3 CHAPTER

Chain Surveying

Q.1 Offsets are
(a) short measurements from chain line
(b) ties or check lines which are perpendicular to chain line
(c) set of minor instruments in chain surveying
(d) chain lines which go out of alignment

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

Q.3 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

Q.4 The approximate formula for radial or perpendicular offsets from the tangent is

(a) $\frac{x}{2R}$ (b) $\frac{x^2}{2R}$

(c) $\frac{x}{R}$ (d) $\frac{x^2}{R}$

Where, R = Radius of curve, x = distance from tangent point along it

Q.5 The apparatus required for measuring base line length using rigid bar, is
(a) Colby apparatus
(b) Wheeler's base line apparatus
(c) both of the above
(d) None of the above

Q.6 In chain surveying, tie lines are primarily provided
(a) to check the accuracy of the survey
(b) to take offsets for detailed survey
(c) to avoid long offsets from chain lines
(d) to increase the number of chain lines

Q.7 If a 30 m chain diverges through a perpendicular distance 'd' from its correct alignment, the error in length is

(a) $\frac{d^2}{60}$m (b) $\frac{d^2}{40}$m

(c) $\frac{d^2}{30}$m (d) None of these

Q.8 In the "two-peg test" in levelling, back sight and foresight readings are taken at a setup midway between two points P and Q. Then both points are sighted from an instrument setup outside of the line PQ and the results are used to determine the
(a) errors on the rods
(b) reading errors of the surveyor
(c) mislevelment of the line of sight
(d) accuracy of circular bubble

Q.9 The maximum length of offset so that displacement of point on the paper should not exceed 0.25 mm, given that maximum error expected is 2.5° from its true direction and scale is 1 : 2000 is
(a) 10.264 m (b) 8.462 m
(c) 11.462 m (d) 9.264 m

Q.10 Which of following instrument is used for setting out an offset at an angle of 45° with a chain line?
(a) A prism square (b) An open cross-staff
(c) An optical square (d) A french cross-staff

Q.11 When distance between two points of plan drawn to scale of 1 cm = 50 m measures 575 m, later it was found that scale used was 1 cm = 30 m. The true distance is
(a) 598.333 m (b) 868.333 m
(c) 698.333 m (d) 958.333 m

Q.12 A line is measured with steel tape which was exactly 30 m at 20°C at a pull of 98.1 N, the measured length being 1650 m. The temperature during measurement was 30°C and pull was 147.15 m. The true length of tape line is
(A_{tape} = 0.025 cm^2; α_{tape} = 3.5 × 10^{-6}, E_{tape} = 2.06 × 10^5 N/mm^2)
(a) 1650.2194 m (b) 1650.05775 m
(c) 1650.9124 m (d) 1650.2149 m

Q.13 In a box sextant, the angle between the horizon glass and index glass in 30°; the horizontal angle between the two points sighted by instrument is measured as:
(a) 45° (b) 60°
(c) 75° (d) 80°

Q.14 A long a slope the distance between two points A and B is measured as 505 m. The horizontal distance between A and B when difference of elevation of A and B is 65 m considering correction for slope is
(a) 500.7993 m (b) 480.7993 m
(c) 500.8169 m (d) 480.8169 m

Q.15 The sag correction for 30 m steel tape under pull of 78.5 N in three equal spans of 10 m each. Weight of 1 cm^3 of steel is 70.0786 N. Area of cross-section of tape = 0.1 cm^2 is
(a) 0.01253 m (b) 0.02135 m
(c) 0.03125 m (d) 0.05312 m

Q.16 A river is flowing from west to east. Two points A and B are selected on southern bank such that AB = 75 m. Point A is westwards. The bearings of trees C on the northern bank are observed to be 36° and 338° respectively from A and B. The width of river is
(a) 90.23 m (b) 68.23 m
(c) 71.67 m (d) 63.27 m

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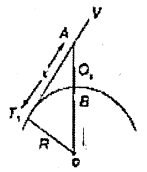
Answers Chain Surveying

1. (a) 2. (c) 3. (b) 4. (b) 5. (c) 6. (c) 7. (a) 8. (c) 9. (c) 10. (d)
11. (d) 12. (d) 13. (b) 14. (c) 15. (a) 16. (d)

Explanations Chain Surveying

2. (c)
The maximum tolerance in 20 m chain is ± 5 mm and in 30 m chain is ± 8 mm

4. (b)



$O_x = AB = OA - OB$

$O_x = \sqrt{R^2 + x^2} - R$

On expanding, we get

O_x(approximate) = $\frac{x^2}{2R}$

7. (a)

Slope correction = $\frac{h^2}{2L} = \frac{d^2}{2\times 30} = \frac{d^2}{60}$

8. (c)
The two peg test is used to calibrate the deviation of the line of sight of the level from a level line.

9. (c)
Let l be length of the offset
Displacement on the field for

$S = 2000 = l \sin\alpha$

∴ Displacement on paper

$= \frac{l\sin\alpha}{S}$

∴ $0.25 = \frac{l\sin\alpha}{2000}$

$$\therefore \quad l = \frac{0.25 \times 2000}{\sin 2.5^\circ}$$

or, $l = 11.462\,\text{m}$

10. (d)

French cross-staff consists of an octagonal brass tube with slits an all eight side. It has distinct advantage over open cross-staff as with it even lines at 45° can be set out from chain line.

11. (d)

$$\text{RF of scale used} = \frac{1}{30 \times 100} = \frac{1}{3000}$$

$$\text{RF to actual scale} = \frac{1}{50 \times 100} = \frac{1}{5000}$$

$$\text{Correct length} = \frac{\left(\frac{1}{3000}\right)}{\left(\frac{1}{5000}\right)} \times 575$$

$$= 958.333\,\text{m}$$

12. (d)

Correction for temperature,

$$C_t = \alpha(t_m - t_o)\,L$$

$$C_t = 3.5 \times 10^{-6}(30 - 20)\,1650$$

$$= 0.05775\,\text{m}$$

Correction for pull,

$$C_p = \frac{(P - P_0)L}{AE}$$

$$= \frac{(147.15 - 98.1) \times 1650}{(0.025 \times 100 \times 2.06 \times 10^6)}$$

$$= 0.15715\,\text{m}$$

Total correction

$$= C_t + C_p = 0.2149\,\text{m}$$

$\therefore$ True length of line

$$= 1650 + 0.2149 = 1650.2149\,\text{m}$$

13. (b)

Angle between two points sighted by instrument

$$= 2 \times 30^\circ = 60^\circ$$

(Principle on which box sextant measures horizontal angle)

14. (c)

Horizontal distance

$$= \sqrt{(505)^2 - 65^2} = 500.7993$$

Again correction for slope,

$$C_s = \frac{l^2}{2L} = \frac{(65)^2}{2 \times 505} = 4.1831\,\text{m}$$

Horizontal distance is

$505 - 4.1831 = 500.8169\,\text{m}$

15. (a)

Volume of tape/metre run

$$= (0.1 \times 100) = 10\,\text{cm}^3$$

Weight of tape/metre run

$$= (10 \times 0.0786) = 0.786\,\text{N}$$

Total weight of tape in one span

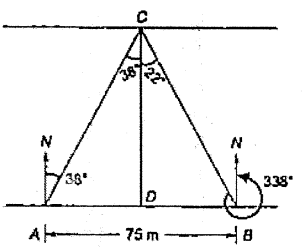
$$W = 10 \times 0.0786\,\text{N} = 7.86\,\text{N}$$

Sag correction in 3 spans of 10 m each

$$C_s = \frac{3 \times 10 \times (7.86)^2}{24(78.5)^2}$$

$$C_s = 0.01253\,\text{m}$$

16. (d)



Let CD be width of river

$$\frac{AD}{CD} = \tan 38^\circ$$

and $$\frac{DB}{CD} = \tan 22^\circ$$

Hence, $$\frac{AD}{CD} = \tan 38^\circ$$

Adding

$$AD + DB = 75 = CD(\tan 38^\circ + \tan 22)$$

$$\Rightarrow \quad DB = CD \tan 22^\circ$$

$$\therefore \quad CD = \frac{75}{(\tan 38^\circ + \tan 22^\circ)}$$

$$= 63.27\,\text{m}$$

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