

(3 hours)

01/06/18

[Total Marks-80]

- N.B. (1) Question no. 1 is compulsory
(2) Attempt any three questions out of remaining five.
(3) If any additional data is assumed.
(4) Explain with neat sketches, wherever necessary

1. a) Explain Geodetic surveying [05]
b) State advantages of plane tabling surveying. [05]
c) Explain the characteristics of contours [05]
d) Enumerate the various sources of errors in Compass survey. [05]
2. a) Explain reiteration methods for computing horizontal angle. [05]
b) What do you understand by reciprocal levelling? Give the corrections for curvature and refraction. [05]
c) The following consecutive readings were taken with a level and 4.0m Staff on a continuously sloping ground at a common interval of 30 mt [10]
0.780, 1.535, 1.955, 2.430, 2.985, 3.480, 1.155, 1.960, 2.365, 3.640, 0.935, 1.045, 1.630 and 2.555.
The RL of first point A was 190.75 m. Rule out a page of level book & enter above readings. Calculate the RL of all the points by Rise & Fall Method. Also calculate the gradient of the line joining the first & last point.
3. a) Calculate latitudes, departures and closing error for the following traverse and adjust using Bowditch's rule [08]

Line	Length(m)	WCB
AB	155.5	78°40'
BC	178.2	152°32'
CD	234.8	251°18'
DA	202.6	356°15'

- b) Following data refers to a site of a reservoir. The areas are the ones which will be contained by a proposed dam and contour lines as given below: [08]

Contour (in metres)	Area enclosed (in hectares)
610	22
615	110
620	410
625	890
630	1158

- Calculate the total volume of the water impounding.
- c) Represent the following with conventional symbols [04]
- Cultivated land
 - Embankment
 - Railway crossing
 - Fence

TURN OVER

4. a) Explain Temporary adjustments of a level. How reading of the vernier theodolite is taken? [07]
- b) Explain the civil engineering applications of contour maps. [08]
- c) Select only one from the following multiple choices [05]
- The principle of plane tabling is
(a) Triangulation (b) Traversing (c) Parallelism (d) None of above
 - The face left position is called
(a) Telescope reverse (b) Telescope inverted
(c) Telescope normal (d) None of above
 - Balancing of traversing is done according to
(a) Bowditch's rule (b) Transit rule (c) Third rule (d) All of above
 - If N be the number of lines of the traverse, then sum of measured interior angles should be equal to
(a) $(2N+4) \times 90^\circ$ (b) $(2N \times 4) \times 90^\circ$ (c) $(2N-4) \times 90^\circ$ (d) $(N+4) \times 90^\circ$
 - The area of zero circle is equal to
(a) C (b) M (c) $M \times C$ (d) M / C
5. a) Give a list of sources of errors in chain surveying and say which of them are cumulative and which of them are compensating. [04]
- b) Compare Trapezoidal and Simpson's rule. [04]
- c) Discuss the advantages of prismatic compass over surveyor's compass. [04]
- d) A closed compass traverse ABCDEA was conducted round a lake and the following bearings were obtained. Correct for local attraction and find included angles and corrected bearings [08]

Line	Length(m)	Whole Circle Bearing
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	$300^\circ 42'$

6. Write short notes on: (any 4) [20]
- Orientation of Plane Tabling
 - Gales Traverse Table
 - Volume by Spot levels
 - Precise Leveling
 - Triangulation

Q.No.
20

Reduction of levels By Rise and Fall method
and Gradient of a line AB

st ⁿ	Distance (m).	BS	IS	FS	Rise (m)	Fall (m)	RL (m)	REMARK
A	0	0.780			-		190.750	BM
1	30		1.535		-	0.755	189.995	
2	60		1.955		-	0.420	189.575	
3	90		2.430		-	0.475	189.100	
4	120		2.985		-	0.555	188.545	
5	150	1.155		3.480	-	0.495	188.050	CP1
6	180		1.960		-	0.805	187.245	
7	210		2.365		-	0.405	186.840	
8	240	0.935		3.640	-	1.275	185.565	CP2
9	270		1.045		-	0.110	185.455	
10	300		1.630		-	0.585	184.870	
B	330			2.555	-	0.925	183.945	CP
		ΣBS	-	ΣFS	$\Sigma Rise$	$\Sigma Fall$	Last RL - First RL	
		2.870	-	9.675	0	6.805	183.945 - 190.750	

A.
C.

$$-6.805 = -6.805 = -6.805$$

Gradient of Line AB = $\frac{\text{Elevation Difference between station A and station B}}{\text{Horizontal Distance AB}}$

$$G_{AB} = \frac{-6.805}{330} = -1:49 \quad (\text{Falling})$$

Q.NO.4 C)

- i) The principle of plane tabling is parallelism
- ii) The face left position is called as Telescope normal
- iii) Balancing of traverse is done according to d) all of above
- iv) If 'N' be the number of lines of the traverse, then sum of measured interior angles should be equal to $(2N-4)90^\circ$
- v) The area of zero circle is equal to $M \times C$

Q.NO.3 (A)

a)	Line	Length (m)	OBSERVED				CORRECTION	
			WCB	RB	LAT	DEP	LAT	DEP
	AB	156.50	78°40'	N 78°40' E	+30.75	+153.45	+0.0953	+0.002
	BC	178.20	152°32'	S 27°28' E	-158.11	+82.19	+0.009	+0.002
	CD	234.80	251°18'	S 71°18' W	-75.28	-222.40	+0.143 +0.004	+0.003
	DA	202.60	356°15'	N 03°45' W	+202.17	-13.25	+0.193	+0.002
		$\Sigma L = 772.10$			$\Sigma L = -0.47$	$\Sigma D = -0.090$		
			CORRECTED		CORRECTED			
			LAT		DEPARTURE			
			+30.845		+153.452			
			-158.001		+82.192			
			-75.137		222.397			
			+202.293		-13.248			
			$\Sigma L = \text{ZERO}$		$\Sigma D = \text{ZERO}$			

Bowditch's Rule:

$$S_L = \frac{\Sigma L \times l}{\Sigma l} = \text{ERROR IN LAT} \times \frac{\text{length of the leg}}{\text{perimeter of the traverse}}$$

$$S_D = \frac{\Sigma D \times l}{\Sigma l} = \text{Total error in DEP} \times \frac{\text{length of the leg}}{\text{perimeter of the traverse}}$$

Q.NO.3 (B)

b)

Total volume = $\frac{B}{3} (C_1 + 4C_2 + C_3)$

$$= \frac{5}{3} (22 + 1158 + 410) + 2(410) + 4(110 + 890)$$

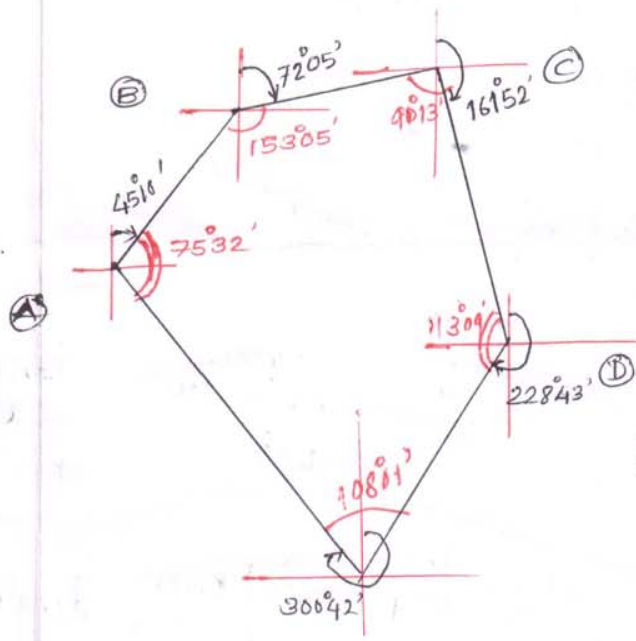
$$= \frac{5}{3} (1180 + 820 + 4000)$$

$$= \frac{5}{3} \times 6000 \times 10000 = 100000000 \text{ m}^3$$

~~10000~~ ~~mm~~ ~~mm~~

Q. No. 5 (d)

Line	Length (cm)	W.C.B. (F.B.)	B.B.	∠s
AB	89.31	45°10'	225°10'	∠A = 75°32'
BC	219.76	72°05'	252°05'	∠B = 153°05'
CD	151.18	161°52'	341°52'	∠C = 90°13'
DE	159.10	228°43'	48°43'	∠D = 113°09'
EA	232.26	300°42'	120°42'	∠E = 108°01'
				Σ∠s = 540°00'



calculation of Included angle

need B.B.

$$\therefore \text{B.B.} = \text{F.B.} \pm 180^\circ$$

i) Included Angle A = B.B. of line EA - F.B. of line AB

$$= 120^\circ 42' - 45^\circ 10' = 75^\circ 32'$$

ii) Included Angle B = B.B. of line AB - F.B. of line BC

$$= 225^\circ 10' - 72^\circ 05' = 153^\circ 05'$$

iii) " " " " ∠C = B.B. of line BC - F.B. of line CD

$$= 252^\circ 05' - 161^\circ 52' = 90^\circ 13'$$

iv) " " " " ∠D = B.B. of line CD - F.B. of line DE

$$= 341^\circ 52' - 228^\circ 43' = 113^\circ 09'$$

v) " " " " ∠E = 360° - F.B. of line EA + B.B. of line DE

$$= 360^\circ - 300^\circ 42' + 48^\circ 43' = 108^\circ 01'$$

∴ Σ∠s = (2n-4) 90° as n=5 Σ∠s = (2x5-4) 90° = 540°00'