers and taking the mean of the two
b) taking both face observations and taking the mean of the two
c) double sighting
d) taking mean of several readings distributed over different portions of the graduated circle

*66. In the double application of principle of reversion, the apparent error is
a) equal to true error
b) half the true error
c) two times the true error
d) four times the true error

*67. Which of the following errors can be eliminated by taking mean of both face observations ?
a) error due to imperfect graduations
b) error due to eccentricity of verniers
c) error due to imperfect adjustment of plate levels
d) error due to line of collimation not being perpendicular to horizontal axis

68. Which of the following errors cannot be eliminated by taking both face observations ?
a) error due to horizontal axis not being perpendicular to the vertical axis
b) index error i.e. error due to imperfect adjustment of the vertical circle vernier
c) error due to non-parallelism of the axis of telescope level and line of collimation
d) none of the above

69. If a tripod settles in the interval that elapses between taking a back sight reading and the following foresight reading, then the elevation of turning point will
a) increase
b) decrease
c) not change
d) either 'a' or 'b'

70. If altitude bubble is provided both on index frame as well as on telescope of a theodolite, then the instrument is levelled with reference to
i) altitude bubble on index frame
ii) altitude bubble on index frame if it is to be used as a level
iii) altitude bubble on telescope
iv) altitude bubble on telescope if it is to be used as a level
The correct answer is
a) only (i)
b) both (i) and (iv)
c) only (iii)
d) both (ii) and (iii)

71. A 'level line' is a
a) horizontal line
b) line parallel to the mean spheriodal surface of earth
c) line passing through the centre of cross hairs and the centre of eye piece
d) line passing through the objective lens and the eye-piece of a dumpy or tilting level

72. The following sights are taken on a "turning point"
a) foresight only
b) backsight only
c) foresight and backsight
d) foresight and intermediate sight

73. The rise and fall method of levelling provides a complete check on
a) backsight
b) intermediate sight
c) foresight
d) all of the above

a) adjustment of plate levels
b) adjustment of line of sight
c) adjustment of horizontal axis
d) adjustment of altitude bubble and vertical index frame

63. The adjustment of horizontal cross hair is required particularly when the instrument is used for
a) levelling
b) prolonging a straight line
c) measurement of horizontal angles
d) all of the above

64. Which of the following errors is not eliminated by the method of repetition of horizontal angle measurement ?
a) error due to eccentricity of verniers
b) error due to displacement of station signals
c) error due to wrong adjustment of line of collimation and trunion axis
d) error due to inaccurate graduation

*65. The error due to eccentricity of inner and outer axes can be eliminated by
a) reading both verniers and taking the mean of the two
b) taking both face observations and taking the mean of the two
c) double sighting
d) taking mean of several readings distributed over different portions of the graduated circle

*66. In the double application of principle of reversion, the apparent error is
a) equal to true error
b) half the true error
c) two times the true error
d) four times the true error

*67. Which of the following errors can be eliminated by taking mean of both face observations ?
a) error due to imperfect graduations
b) error due to eccentricity of verniers
c) error due to imperfect adjustment of plate levels
d) error due to line of collimation not being perpendicular to horizontal axis

68. Which of the following errors cannot be eliminated by taking both face observations ?
a) error due to horizontal axis not being perpendicular to the vertical axis
b) index error i.e. error due to imperfect adjustment of the vertical circle vernier
c) error due to non-parallelism of the axis of telescope level and line of collimation
d) none of the above

69. If a tripod settles in the interval that elapses between taking a back sight reading and the following foresight reading, then the elevation of turning point will
a) increase
b) decrease
c) not change
d) either 'a' or 'b'

70. If altitude bubble is provided both on index frame as well as on telescope of a theodolite, then the instrument is levelled with reference to
i) altitude bubble on index frame
ii) altitude bubble on index frame if it is to be used as a level
iii) altitude bubble on telescope
iv) altitude bubble on telescope if it is to be used as a level
The correct answer is
a) only (i)
b) both (i) and (iv)
c) only (iii)
d) both (ii) and (iii)

71. A 'level line' is a
a) horizontal line
b) line parallel to the mean spheriodal surface of earth
c) line passing through the centre of cross hairs and the centre of eye piece
d) line passing through the objective lens and the eye-piece of a dumpy or tilting level

72. The following sights are taken on a "turning point"
a) foresight only
b) backsight only
c) foresight and backsight
d) foresight and intermediate sight

73. The rise and fall method of levelling provides a complete check on
a) backsight
b) intermediate sight
c) foresight
d) all of the above

74. If the R.L. of a B.M. is 100.00 m, the back- sight is 1.215 m and the foresight is 1.870 m, the R.L. of the forward station is
a) 99.345 m
b) 100.345 m
c) 100.655m
d) 101.870m

75. In an internal focussing type of telescope, the lens provided is
a) concave
b) convex
c) plano-convex
d) plano-concave

76. Which of the following errors can be neutralised by setting the level midway between the two stations ?
a) error due to curvature only
b) error due to refraction only
c) error due to both curvature and refraction
d) none of the above

77. Height of instrument method of levelling is
a) more accurate than rise and fall method
b) less accurate than rise and fall method
c) quicker and less tedious for large number of intermediate sights
d) none of the above

78. The rise and fall method
a) is less accurate than height of instrument method
b) is not suitable for levelling with tilting levels
c) provides a check on the reduction of intermediate point levels
d) quicker and less tedious for large number of intermediate sights

79. If the staff is not held vertical at a levelling station, the reduced level calculated from the observation would be
a) true R.L.
b) more than true R.L.
c) less than true R.L.
d) none of the above

80.

Station	B.S.	I.S.	F.S.	Rise	Fall	R.L.	Remarks
A	2.1		2.3		1.5	100.00	C.P.
B		1.0		X		101.10	
C			1.3		0.3	100.80	

Above table shows a part of a level field book. What is value of X ?
a) 0.5
b) 1.0
c) 1.1
d) 2.1

81. The difference between a level line and a horizontal line is that
a) level line is a curved line while horizontal line is a straight line
b) level line is normal to plumb line while horizontal line may not be normal to plumb line at the tangent point to level line
c) horizontal line is normal to plumb line while level line may not be normal to the plumb line
d) both are same

82. The sensitivity of a bubble tube can be increased by
a) increasing the diameter of the tube
b) decreasing the length of bubble
c) increasing the viscosity of liquid
d) decreasing the radius of curvature of tube

*83. With the rise of temperature, the sensitivity of a bubble tube
a) decreases
b) increases
c) remains unaffected
d) none of the above

84. Refraction correction
a) completely eliminates curvature correction
b) partially eliminates curvature correction
c) adds to the curvature correction
d) has no effect on curvature correction

*85. The R.L, of the point A which is on the floor is 100 m and backsight reading on A is 2.455 m. If the foresight reading on the point B which is on the ceiling is 2.745 m, the R.L. of point B will be
a) 94.80 m
b) 99.71 m
c) 100.29 m
d) 105.20 m

86. As applied to staff readings, the corrections for curvature and refraction are respectively
a) + and –
b) – and +

c) + and +
d) – and –

*87. Which of the following arithmetic checks can be applied in rise and fall method ?
a) ΣB.S.– ΣF.S. = ΣRise – ΣFall only
b) ΣB.S.– ΣF.S. = Last R.L.– First R.L. only
c) ΣRise –ΣFall = Last R.L. – First R.L. only
d) ΣB.S. – ΣF.S. = ΣRise – ΣFall = Last R.L. – First R.L. [ES 2k]

88. What is the arithmetic error in the following table ?

Station	.S.	I.S.	F.S.	H.I.	R.L.	Remarks
A	2.00			102.00	101.00	B.M.
B		1.00			102.00	
C			0.50		102.50	

a) The R.L. of B.M. should be 100.00.
b) The height of instrument (H.I.) should be 103.00.
c) The backsight should be 1.00.
d) There is no error in the table.

89. The following consecutive readings were taken with a dumpy level :
0.695. 1.525, 2.395, 0.635, 0.605, 0.805, 0.125
The instrument was shifted after the third and fifth readings. The readings 2.395 and 0.635 respectively represent
a) F.S. and B.S.
b) F.S. and I.S.
c) B.S. and F.S.
d) I.S. and B.S.
where F.S. is foresight, B.S. is backsight and I.S. is intermediate sight

90. In Question no. 89, the number of stations is
a) 2
b) 5
c) 6
d) 7

*91. In Question no. 89, the R.L. of last point
a) is greater than R.L. of first point
b) is same as R.L. of first point
c) is smaller than R.L. of first point
d) cannot be determined from the given data

92.

Station	B.S.	I.S.	F.S.	H.I	R.L.	Remarks
A	2.30			02.30	100.00	.M.
B		1.30			101.00	
C			2.30		X	

The above table shows a part of a level field book. The value of X should be
a) 98.70
b) 100.00
c) 102.30
d) 103.30

93. The correction for refraction as applied to staff reading is
a) $+\frac{1}{7}\left(\frac{d^2}{2R}\right)$
b) $-\frac{1}{7}\left(\frac{d^2}{2R}\right)$
c) $+\frac{1}{7}\left(\frac{d^2}{R}\right)$
d) $-\frac{1}{7}\left(\frac{d^2}{R}\right)$
where R is radius of earth

*94. The following consecutive readings were taken with a dumpy level and a 3 m staff on a continuously sloping ground.
0.425, 1.035, 1.950, 2.360, 2.950, 0.750, 1.565, 2.450, 0.320, 1.025, 2.165, 2.955
Which of the following readings are backsights ?
a) 0.425, 2.950, 0.750, 0.320
b) 0.425. 0.750, 0.320, 2.955
c) 0.425, 0.750, 0.320
d) 0.425, 2.360, 0.750, 0.320

*95. A level was set up at a point A and distance to the staff station B was 100 m. The net combined correction due to curvature and refraction as applied to the staff reading is
a) 0.00673 m
b) 0.000673 m
c) – 0.000673 m
d) – 0.00673 m

*96. In levelling between two points A and B on opposite banks of a river, the following readings were taken

Level position	Staff readings	
	A	B
A	1.500	1.000
B	1.350	0.850

If R.L of A is 100.00 m, the R.L of B
a) is less than 100.00 m
b) is more than 100.00 m
c) is 100.00 m
d) cannot be determined from given data

*97. While doing levelling in undulating terrain, it is preferable to set the level on
a) the top of summit
b) the bottom of a valley
c) one side of the slope
d) anywhere

98. If the horizontal distance between the staff point and the point of observation is d, then the error due to curvature of earth is proportional to
a) d
b) 1/d
c) d^2
d) $1/d^2$

99. Sensitiveness of a level tube is designated by
a) radius of level tube
b) length of level tube
c) length of bubble of level tube
d) none of the above

100. Which of the following statements is incorrect ?
a) Error due to refraction may not be completely eliminated by reciprocal levelling.
b) Tilting levels are commonly used for precision work.
c) The last reading of levelling is always a foresight.
d) All of the above statements are incorrect.

101. Select the correct statement.
a) In levelling, a station is the point where the levelling staff is held and not where level is set up.
b) The inner surface of a bubble tube is an arc of a circle.
c) Sensitiveness of a level tube can be increased by the increase in length of bubble.
d) All of the above statements are correct.

102. The distance to the visible horizon from a height of 36 m above mean sea level is given by
a) $\sqrt{\frac{36}{0.6735}}$ km
b) $36\sqrt{\frac{1}{0.06735}}$ km
c) $\sqrt{\frac{36}{0.06735}}$ km
d) $36\sqrt{0.06735}$ km

103. Dumpy level is most suitable when
a) the instrument is to be shifted frequently
b) fly levelling is being done over long distance
c) many readings are to be taken from a single setting of the instrument
d) all of the above

104. The difference of levels between two stations A and B is to be determined.For best results, the instrument station should be
a) equidistant from A and B
b) closer to the higher station
c) closer to the lower station
d) as far as possible from the line AB

105. Contour interval is
a) inversely proportional to the scale of the map
b) directly proportional to the flatness of ground
c) larger for accurate works
d) larger if the time available is more

106. An imaginary line lying throughout the surface of ground and preserving a constant inclination to the horizontal is known as
a) contour line
b) horizontal equivalent
c) contour interval
d) contour gradient

107. The suitable contour interval for a map with scale 1 : 10000 is
a) 2 m
b) 5m
c) 10 m
d) 20 m

108. Select the correct statement.
a) A contour is not necessarily a closed curve.
b) A contour represents a ridge line if the concave side of lower value contour lies towards the higher value contour.
c) Two contours of different elevations do not cross each other except in case of an overhanging cliff.
d) All of the above statements are correct.

109. A series of closely spaced contour lines represents a
a) steep slope
b) gentle slope
c) uniform slope
d) plane surface

110. Direct method of contouring is
a) a quick method
b) adopted for large surveys only
c) most accurate method
d) suitable for hilly terrains

111. In direct method of contouring, the process of locating or identifying points lying on a contour is called
a) ranging
b) centring
c) horizontal control
d) vertical control

112. In the cross-section method of indirect contouring, the spacing of cross-sections depends upon
i) contour interval
ii) scale of plan
iii) characteristics of ground
The correct answer is
a) only (i)
b) (i) and (ii)
c) (ii) and (iii)
d) (i), (ii) and (iii)

*113. Which of the following methods of contouring is most suitable for a hilly terrain ?
a) direct method
b) square method
c) cross-sections method
d) tacheometric method

114. Select the correct statement.
a) Contour interval on any map is kept constant.
b) Direct method of contouring is cheaper than indirect method.
c) Inter-visibility of points on a contour map cannot be ascertained.
d) Slope of a hill cannot be determined with the help of contours.

115. Closed contours, with higher value inwards, represent a
a) depression
b) hillock
c) plain surface
d) none of the above

116. Contour interval is
a) the vertical distance between two consecutive contours
b) the horizontal distance between two consecutive contours
c) the vertical distance between two points on same contour
d) the horizontal distance between two points on same contour

117. Benchmark is established by
a) hypsometry
b) barometric levelling
c) spirit levelling
d) trigonometrical levelling

118. The type of surveying which requires least office work is
a) tacheometry
b) trigonometrical levelling
c) plane table surveying
d) theodolite surveying

*119. Intersection method of detailed plotting is most suitable for
a) forests
b) urban areas
c) hilly areas
d) plains

120. Detailed plotting is generally done by
a) radiation
b) traversing
c) resection
d) all of the above

121. Three point problem can be solved by
a) Tracing paper method
b) Bessels method
c) Lehman's method
d) all of the above

122. The size of a plane table is
a) 750 mm × 900 mm
b) 600 mm × 750 mm
c) 450 mm × 600 mm
d) 300 mm × 450 mm

123. The process of determining the locations of the instrument station by drawing resectors from the locations of the known stations is called
a) radiation
b) intersection
c) resection
d) traversing [ES 96]

124. The instrument used for accurate centering in plane table survey is
a) spirit level
b) alidade
c) plumbing fork
d) trough compass

125. Which of the following methods of plane table surveying is used to locate the position of an inaccessible point ?
a) radiation
b) intersection
c) traversing
d) resection [ES 95]

126. The two point problem and three point problem are methods of
a) resection
b) orientation
c) traversing
d) resection and orientation

127. The resection by two point problem as compared to three point problem
a) gives more accurate problem
b) takes less time
c) requires more labour
d) none of the above

128. The methods used for locating the plane table stations are
i) radiation
ii) traversing
iii) intersection
iv) resection
The correct answer is
a) (i) and (ii)
b) (iii) and (iv)
c) (ii) and (iv)
d) (i) and (iii)

129. After fixing the plane table to the tripod, the main operations which are needed at each plane table station are
i) levelling
ii) orientation
iii) centering
The correct sequence of these operations is
a) (i), (ii), (iii)
b) (i), (iii), (ii)
c) (iii), (i), (ii)
d) (ii), (iii), (i)

130. Bowditch rule is applied to
a) an open traverse for graphical adjustment
b) a closed traverse for adjustment of closing error
c) determine the effect of local attraction
d) none of the above

131. 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 the east departures, the bearing of the closing line is in the
a) NE quadrant
b) SE quadrant
c) NW quadrant
d) SW quadrant

132. If the reduced bearing of a line AB is N60°W and length is 100 m, then the latitude and departure respectively of the line AB will be
a) +50 m, +86.6 m
b) +86.6 m, –50 m
c) +50m, –86.6 m
d) +70.7 m, –50 m

133. If the sum of northings of a 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 respectively are
a) 1 m, N45°E
b) 2 m, N45°W
c) $\sqrt{2}$ m,N45°E
d) 0, N45°E

134. The angle between the prolongation of the preceding line and the forward line of a traverse is called
a) deflection angle
b) included angle
c) direct angle
d) none of the above

135. Transit rule of adjusting the consecutive coordinates of a traverse is used where
a) linear and angular measurements of the traverse are of equal accuracy
b) angular measurements are more accurate than linear measurements

c) linear measurements are more accurate than angular measurements
d) all of the above

136. The Bowditch method of adjusting a traverse is based on the assumption that

a) $e_1 \propto \sqrt{l}$ and $e_2 \propto \frac{1}{\sqrt{l}}$

b) $e_1 \propto \sqrt{l}$ and $e_2 \propto \sqrt{l}$

c) $e_1 \propto \frac{1}{\sqrt{l}}$ and $e_2 \propto \sqrt{l}$

d) $e_1 \propto \frac{1}{\sqrt{l}}$ and $e_2 \propto \frac{1}{\sqrt{l}}$

where e_1 and e_2 are errors in linear and angular measurements respectively and l is the length of a line [CS 99]

137. Which of the following methods of theodolite traversing is suitable for locating the details which are far away from transit stations ?
a) measuring angle and distance from one transit station
b) measuring angles to the point from at least two stations
c) measuring angle at one station and distance from other
d) measuring distance from two points on traverse line

138. Subtense bar is an instrument used for
a) levelling
b) measurement of horizontal distances in plane areas
c) measurement of horizontal distances in undulated areas
d) measurement of angles

139. Horizontal distances obtained by tacheometric observations
a) require slope correction
b) require tension correction
c) require slope and tension corrections
d) do not require slope and tension corrections

140. The number of horizontal cross wires in a stadia diaphragm is
a) one
b) two
c) three
d) four

141. Which of the following represents a correct match ?
i) moveable hair method—
The intercept on levelling staff is kept constant and stadia hair interval is variable.
ii) fixed hair method—
The intercept on levelling staff is variable and stadia hair interval is fixed.
iii) tangential hair method—
The stadia hairs are not used.
a) only (iii) is correct
b) only (i) and (ii) are correct
c) all (i), (ii) and (iii) are correct
d) none is correct

142. The multiplying constant of a theodolite is
a) f / i
b) (f + d)
c) $\frac{f}{i} + d$
d) $\frac{f}{d} + i$
where f is focal length of object lens, i is stadia hair interval and d is the distance between the optical centre of the object lens and the axis of the theodolite

*143. If the staff is held normal to the line of sight and the angle of elevation and depression are kept same, then the horizontal distance between instrument station and staff station computed by observations will be
a) same in both cases
b) greater at an angle of elevation than at an angle of depression
c) greater at an angle of depression than at an angle of elevation
d) unpredictable

*144. If the intercept on a vertical staff is observed as 0.75 m from a tacheometer, the horizontal distance between tacheometer and staff station is
a) 7.5 m
b) 25 m
c) 50
d) 75 m

145. For a tacheometer the additive and multiplying constants are respectively
a) 0 and 100
b) 100 and 0
c) 0 and 0
d) 100 and 100

*146. If the focal length of the object glass is 25 cm and the distance from object glass to the trunnion axis is 15 cm, the additive constant is
a) 0.1
b) 0.4
c) 0.6
d) 1.33

*147. If the spacing of cross hairs in a stadia diaphragm of a tacheometer is 1.2 mm and the focal length of object glass is 24 cm, then the multiplying constant of tacheometer is
a) 50
b) 100
c) 150
d) 200

148. Overturning of vehicles on a curve can be avoided by using
a) compound curve
b) vertical curve
c) reverse curve
d) transition curve

149. Different grades are joined together by a
a) compound curve
b) transition curve
c) reverse curve
d) vertical curve

150. The angle substended by the long chord of a simple circular curve at its centre is equal to
a) angle of deflection
b) two times the angle of deflection
c) 180° - angle of deflection
d) $\left(180° - \frac{\text{angle of deflection}}{2}\right)$

151. A curve tangential to four straight lines and consisting of arcs of different radii is known as
a) one centred compound curve
b) two centred compound curve
c) three centred compound curve
d) four centred compound curve

152. If the degree of a curve is 1°, then radius of the curve is equal to
a) 5400 m
b) 1720 m
c) $1720 / \pi$ m
d) $3440 / \pi$ m

153. The length of the tangent of a curve of radius R and angle of deflection A is given by
a) $R \cos(\Delta/2)$
b) $R \tan(\Delta/2)$
c) $R \sin(\Delta/2)$
d) $R \cot(\Delta/2)$

154. The length of the long chord of a simple circular curve of radius R and angle of deflection A is
a) $R \cos(\Delta/2)$
b) $2R \cos(\Delta/2)$
c) $2R \sin(\Delta/2)$
d) $R \sin(\Delta/2)$

155. Setting out a simple curve by two theodolite method does not require
a) angular measurements
b) linear measurements
c) both angular and linear measurements
d) none of the above

156. The radial offset at a distance X from the point of commencement of curve of radius R is given by
a) $\sqrt{R^2 - X^2} - R$
b) $R - \sqrt{R^2 - X^2}$
c) $R - \sqrt{R^2 + X^2}$
d) $\sqrt{R^2 + X^2} - R$

157. If r is the radius of curvature at any point of a transition curve and l is the distance from the beginning of the transition curve to that point, then for ideal transition
a) $l \propto r$
b) $l \propto r^2$
c) $l \propto 1/r$
d) $l \propto 1/r^2$

158. If the angle of intersection and radius of simple circular curve are 120° and 700 m respectively, then
i) length of long chord is 700 m
ii) length of curve is 700/2 m
a) only (i) is correct
b) only (ii) is correct
c) both (i) and (ii) are correct
d) none is correct

159. In a reverse curve, the superelevation provided at the point of reverse curvature is
a) zero
b) minimum
c) maximum
d) dependent on elements of reverse curve

160. Total angle of deflection of a transition curve is
a) spiral angle
b) spiral angle /2
c) spiral angle /3
d) spiral angle /4

161. The shape of the vertical curve generally provided is
a) circular
b) parabolic
c) spiral
d) elliptical

162. Perpendicular offset from the junction of transition curve and circular curve to the tangent is equal to
a) shift
b) two times the shift
c) three times the shift
d) four times the shift

163. If the radius of circular curve is five times the length of the transition curve, then the spiral angle is given by
a) 1/5 radian
b) 1/10 radian
c) 1/20 radian
d) 1/40 radian

*164. If L is the length of transition curve and R is the radius of circular curve, then the shift of the curve is directly proportional to
a) R and $1/L^2$
b) 1/R and L^2
c) $1/R^2$ and L
d) R^2 and 1/L

*165. If an upgrade of 1.5% is followed by a downgrade of 0.5% and rate of change of grade is 0.2% per 20m chain, then the length of vertical curve is
a) 100 m
b) 200 m
c) 300 m
d) 400 m

166. The difference in elevation of points between a vertical and a tangent is
a) directly proportional to its horizontal distance from the point of tangency
b) inversely proportional to its horizontal distance from the point of tangency
c) directly proportional to the square of its horizontal distance from the point of tangency
d) inversely proportional to the square of its horizontal distance from the point of tangency

167. Read the following two statements and select the correct answer.
i) Shift bisects the transition curve.
ii) Transition curve bisects the shift.
a) only (i) is correct
b) only (ii) is correct
c) both (i) and (ii) are correct
d) neither (i) nor (ii) is correct

168. The maximum value of centrifugal ratio on roads and railways respectively are taken as
a) 1/4 and 1/6
b) 1/6 and 1/8
c) 1/4 and 1/8
d) 1/8 and 1/4

169. Agonic line is the line joining points having
a) zero declination
b) minimum declination
c) maximum declination
d) same declination

170. For a circumpolar star, declination must be
a) equal to colatitude
b) more than colatitude
c) less than colatitude
d) any of the above

*171. For a star at its upper transit, the local sidereal time is equal to
a) H.A. of the star
b) Declination of the star
c) R.A. of the star
d) None of the above

*172. The limiting minimum declination of a circumpolar star having latitude 40^0 N is
a) 40^0
b) 50^0
c) 90^0
d) 0^0

*173. The relationship between tropical year TY and sidereal year SY is
a) TY>SY
b) TY<SY
c) TY=SY
d) any of the above

*174. A star has a declination of 55^0N. Its upper culmination is in the zenith of the place. The altitude of the lower culmination is

a) 55^0
b) 35^0
c) 70^0
d) 20^0

175. A vertical photograph was taken from an aircraft flying at an altitude of 2000 m above mean sea level. The focal length of the camera is 175 mm. The scale of the photograph for a hill of an elevation of 250m is
a) 1/ 10000
b) 1/ 15000
c) 1/20000
d) 1/ 25000

176. In an aerial photograph, if the photograph has a tilt of 3^0 & the focal length is 100 mm, then the distance between the perspective center & the plumb point will be
a) 100 tan 3^0
b) 100 cos 3^0
c) 100 / sin 3^0
d) 100 / cos 3^0

177. In aerial photograph, if the photograph has a tilt of 4^0 & the focal length is 200mm, then the distance between the principal point & plumb point will be
a) 200 tan 4^0
b) 200 cos 4^0
c) 200 / sin 4^0
d) 200 / cos 4^0

178. When the wind effect is not considered during flight planning, the result is a
a) crab
b) drift
c) mosaic
d) none of above

*179. An aircraft is flying at a ground speed of 200 km/h. The focal length of the camera is 200mm. The ground distance covered along the flight line between exposures is 2 km. The time interval between exposures is given by :
a) 18 sec
b) 36 sec
c) 72 sec
d) 180 sec

180. The relief displacement is radial from
1. isocentre on a vertical photograph
2. principal point on a vertical photograph
3. nadir point on a tilted photograph
4. isocentre on a tilted photograph

Of these statements
a) 1 and 3 are correct
b) 1 and 4 are correct
c) 2 and 3 are correct
d) 2 and 4 are correct

181. If f is the focal length, t is the angle of tilt then the distance of isocentre on the principal line from the principal point is
a) f tan t
b) f tan t/2
c) f cot t
d) f cot t/2

182. Parallax bar is used to measure
a) parallax
b) parallax difference
c) difference in elevation
d) relief displacement

183. As compared to mirror stereoscope, lens stereoscope
1. causes less strain to the eyes of the user
2. is small in size
Of these statements
a) only 1 is correct
b) only 2 is correct
c) both 1 and 2 are correct
d) both 1 and 2 are incorrect

184. Setting out of bridges involves determination of
1. length of centre line
2. height of piers
3. direction of centre line
4. position of piers
Of these statements
a) 1 and 2 are correct
b) 2 and 3 are correct
c) 3 and 4 are correct
d) 1 and 4 are correct

185. Match List I with List II and select the correct answer using the codes given below the lists :

List I		List II
A. Boning rod	1.	It is a flat, square, wooden board which is forced on the top of a pin anchored in ground. It is also known as slope rail.
B. Travelling rod	2.	The horizontal member of the cross head nailed to the posts.

C.	Sight rails	3.	It is generally used in layout of trenches for sewers, pipe lines etc
D.	Batter boards	4.	The horizontal piece can be moved along a graduated vertical staff.

Codes :

	A	B	C	D
a)	3	4	2	1
b)	3	4	1	2
c)	2	4	1	3
d)	2	4	3	1

186. In triangulation, the best shape of the triangle would be
a) equilateral
b) right angled isosceles triangle
c) isosceles with two base angles of 56^0 14′ each
d) isosceles with two base angles of 65^0 14′ each

187 Match List I with List II and select the correct answer using the codes given below the lists :

	List I		List II
A.	Fathometer	1.	Microwave instrument
B.	Passometer	2.	Sounding instrument
C.	Tellurometer	3.	Distance measuring instrument
D.	Altimeter	4.	Height measuring instrument
		5.	Pressure measuring instrument

Codes :

	A	B	C	D
a)	2	3	1	4
b)	3	5	1	4
c)	2	5	4	1
d)	3	2	5	1

[ES 93]

188. A closed compass traverse PQRS is run with a prismatic compass in a clock-wise direction:

Line	Fore bearing
PQ	50^0
QR	170^0
RS	230^0
SP	310^0

The value of the included angle S is
a) 360^0
b) -260^0
c) 100^0
d) 50^0

[ES 93]

189. The vertices of an astronomical triangle would include:
a) zenith, pole & heavenly body
b) azimuth, Zenith ,pole
c) azimuth, pole & heavenly body
d) azimuth, zenith & heavenly body

[ES 93]

190. The tilt displacement in an aerial photograph is radial from
a) plumb point
b) isocentre point
c) principal point
d) nadir point

[ES 93]

191. Match List I with List II and select the correct answer using the codes given below the Lists :

	List I		List II
A.	Adjustment of surveying instruments	1.	Bringing the various fixed parts of the instrument into proper relation with one another
B.	Bowditch rule	2.	Solution of 3-point problem
C.	Triangulation	3.	Measuring all the angles and the base line
D.	Bessel's method	4.	Balancing the latitudes and departures

Codes:

	A	B	C	D
a)	1	2	3	4
b)	2	1	4	3

c)

A	B	C	D
1	4	3	2

d)

A	B	C	D
3	2	1	4

[ES 94]

192. If a quantity A has a weight of 3, then the weight of A/3 will be
a) 28
b) 27
c) 24
d) 21
[ES 94]

193. In a parabolic vertical curve, the rising grade $g_1 = +0.80$percentage and the falling grade $g_2 = -0.70\%$. The rate of change of grade is 0.05 per chain. The length of the vertical curve is
a) 30 chains
b) 40 chains
c) 50 chains
d) 60 chains
[ES 94]

194. Which one of the following indicates the correct relationship between the flying height (H), the focal length (f), the air-base (B) and the photographic base (b)?
a) $B = \frac{f}{b.H}$
b) $B = \frac{b.H}{f}$
c) $B = \frac{b}{f.H}$
d) $B = \frac{H}{b.f}$
[ES 94 & CS 99]

195. While measuring horizontal angles by the method of repetition with a theodolite, readings are taken on both the verniers. Which one of the following errors will be eliminated by reading both the verniers?
a) Error due to eccentricity of the centres
b) Error due to imperfect adjustment of the line of collimation
c) Error due to imperfect adjustment of the horizontal axis
d) Error due to imperfect graduations
[ES 94]

196. An angle-measuring instrument reading upto one-sixth of a degree on the main scale is equipped with a vernier having 19 main scale divisions divided into 20 parts. The correct least count for the instrument is
a) 60 seconds
b) 30 seconds
c) 20 seconds
d) 10 seconds
[ES 94]

197. It is required to produce a small-scale map of an area in a magnetic zone by directly plotting and checking the work in the field itself. Which one of the following surveys will be most appropriate for this purpose?
a) Chain
b) Theodolite
c) Plane Table
d) Compass
[ES 95]

198. Match List I with List II and select the correct answer using the codes given below the lists:

List I		List II	
A.	Clinometer	1.	Area measuring instrument
B.	Pantograph	2.	Gradient finding instrument
C.	Tellurometer	3.	Angle measuring instrument
D.	Ghat tracer	4.	Plan enlarging instrument
		5.	Microwave instrument

Codes:

a)

A	B	C	D
1	2	5	3

b)

A	B	C	D
3	4	1	2

c)

A	B	C	D
1	5	4	3

d)

A	B	C	D
3	4	5	2

[ES 95]

199. A 30 m metric chain is found to be 0.1 m too short throughout the measurement. If the distance measured is recorded as 300 m, then the actual distance will be
a) 300.1 m
b) 301.0 m
c) 299.0 m
d) 310.0 m
[ES 95]

200. Offsets are
a) lateral measurements made with respect to main survey lines
b) perpendiculars erected from chain lines

367.	c	368.	b	369.	c	370.	b	371.	c	366.	a
373.	c	374.	d	375.	d	376.	a	377.	d	372.	a
379.	c	380.	a	381.	b	382.	b	383.	b	378.	a
385.	b	386.	d	387.	b	388.	d	389.	a	384.	d
391.	c	392.	b	393.	b	394.	b	395.	c	390.	b
397.	c	398.	b	399.	a	400.	c	401.	c	396.	a
403.	b	404.	c	405.	d	406.	a	407.	b	402.	b
409.	b	410.	b	411.	d	412.	d	413.	d	408.	b
415.	b	416.	a	417.	b	418.	a	419.	d	414.	d
421.	c	422.	b	423.	b	424.	d	425.	b	420.	d
427.	a	428.	b	429.	c	430.	a	431.	b	426.	a
433.	a	434.	a	435.	a	436.	d	437.	a	432.	a
439.	a	440.	c	441.	d	442.	c			438.	d

CHAPTER 2

1.	a	2.	c	3.	a	4.	c	5.	d	6.	a
7.	a	8.	a	9.	d	10.	d	11.	b	12.	b
13.	c	14.	b	15.	b	16.	d	17.	b	18.	c
19.	b	20.	d	21.	b	22.	a	23.	c	24.	c
25.	b	26.	d	27.	c	28.	a	29.	b	30.	b
31.	b	32.	b	33.	a	34.	a	35.	c	36.	c
37.	b	38.	a	39.	c	40.	c	41.	a	42.	d
43.	c	44.	c	45.	b	46.	a	47.	b	48.	b
49.	c	50.	a	51.	d	52.	c	53.	b	54.	d
55.	d	56.	d	57.	c	58.	d	59.	c	60.	a
61.	b	62.	c	63.	a	64.	b	65.	a	66.	d
67.	d	68.	d	69.	a	70.	b	71.	b	72.	c

73. d
79. c
85. d
91. c
97. c
103. c
109. a
115. b
121. d
127. c
133. c
139. d
145. a
151. c
157. c
163. b
169. a
175. a
181. b
187. a
193. a
199. c
205. c
211. d
217. c

74. a
80. c
86. b
92. b
98. c
104. a
110. c
116. a
122. b
128. c
134. a
140. c
146. b
152. b
158. a
164. b
170. b
176. d
182. b
188. b
194. b
200. a
206. d
212. c
218. a

75. a
81. a
87. d
93. a
99. a
105. a
111. d
117. c
123. c
129. b
135. b
141. c
147. b
153. b
159. a
165. b
171. c
177. a
183. b
189. a
195. a
201. d
207. a
213. d
219. c

76. c
82. a
88. b
94. c
100. d
106. d
112. d
118. c
124. c
130. b
136. a
142. a
148. d
154. c
160. c
166. c
172. b
178. b
184. d
190. b
196. b
202. b
208. b
214. a
220. a

77. c
83. a
89. a
95. c
101. d
107. a
113. d
119. c
125. b
131. b
137. b
143. b
149. d
155. b
161. b
167. c
173. b
179. b
185. a
191. c
197. c
203. d
209. c
215. a
221. b

78. c
84. b
90. b
96. b
102. c
108. c
114. a
120. a
126. d
132. c
138. c
144. d
150. a
156. d
162. d
168. c
174. d
180. c
186. c
192. b
198. d
204. a
210. a
216. a
222. b