

Assignment

Chapter 1: Introduction to surveying, Linear measurement

- Q1. Define surveying.
Explain the fundamental principles of surveying.
- Q2. Explain clearly the points of difference between plane surveying and Geodetic surveying.
- Q3. Describe different types of chains commonly used in surveying, stating the special advantages of each.
- Q4. Describe different types of Tapes commonly used in surveying stating the advantages of each.
- Q5. Explain the following
- (i) The Leader and the follower
 - (ii) Drop arrow
 - (iii) Hypotenusal allowance
 - (iv) Ranging rod, Plumb bob.
 - (v) Precision & accuracy.
 - (vi) Positive cumulative error
 - (vii) negative cumulative error
 - (viii) compensating error
- Q6. Give the sources of errors in linear measurements and say which of them are cumulative and which are compensating.
- Q7. Enumerate the list of corrections to be applied in linear measurement and say whether they are additive or subtractive.
- Q8. What do you mean by nominal and designated lengths of a chain?

Assignment

Chapter 1 Part 2

Q1. The length of a survey line measured with a 30m chain was found to be 631.5 m. When the chain was compared with a standard chain, it was found to be 0.10 m too long. Find the true length of the survey line.

Q2. A 20 m chain was found to be 4 cm too long after chaining 1400 m. It was 8 cm too long at the end of days work after chaining a total distance of 2420 m. If the chain was correct before commencement of the work, find the true distance.

Q3. A line was measured by 30 m and 100 ft. chain respectively and was 12 chains in length in each case. If the 30 m chain was 0.2 m too long, find the correct length of the 100 ft. chain upto three decimal places. Take 1 m = 3.28ft.

Q4. The area of a certain field was measured with a 30 m chain and found to be 5000 sq. m. It was afterwards detected that the chain was 10 cm too short. What is the true area of the field ?

Q5. The volume of an excavation was computed from the measurements taken by a 20 m chain and found to be 58,75,000 cu.m. On the close of the work it was detected that the chain used was 5 cm too long, whereas it was correct at the commencement of the work. Calculate the correct volume of the excavation.

Q6. A line was measured with a steel tape was exactly 30 m at 20° C at a pull of 100 N (or 10 kgf), the measured length being 1650.00 meters. The temperature during the measurement was 30° C and the pull applied was 150 N (or 15 kgf). Find the length of the line, if the cross sectional area of the tape was 0.025 sq.cm. The coefficient of expansion of the material of the tape per 1° C = 3.5×10^{-6} and the modulus of elasticity of the material of the tape = 2.1×10^5 N/mm² (2.1×10^6 kg/cm²).

Q7. To measure base line, a steel tape 30 m long standardized at 15° C with a pull of 100 N (10 kgf) was used. Find the correction per tape length, if the temperature at the time of measurement was 20° C and the pull exerted was 160 N (16 kgf). Weight of the 1 cubic cm of steel is 0.0786 N (or 0.00786 kgf). Weight of the tape = 8 N (or 0.8 kgf). $E = 2.1 \times 10^5$ kg/sq.cm. Coefficient of the expansion of the tape per 1° C = 7.1×10^{-7} .

Q8. A tape 100m long, 6.35 mm wide, 0.5 mm thick was used to measure a line, the apparent length of which was found to be 1986.96 m. The tape was standardized under a pull of 67.5 N, but after the line was measured, it was found that the pull was actually used during the measurement was 77.5 N. What was the true length of the line if the tape was standardized and used on the field. $E = 200000$ N/mm².

Q9. A base line AC was measured in two parts along two straight drains AB and BC of length

1650 m and 1819.5 m with a steel tape which was exactly 30m at 25° C at a pull of 9 N. The applied pull during measurement of both parts was 200 N whereas the respective temperatures were 45° C and 25° C. The slopes of the drains AB and AC were 3° and 3°30' and the deflection angle of BC was 10° right. Find the correct length of the base line if the cross section area of the tape was 2.5 mm². The coefficient of expansion and the modulus of elasticity of the tape material were 3.5×10^{-6} per 1° C and 21×10^5 N/mm² respectively.

Q10. The length of a line measured with a 20m chain was found to be 375 m. The true length of the line was known to be 374.5 m. Find the error in the chain.

Q11. A 30 m chain was found to be 15cm too long after chaining 1524 m. The same chain was found to be 30.5 cm too long after chaining the total distance of 3048 m. Find the correct length of the total distance chained assuming that the chain was correct at the commencement of chaining.

Assignment 3

Chapter 2 Part 1

- Q1. Explain the principle used in chain surveying and its limitations.
- Q2. Describe the advantages of working from whole to part.
- Q3. What do you understand by well conditioned triangles and why are they used ?
- Q4. Describe the principle, construction and working of an optical square with a neat sketch.
- Q5. Explain briefly about the obstacles in chain surveying and how would you counter them during surveying.
- Q6. Enumerate the difference between direct ranging and indirect ranging.
- Q7. Define the following terms :
- (i) swing offset (ii) oblique offset (iii) base line (iv) check line (v) tie line (vi) tie station (vii) well conditioned triangles (viii) main survey station (ix) subsidiary survey station
- Q8. Give a list of sources of errors in chain survey and say which of these are cumulative and which are compensating.

Assignment 4

Chapter 2 Part 2

Q1. A survey line BAC crosses a river, A and C being near and far banks respectively. A perpendicular AD, 40 m long is set out at A. If the bearings of AD and DC are $38^{\circ}45'$ and $278^{\circ}45'$ respectively, find the width of the river.

Q2. A survey line CD crosses a river, D being on the near bank and E on the opposite bank. A perpendicular DF = 150 m is ranged at D on the left. From F bearings of E and C are observed to be 25° and 115° respectively. If the chainage of C is 1250 m and that of D is 1620 m, find the chainage of E.

Q3. A chainage line PQR crosses a stream, Q and R being the near and far banks respectively. A line QM of length 60 m is set out at right angles to the chain line at Q. If the bearings of QM and MR are $282^{\circ}45'$ and $42^{\circ}45'$ respectively, find the width of the stream.

Q4. A chain line PQR crosses a river, Q and R being on the near and far banks respectively. A perpendicular QS, 90 m long, is set out at Q on the left of the chain line. The respective bearings of R and P taken at S are $77^{\circ}30'20''$ and $167^{\circ}30'20''$. Find the chainage of R given that PQ is 45 m and the chainage of Q is 650 m.

Q5. A river is flowing from West to East. For determining the width of the river two points A and B are selected on the southern bank such that distance AB = 75 m. Point A is westwards. The bearings of a tree C on the Northern bank are observed to be 38° and 338° respectively from A and B. Calculate the width of the river.

Assignment 5

Chapter 3 part 1

Q1: Define the following terms :

(i) Meridian (ii) True meridian (iii) Magnetic meridian (iv) Convergency of meridian (v) Bearing
(vi) True bearing (vii) Magnetic bearing (viii) Azimuth (ix) Arbitrary Meridian

Q2: What is meant by traverse surveying ? How does it differ from chain surveying ? Distinguish between a closed and an open traverse.

Q3: What are the sources of errors in compass survey and what precautions are taken to eliminate them.

Q4: Explain clearly the points of difference between the prismatic compass and surveyor's compass.

Q5: What is local attraction ? How does it detected and removed ?

Q6: Briefly explain the various types of variation of declination.

Q7: What do you understand by closing 'error' of compass traverse.

Q8: What are the advantages and disadvantages of compass surveys ?

Q9: Write short notes on :

(i) Fore and back bearings

(ii) Whole circle bearing and Reduced bearing

(iii) Local attraction and dip of needle

(iv) Isogonic lines and agonic lines.

(v) Secular and irregular variations.

✓ 24. Convert the following whole circle bearings to quadrantal bearings;

(a) $87^{\circ} 30'$

(b) $120^{\circ} 05'$

(c) $210^{\circ} 10'$

(d) $266^{\circ} 36'$

(e) $310^{\circ} 10'$

(f) $359^{\circ} 15'$.

✓ 25. Convert the following quadrantal bearings to the whole circle bearings:

(a) N $30^{\circ} 30'$ E

(b) S $20^{\circ} 45'$ E

(c) S $10^{\circ} 45'$ W

(d) N $50^{\circ} 45'$ W

✓ 26. (i) Write the back bearings of the following fore-bearings :

(a) $30^{\circ} 05'$

(b) $120^{\circ} 25'$

(c) $225^{\circ} 15'$

(d) $310^{\circ} 36'$.

(ii) Write the fore bearings of the following back bearings :

(a) $67^{\circ} 15'$

(b) $136^{\circ} 36'$

(c) $189^{\circ} 20'$ (d) $7^{\circ} 07'$

27. The bearings of the sides of a triangle ABC are as under :

$$AB = 45^{\circ} 15'$$

$$BC = 150^{\circ} 50'$$

$$CA = 270^{\circ} 00'$$

Calculate the interior angles of the triangle.

28. The bearings of lines AB, and AC are $37^{\circ} 45'$ and $127^{\circ} 35'$ respectively. Calculate the acute angle BAC.

29. The bearing of a diagonal AC of a left handed square is $36^{\circ} 30'$. Find the bearing of the diagonal BD.

30. The following fore bearings were observed in running a closed compass traverse :

$$AB = 80^{\circ} 35'$$

$$BC = 170^{\circ} 35'$$

$$CD = 260^{\circ} 35'$$

$$DA = 350^{\circ} 35'$$

Calculate the interior angles of the closed traverse.

31. The bearings of the sides of a traverse ABCDEA are as follows :

Side	F.B.	B.B.
AB	$150^{\circ} 10'$	$285^{\circ} 10'$
BC	$20^{\circ} 20'$	$200^{\circ} 20'$
CD	$275^{\circ} 35'$	$95^{\circ} 35'$
DE	$179^{\circ} 45'$	$359^{\circ} 45'$
EA	$120^{\circ} 50'$	$300^{\circ} 50'$

Compute the interior angles of the traverse and exercise the geometric checks.

32. The magnetic bearing of a line : AB is $125^{\circ} 25'$. Find its true bearing if the magnetic declination at A is (a) $9^{\circ} 15' W$ (b) $5^{\circ} 30' E$.

33. The true bearing of a line CD is $135^{\circ} 35'$. Find its magnetic bearing if the magnetic declination at C is (a) $5^{\circ} 25' W$; (b) $3^{\circ} 10' E$.

34. A line has a true bearing of 235° . The declination is $3^{\circ} 30' E$. Calculate the magnetic bearing on whole circle as well as reduced bearing systems.

35. Find the magnetic declination, if magnetic bearings of the sun at noon are : (a) $182^{\circ} 30'$ (b) $177^{\circ} 30'$ (c) $359^{\circ} 10'$.

36. The true bearing of a line is $N 30^{\circ} 45' E$. Compute the magnetic bearing of the line if the magnetic declination is : (a) $3^{\circ} 10' E$ and (b) $5^{\circ} 25' W$.

37. In an old survey made when the magnetic declination was $3^{\circ} 39' W$, the magnetic bearing of a line AB was $N 56^{\circ} 12' E$. If the present

magnetic declination in the same locality is $3^{\circ} 26' E$, calculate the true bearing and magnetic bearing of AB .

38. The following bearings were observed with a compass on a traverse:

Line	F.B.	B.B.	
AB	$72^{\circ} 0'$	BA	$252^{\circ} 0'$
BC	$93^{\circ} 0'$	CB	$273^{\circ} 0'$
CD	$168^{\circ} 0'$	DC	$344^{\circ} 0'$
DE	$176^{\circ} 0'$	ED	$0^{\circ} 0'$
EF	$187^{\circ} 0'$	FE	$7^{\circ} 0'$

At what station(s) do you suspect local attraction? Find the correct bearings.

39. The following bearings were observed on a traverse :

Line	F.B.	B.B.
AB	$80^{\circ} 45'$	$260^{\circ} 00'$
BC	$130^{\circ} 30'$	$311^{\circ} 35'$
CD	$240^{\circ} 15'$	$60^{\circ} 15'$
DA	$290^{\circ} 30'$	$110^{\circ} 10'$

Make corrections for local attraction and declination of $1^{\circ} 30' W$ and calculate true fore bearings.

40. The following fore and back bearings were observed in an open compass traverse :

Line	F.B.	B.B.
AB	$223^{\circ} 00'$	$42^{\circ} 45'$
BC	$166^{\circ} 30'$	$346^{\circ} 45'$
CD	$02^{\circ} 15'$	$182^{\circ} 15'$
DE	$174^{\circ} 15'$	$354^{\circ} 00'$

Which stations are affected by local attraction and how much? Determine the true fore and back bearings if area is known to have declination of $2^{\circ} 15'$ east.

41. The following bearings were taken in running an open traverse with a compass in a place where local attraction was suspected :

Line	F.B.	B.B.
AB	$44^{\circ} 40'$	$225^{\circ} 20'$
BC	$96^{\circ} 20'$	$274^{\circ} 18'$
CD	$30^{\circ} 40'$	$212^{\circ} 02'$
DE	$320^{\circ} 12'$	$140^{\circ} 12'$

At what stations do you expect local attraction. Find the corrected bearings.

42. Give the corrected bearings of the following traverse taken from-a compass survey :

50. The following bearings were taken in running a closed compass traverse :

<i>Line</i>	<i>F.B.</i>	<i>B.B.</i>
<i>AB</i>	48° 25'	230° 00'
<i>BC</i>	177° 45'	356° 00'
<i>CD</i>	104° 15'	284° 55'
<i>DE</i>	165° 15'	345° 15'
<i>EA</i>	259° 30'	79° 90'

(i) State what stations were affected by local attraction and by how much.

(ii) Determine the corrected bearings.

(iii) Calculate the true bearings if the declination was 1° 30' W.