

**Surveying - I**

P. Pages : 3

Time : Three Hours

**NIR/KW/18/3351**

Max. Marks : 80

- Notes :
1. All questions carry marks as indicated.
  2. Solve Question 1 OR Questions No. 2.
  3. Solve Question 3 OR Questions No. 4.
  4. Solve Question 5 OR Questions No. 6.
  5. Solve Question 7 OR Questions No. 8.
  6. Solve Question 9 OR Questions No. 10.
  7. Solve Question 11 OR Questions No. 12.
  8. Assume suitable data whenever necessary.
  9. Illustrate your answers whenever necessary with the help of neat sketches.

1. a) Explain the principles of surveying. 5
- b) The following are the observed Bearing of the line of the Traverse ABCDEA with the compass in a place where local attraction was suspected. 8

Line	F.B.	B.B.
AB	191°41'	13°0'
BC	39°30'	222°30'
CD	22°15'	200°30'
DE	242°45'	52°45'
EA	330°15'	147°45'

Find the correct Bearing of line.

**OR**

2. a) Explain with Diagram various parts of prismatic compass and their uses. 7
- b) A steel Tape was exactly 30m long at 20°C when supported throughout its length under a pull of 10 kg. A line was measured with this Tape under a pull of 15kg at a mean Temperature of 32°C and found to be 780m long. The cross-sectional area of Tape = 0.03cm<sup>2</sup>, and its total weight = 0.693kg  $\alpha$  for steel =  $11 \times 10^{-6}$  per °C and E for steel =  $2.1 \times 10^6$  kg/cm. Compute the True length of line when the Tape was supported During measurement at every (i) 15m (ii) 30m. 6
3. a) What is reciprocal levelling and why it is employed? What error will be eliminated By this? 5
- b) The following are the consecutive staff reading observed with a 4m levelling staff at a common interval of 30m  
0.525m, on A, 0.936, 1.953, 2.846, 3.644, 0.962, 2.534, 3.844, 0.956, 1.579 and 3.016m on B. The elevation of point A is 120m. Make a level Book and apply usual-check. Determine the Gradient of Line AB. 8

**OR**

4. a) What are the Temporary adjustment of Dumpy level? And How are they carry out. 6

b) The following Notes refers to reciprocal levels, 7

Instrument at	Staff	Reading at	Remark
	A	B	
A	1.155	2.595	RL of A = 525.0
B	0.985	2.415	Distance AB = 500m

Find :-

- True RL of point B
- Combined correction for curvature and Refraction
- Error in line of Collimation.

5. a) Explain with neat sketches the characteristic of contours. 6

b) In conducting the Two-peg test of level, the same was setup at a station 'C' exactly midway between pegs A and B 90m apart. The staff reading on pegs A and B was found to be 1.325m and 1.565m. The instrument was then moved and set up at point 'D' Beyond peg A in line BA produced at a Distance 10m from A. The staff readings on A and B were 1.110m and 1.375m. Calculate the staff reading on pegs A and B to give a Horizontal line of sight. 7

**OR**

6. a) What are the fundamental lines of level? How to check and adjust for the Desired relation between them? 6

b) A Theodolite was set up at a Distance of 300m from a Tower, and the Angle of elevation to its Top was  $10^{\circ}50'$ . The staff reading on B.M. of R.L. 80.20m with the Telescope Horizontal was 0.955. Find the R.L. of Top of Tower. 7

7. a) An incomplete Traverse table is obtain as follow. 8

Line	Length(m)	Bearing
AB	100.50	?
BC	80.5	$140^{\circ}30'$
CD	60.0	$220^{\circ}30'$
DA	?	$310^{\circ}15'$

Calculate the length of DA and Bearing of AB.

b) What are the permanent adjustment of Theodolite? Explain any one adjustment in Detail. 6

**OR**

8. a) Find the area of closed Traverse having the following Data, By the Co-ordinate method. 7

Line	Latitude	Departure
AB	225.5	120.5
BC	-245.0	210.0
CD	-150.5	-110.5
DA	170	-220

b) List out the various uses of Theodolite and explain measurement of vertical Angle. 7

9. a) Define principle of plane Table surveying. Explain Traversing method of plane Table surveying. 6

b) A railway embankment of formation width of 8m and side slope 2:1 is to constructed. The ground level along the centre line is as follows: 7

Chainage	0	50	100	150	200	250
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G.L(m)	115.75	114.35	116.80	115.20	118.50	118.25
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The embankment has a rising gradient of 1 in 100, and the formation level at zero chainage is 115.00.

Assume the ground is level across the centre line, compute the volume of earthwork.

**OR**

10. a) Explain the Three point problem in plane Table surveying. 6

b) The Ground level along the centre line of a road is given below: 7

Chainage	0	50	100	150	200	250	300
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G.L(m)	117.50	116.25	115.95	116.65	117.20	117.85	115.75
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It is proposed that the formation level of RL 115.00

Should be kept constant of starting from the chainage 'zero'. The Formation width of the road is 8m and the side slope 1:1. The Ground level Transverse to the centre line.

11. a) What is sounding? Explain any two methods of sounding. 7

b) What are the equipments required for sounding? Explain the use of each equipment. 7

**OR**

12. Write short notes on **any three**. 14

i) E.D.M.

ii) GPS.

iii) Transferring the level underground.

iv) Uses of Hydrographic survey.

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**Surveying – I**

P. Pages : 3

Time : Three Hours

**NJR/KS/18/4406**

Max. Marks : 80

- Notes :
1. Solve Question 1 OR Questions No. 2.
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  3. Solve Question 5 OR Questions No. 6.
  4. Solve Question 7 OR Questions No. 8.
  5. Solve Question 9 OR Questions No. 10.
  6. Solve Question 11 OR Questions No. 12.
  7. Assume suitable data whenever necessary.
  8. Illustrate your answers whenever necessary with the help of neat sketches.
  9. Use of non programmable calculator is permitted.

1. a) Describe with neat sketch, the construction and use of an open cross-staff. 7
- b) Define ranging and explain various methods of ranging. 6

**OR**

2. a) Differentiate between Prismatic compass and Surveyor's compass. 6
- b) The following are the observed bearings of the lines of a traverse. ABCDEA with a compass in a place where local attraction was suspected. 7

Line	FB	BB
AB	191°45'	13°0'
BC	39°30'	222°30'
CD	22°15'	200°30'
DE	242°45'	62°45'
EA	330°15'	147°45'

Find the correct bearings of the lines.

3. a) The following successive readings were taken with a dumpy level along a chain at common interval of 20m. The first reading was taken on a chainage 140m. The RL of the second change point was 107.215m, the instrument was shifted after the third and seventh readings. Calculate the RLs of all the points. 3.150, 2.245, 1.125, 3.860, 2.125, 0.760, 2.235, 0.470, 1.935, 3.255 & 3.890m. 7
- b) An observer standing on the deck of a ship just sees a light house. The top of the light house is 65m above the sea level and height of the observer eye is 5m above the sea level. Find the distance of the observer from the light house. 6

**OR**

4. a) Explain with neat sketches of characteristics of contour. 6

b) The following notes refer to reciprocal levels.

7

Instrument at	Staff reading at		Remark
	A	B	
A	1.055	1.655	Distance AB = 1500m.
B	0.940	1.550	RL of A = 220.250m

Find:

- i) True RL of point B.
- ii) Combined correction for curvature and refraction.
- iii) Error in line of collimation.

5. a) Derive the equation to determine RL of top the elevated object as the base of the object is not accessible and nearer theodolite is higher than the far theodolite.

6

b) A Leveling instrument was set up at exactly midway between two pegs A & B, 100m apart. The staff readings on A & B were 1.875 & 1.790 resp. The instrument was then set up at a distance of 10m from A at the line AB. The respective staff readings were 1.630 & 1.560. Calculate the correct staff readings on A & B when the line of collimation is exactly horizontal.

7

**OR**

6. a) Explain collimation system & Rise and Fall system.

6

b) A Theodolite was set up at a distance of 250m from a tower, and the angle of elevation to its top was  $15030'$ . The staff reading on B.M. of reduced level 210.20 m the telescope horizontal was 0.350. Find the RL of top of Tower.

7

7. a) What are the temporary adjustment of Theodolite? Explain in details.

7

b) The record of the closed traverse is given below,

7

Line	Length	Bearing
AB	100.5	N $30^{\circ}30'E$
BC	?	S $45^{\circ}0'E$
CD	75.0	S $40^{\circ}30'W$
DE	50.5	S $60^{\circ}0'W$
EA	?	N $40^{\circ}15'W$

Calculate the length of BC & EA.

**OR**

8. a) Explain the repetition method of measuring horizontal angle.

7

b) Find the area of closed traverse having the following data, by the departure and total latitude method.

7

Side	Latitude (m)	Departure (m)
AB	+108.00	+4.00
BC	+15.00	+249.00
CD	-123.00	+4.00
DA	0.00	-257.00

9. a) Define principal of plane table Surveying. Explain traversing method of plane table surveying. **6**
- b) An embankment of width 10m and side slope 1.5:1 is required to be made a ground which is level in a direction transvers to the center line. The central heights at 40m intervals are as follows: 0.90, 1.25, 2.15, 2.50, 1.85, 1.35, & 0.85. Calculate the volume of earthwork according to Prismoidal Formula. **7**

**OR**

10. a) Explain the resection method of plane table surveying. **6**
- b) The formation width of road is 10m and the side slope for cutting is 1:1 and filling 2:1. The transverse slope of the ground is 1:5 (fall). The sections are 50m apart. The depth of excavation at the center of the two sections is 0.50m and 0.70m respectively. Find the volume of cutting and filling. **7**
11. a) Enlist the various methods of locating soundings. Explain any one method in details. **7**
- b) Explain the measurement of velocity of flow with neat sketches. **7**

**OR**

12. a) Write short note on **any three**. **14**
- |                         |  |
|-------------------------|--|
| 1) E.D.M.               | 2) G.P.S.                                  |
| 3) Hydrographic survey. | 4) Transferring the alignment underground. |

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1. All questions carry marks as indicated.
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  4. Solve Question 5 OR Questions No. 6.
  5. Solve Question 7 OR Questions No. 8.
  6. Solve Question 9 OR Questions No. 10.
  7. Solve Question 11 OR Questions No. 12.
  8. Due credit will be given to neatness and adequate dimensions.
  9. Assume suitable data whenever necessary.
  10. Illustrate your answers whenever necessary with the help of neat sketches.
  11. Use of non programmable calculator is permitted.

1. a) What is the principle of surveying? Explain in detail. 5
- b) The following bearings were observed in running a compass traverse. Calculate the interior angles and correct them for observational error, find corrected bearing of all the remaining sides:- 8

Line	Fore Bearing	Back Bearing
AB	75°5'	254°20'
BC	115°20'	296°35'
CD	165°35'	345°35'
DE	224°50'	44°5'
EA	304°50'	125°5'

**OR**

2. a) Describe the construction of optical square and explain how to use it in field. 6
- b) A line was measured with a steel tape which was exactly 30m at a temperature of 20°C and a pull of 100N. The measured length was 1620m. The temperature during measurements was 30°C and the pull applied was 150N. Find the true length of line if the cross sectional area of the tape was 0.025cm<sup>2</sup>. The Co-efficient of thermal expansion of the material of the tape is  $3.50 \times 10^{-6} / ^\circ\text{C}$  & modulus of elasticity of the tape material is  $2.1 \times 10^7 \text{ N/cm}^2$ . 7
3. a) Define visible horizon distance and derive the expression for it. 5
- b) The following consecutive readings were taken with the help of a level and 4m levelling staff at common interval of 30m. 1.904, 2.650, 3.905, 4.025, 1.965, 1.705, 1.595, 1.265, 2.545, 2.005, 3.145. The instrument was shifted after the fourth and seventh reading. The first reading was taken on the B.M. of reduce level 101.00m. Calculate R.L. of other points in a level page and apply arithmetic check. 8

**OR**

4. a) What are the temporary adjustments of dumpy level? How it is done? 6

b) The following notes refer to the reciprocal levels taken with one level:- 7

Instrument station	Staff Reading at		Remarks
	A	B	
A	1.029	1.634	Distance between A & B = 800m R. L of A = 421.543m
B	0.943	1.542	

Find :-

- i) True RL of point B.
- ii) Combined correction for curvature and refraction.
- iii) Error in line of Collimation.

5. a) Explain the procedure of indirect levelling. 6

b) A level was tested by the two-peg method and following results were observed. Calculate staff readings on A & B to give a horizontal line of sight. 7

Instrument at	Staff Reading at		Remark
	A	B	
C	1.150	1.795	Distance AB = 100m. C is exactly mid-way between A & B. D lies on BA & 20m behind pt. 'A'
D	1.538	1.933	

**OR**

6. a) Define contouring and explain various uses of contour map. 6

b) A theodolite was set-up at a distance of 300m from a tower, and the angle of elevation to its top was  $10^{\circ}50'$ . The staff reading on B.M. of R.L. 80.20m with the telescope horizontal was 0.955. Find the R.L. of the top of tower. 7

7. a) What are the permanent adjustments of theodolite? Explain any one adjustment in detail. 6

b) Following notes refer to theodolite surveying calculate Latitudes, Departures and closing error using Bowditch's rule. 8

Line	Length (m)	W.C.B.
AB	89.31	$45^{\circ}10'$
BC	219.76	$72^{\circ}05'$
CD	151.18	$161^{\circ}52'$
DE	159.10	$228^{\circ}43'$
EA	232.26	$300^{\circ}42'$

**OR**

8. a) Distinguish between consecutive & independent Co-ordinates of traverse station. 6

b) Find area of closed traverse having following data, by Co-ordinate method.

Side	Latitude (m)	Departure (m)
AB	+ 225.50	+ 120.50
BC	- 245.00	+ 210.00
CD	- 150.50	- 110.50
DA	+ 170.00	- 220.00

9. a) Define orientation of plane table and explain various method of orientation. **6**
- b) A road in cutting has a formation width of 9m, side slopes of 1.5:1 & Centre line depths at chainages tabulated below. **7**

Chainage (m)	0	30	60	90	120	150	180
Depth (m)	0.3	0.45	0.36	0.60	1.20	1.11	0.15

Calculate earthwork by prismatic formula.

**OR**

10. a) Explain three point problem in plane table surveying. **7**
- b) Explain Trapezoidal and Simpson's rule for area calculation. **6**
11. a) What is meant by sounding? Explain any one method of locating sounding. **7**
- b) What are the equipment required for sounding? Explain the use of each equipment. **7**

**OR**

12. Write short note on **any three**. **14**
- i) EDM.
- ii) GPS.
- iii) Uses of Hydrographic survey.
- iv) Procedure of transferring the levels underground.

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1. All questions carry marks as indicated.
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  7. Solve Question 11 OR Questions No. 12.
  8. Due credit will be given to neatness and adequate dimensions.
  9. Assume suitable data whenever necessary.
  10. Illustrate your answers whenever necessary with the help of neat sketches.
  11. Use of non programmable calculator is permitted.

1. a) Define Ranging and explain various methods of Ranging. 5
- b) The following bearings were observed in running a close travers. 8

LINE	F.B.	B.B.
AB	70°50'	254°20'
BC	115°20'	296°35'
CD	165°35'	345°35'
DE	224°50'	44°45'
EA	304°50'	125°50'

Determine the correct included angles and determine the correct bearings.

**OR**

2. a) Differentiate between Prismatic Compass and Surveyor's Compass. 6
- b) The area of an old map plotted to a scale of 10 m to 1 cm measures now as 250 cm<sup>2</sup> as measured by planimeter. The plan is found to have shrunk so that a line originally 10 cm long now measures 9.80 cm only further 20 m chain used was 8 cm to short. Find the true area of the land. 7
3. a) The following consecutive readings were taken with a level and 4 m leveling staff on continuously sloping ground at common interval of 50m. 0.350, 0.750, 2.655, 2.820, 3.150, 0.670, 1.445, 1.790, 2.530, 2.870, 3.850, 0.730, 2.125, 3.310, 3.750. The R.L. of first point is 325.50 m. Calculate R.L. of other points in a level page and also determine the gradient of line Use HL method. 8
- b) An observer standing on the deck of a ship just sees a light house. The top of the light house is 65 m above the sea level and height of the observer's eye is 5 m above the sea level. Find the distance of the observer from the light house. 5

**OR**

4. a) What are the temporary adjustments of Auto level ? Explain how to carry it. 6
- b) The following notes refer to reciprocal levels : 7

Instrument at	Staff Reading at		Remark
	A	B	
A	1.055	1.655	Distance AB = 1500 m. RL of A = 220.250 m
B	0.940	1.550	

Find :

- i) True RL of point B.
  - ii) Combined correction for curvature and refraction.
  - iii) Error in line of collimation.
5. a) In conducting the two-peg test of level, the same was set up at a station 'C' exactly mid-way between pegs A and B 100 m apart. The staff reading on pegs A and B was found to be 1.325 m and 1.565 m. The instrument was then moved and set up at point 'D' beyond peg A in line BA produced at a distance 10 m from A. the staff readings on pegs A and B were 1.110 m and 1.375 m. Calculate the staff readings on pegs A and B to give a horizontal line of sight. 7
- b) Explain with neat sketches the characteristics of contours. 6

**OR**

6. a) What are the fundamental lines of level ? How to check and adjust for the desired relation between them ? 7
- b) A theodolite was setup at a distance of 250 m from a tower, and the angle of elevation to its top was  $15^{\circ}30'$ . The staff reading on B.M. of reduced level 210.20 m the telescope horizontal was 0.350. Find the R.L. of the top of tower. 6
7. a) What are the temporary adjustments of theodolite ? Explain in detail. 6
- b) Following notes refer to theodolite surveying. 8

Line	Length (m)	Bearing
AB	100.0	?
BC	80.50	$140^{\circ}30'$
CD	60.25	$220^{\circ}30'$
DA	?	$310^{\circ}15'$

Calculate the distance DA and bearing of AB.

**OR**

8. a) Find the area of closed traverse having the following data, by the departure and total latitude method. 7

Side	Latitude (m)	Departure (m)
AB	+108.00	+4.00
BC	+15.00	+249.00
CD	-123.00	+4.00
DA	0.00	-257.00

- b) List out the various uses of theodolite and explain measurement of vertical angle. 7
9. a) Define principle of plane table surveying. Explain Traversing method of plane table surveying. 6
- b) A railway embankment is 8 m wide and 250 m in length at the formation level with a side slope of 2:1. The embankment has a rising gradient of 1 in 100. The ground level at 50 m interval are as follows :

Chainage (m)	0	50	100	150	200	250
G.L. (m)	115.50	114.35	116.90	115.30	118.60	118.30

The formation level of zero chainage is 115.00 m. Assuming ground level across the center line compute the volume of earth work.

**OR**

10. a) Explain the resection method of plane table surveying. 6
- b) The width of formation width of road is 10 m and the side slopes for cutting is 1:1 and filling 2:1. The transverse slope of the ground is 1 in 5 (fall). The sections are 50 m apart. The depth of excavation at the centers of two sections is 0.50 m and 0.70 m respectively. Find the volume of cutting and filling. 7
11. a) Enlist the various methods of locating soundings. Explain any one method in detail. 7
- b) Explain the measurement of velocity of flow with neat sketches. 7

**OR**

12. Write short notes on **any three**. 14
- i) Transferring the alignment underground.
- ii) E.D.M.
- iii) G.P.S.
- iv) Hydrographic survey.

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**Surveying - I Paper - IV**

P. Pages : 2

Time : Three Hours



**KNT/KW/16/7266**

Max. Marks : 80

- Notes :
1. All questions carry marks as indicated.
  2. Solve Question 1 OR Questions No. 2.
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  7. Solve Question 11 OR Questions No. 12.
  8. Assume suitable data whenever necessary.
  9. Illustrate your answers whenever necessary with the help of neat sketches.
  10. Use of non programmable calculator is permitted.

1. a) Describe with neat sketch, the construction and use of an open cross staff. 7
- b) Explain briefly how plane surveying differs from geodetic surveying. 6
2. a) Write about temporary adjustment of prismatic compass. 6
- b) The following are the observed bearings of the lines of a traverse ABCDEA with a compass in a place where local attraction was suspected. 7

Line	FB	BB
AB	191° 45'	13° 0'
BC	39° 30'	222° 30'
CD	22° 15'	200° 30'
DE	242° 45'	62° 45'
EA	330° 15'	147° 45'

Find the correct bearings of the lines.

3. a) What are the temporary adjustments of dumpy level? How it is done? 7
- b) The following successive readings were taken with a dumpy level along a chain at common intervals of 20 m. The first readings was taken on a chainage 140 m. The RL of the second change point was 107.215 m the instrument was shifted after the third & seventh readings. Calculate the RLs of all the points. 7  
 3.150, 2.245, 1.125, 3.860, 2.125, 0.760, 2.235, 0.470, 1.935, 3.255 and 3.890 m.
4. a) Explain with neat sketches of characteristics of contours. 7
- b) The following notes refer to the reciprocal levels taken with one level: 7

Instrument station	Staff reading on		Remarks
	A	B	
A	1.029	1.634	Distance between A&B = 800 m
B	0.943	1.542	RL of A = 421.543 m

- Find
- i) True RL of B.
  - ii) Combined correction for curvature and Refraction
  - iii) The error in collimation adjustment of the instrument.

5. a) Derive the equation to determine RL of top of the elevated object as the base of the object is not accessible and the nearer theodolite is higher than the far theodolite. 6

- b) A levelling Instrument was set up exactly mid-way between two pegs A & B, 100 m apart. The staff readings on A & B were 1.875 and 1.790 respectively. The instrument was then set up at a distance of 10 m from A on the line AB. The respective staff readings were 1.630 & 1.560. Calculate the correct staff reading on A & B when the line of collimation is exactly horizontal. **7**
6. a) Explain collimation system and rise and fall system. **6**
- b) When the bubble is at the centre, the reading on the staff, 100 m from the level is 2.550 m. The bubble is then deviated by five divisions and the staff reading is 2.500 m. If the length of one division of the bubble is 2 mm, calculate radius of curvature of the bubble tube and angular value of one division of the bubble. **7**
7. a) Describe the process of measuring the magnetic bearing of a line by theodolite. **7**
- b) The record of a closed traverse is given below. **7**

Line	Length	Bearing
AB	100.5	N 30° 30'E
BC	?	S 45° 0' E
CD	75.0	S 40° 30' W
DE	50.5	S 60° 0' W
EA	?	N 40° 15' W

Calculate the lengths of BC & EA.

8. a) Explain the repetition method of measuring horizontal angle. **7**
- b) Discuss the Bowditch's rule for balancing the traverse. **7**
9. a) Explain radiation method of plane tabling. **6**
- b) An embankment of width 10 m and side slopes 1.5: 1 is required to be made on a ground which is level in a direction transverse to the centre line. The central heights at 40 m intervals are as follows: 0.90, 1.25, 2.15, 2.50, 1.85, 1.35 and 0.85 calculate the volume of earthwork according to prismoidal formula. **7**
10. a) What is orientation? What are the methods of orientation? Describe any one method with a sketch. **6**
- b) The following offsets are taken from a survey line to a curved boundary line : **7**

Dist. (m)	0	5	10	15	20	30	40	60	80
Offset (m)	2.5	3.80	4.60	5.20	6.10	4.70	5.80	3.90	2.20

Find the area between the survey line, the boundary line, and first and the last offsets by

- i) Trapezoidal rule
- ii) Simpson's rule
11. a) What is sounding? Explain any two methods of sounding. **6**
- b) Write about sub surface float method of measurement of velocity of flow. **7**
12. a) Explain the procedure of transferring the levels underground. **6**
- b) Write a short note on GPS. **7**

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**Surveying - I Paper – IV**

P. Pages : 3

Time : Three Hours



TKN/KS/16/7354

Max. Marks : 80

- Notes :
1. All questions carry marks as indicated.
  2. Solve Question 1 OR Questions No. 2.
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  8. Due credit will be given to neatness and adequate dimensions.
  9. Assume suitable data whenever necessary.
  10. Illustrate your answers whenever necessary with the help of neat sketches.
  11. Use of non programmable calculator is permitted.

1. a) Define surveying. Describe classification of surveying. 5
- b) The following bearings were taken while conducting a closed traverse with prismatic compass. Find out which stations are subjected to local attraction and determine the corrected bearing. 8

LINE	F.B.	B.B
PQ	292° 15'	11° 45'
QR	221° 45'	41° 45'
RS	90° 05'	270° 00'
ST	80° 35'	261° 40'
TP	37° 00'	216° 30'

**OR**

2. a) Describe the construction of optical square and explain how to use it in the field. 6
- b) A and B are two points 200m apart along one bank of river flowing from east to west. The bearings of a tower on the other bank as observed from A and B are 40° and 310° respectively. Find the width of river. 7
3. a) The following consecutive readings were taken with the help of a level and 4m leveling staff at common interval of 30m. 8  
 1.904, 2.650, 3.905, 4.025, 1.965, 1.705, 1.595, 1.265, 2.545, 2.005, 3.145.  
 The instrument was shifted after the fourth and seventh reading. The first reading was taken on the B.M. of reduce level 101.000 m. Calculate R.L. of other points in a level page and apply the arithmetical check.
- b) Show that reciprocal leveling eliminates the effect of the atmospheric refraction and curvature of earth as well as the effect of inadjustment of line of collimation. 5

**OR**

4. a) What are the temporary adjustment of dumpy level? Explain how to carry it. 6
- b) The following notes refer to reciprocal levels:- 7

Instrument at	Staff Reading at		Remark
	A	B	
A	1.050	1.650	Distance AB = 1200m. RL of A = 240.500m
B	0.950	1.560	

Find.

- i) True RL of point B
  - ii) Combined correction for Curvature and Refraction.
  - iii) Error in line of collimation.
5. a) A level was tested by the two-peg method and following results were observed. 7

Instrument at	Staff Reading at		Remark
	A	B	
C	1.150	1.795	Distance AB = 100m. C is exactly mid-way between A and B
D	1.538	1.933	D lies on BA produced and 20m behind pt. 'A'

Calculate the staff readings on A and B to give a horizontal line of sight.

- b) List out the various methods of contouring and explain any one method in detail with neat sketch. 6
- OR**
6. a) Derive the expression to find the distance and elevation of object when the base of object is inaccessible. Consider instrument and object lies in the same vertical plane. 6
- b) A theodolite was set up at a distance of 300 m from a tower, and the angle of elevation to its top was  $10^{\circ} 50'$ . The staff reading on B.M. of reduced level 80.20 m with the telescope horizontal was 0.955. Find the R.L. of the top of tower. 7
7. a) What are the permanent adjustments of theodolite? Explain any one adjustment in detail. 6
- b) Following notes refer to theodolite surveying. 8

Line	Length (m)	Bearing
AB	686	$352^{\circ}24'$
BC	1824	$24^{\circ}36'$
CD	1053	$147^{\circ}30'$

Calculate the distance between a point E on AB, 28m from A and a point F on CD 650m from C.

**OR**

8. a) Find the area of closed traverse having the following data, by the co-ordinate method. 7

Side	Latitude (m)	Departure (m)
AB	+225.50	+120.50
BC	-245.00	+210.00
CD	-150.50	-110.50
DA	+170.00	-220.00

- b) List out the various methods of measurement of horizontal angle by using theodolite and explain any one method in detail. 7

9. a) Define orientation of plane table and explain various methods of orientation. 6

- b) A road embankment is 9 m wide and 300 m in length at the formation level with a side slope of 1.5:1. The embankment has a rising gradient of 1 in 100. The ground level at 50m interval are as follows: 7

Distance (m)	0	50	100	150	200	250	300
R.L. (m)	154.0	155.0	156.0	157.0	158.0	159.0	160.0

The formation level of zero chainage is 157.00 m. Calculate the volume of earth work.

**OR**

10. a) Explain the two point problem in plane table surveying. 6

- b) The width of formation level of a certain cutting is 10 m and the side slopes are 1:1. The surface of the ground has a uniform side slope of 1 in 5. If the depth of cutting at the center lines of three sections 50 m apart is 3m, 4m and 5m respectively, determine the volume of earth work involved in this length of cutting. 7

11. a) Enlist the various methods of locating soundings. Explain any one method in detail. 7

- b) What are the equipments required for sounding? Explain the use of each equipment. 7

**OR**

12. Write short notes on **any three**. 14

- i) Transferring the level underground.
- ii) E.D.M.
- iii) G.P.S
- iv) Uses of Hydrographic survey.

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