Assignments

Question 1

a Compare the methods of leveling considering advantages and drawbacks

Answer

Rise and fall Method

- It is laborious as the staff reading of each station is compared to get a rise or fall
- Errors in the intermediate RLs can be detected as all the Points are Correlated

Height of Collimation Method

- It is more rapid and saves a Considerable time and labour.
- Errors in the intermediate RLs cannot be detected.

b The following readings are Successfully taken with an instrument in a leveling Work on a Peculiar gradient: 0.771, 1.52, 0.802, 2.311, 1.990, 3.580, 1.220, 3.675, 4.020, 2.408, 0.339, 0.157, 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 2.545. The position of the instrument

was changed after taking the 5th, 9th & 12th readings. As from the 13th reading the road gradient was continuously shi till the last reading. If the reduced level initially was (110 + your matriculation number)m, calculate the reduced level of all points by height of collimation method produce the gradient of the readings were taken at an interval of 10m

Answer

RL = 110 + 55 = 165

B.S	I.S	F.S	H of C	RL	DISTANCE
0.771			165.771	165.00	10
0.802		1.52	165.053	164.251	20 CP
	2.811			162.742	30
3.580		1.990	166.643	163.063	40 CP
	1.220			165.423	50
	3.675			162.968	60
2.408		4.020	165.031	162.623	70 CP
	0.339			164.692	80
0.780		0.157	165.654	164.874	90 CP
	1.535			164.119	100
	1.955			163.699	110
	2.430			163.224	120
	2.985			162.669	130
1.155		3.480	163.329	162.174	140 CP
	1.960			161.369	150
	2.365			160.964	160
0.935		3.640	160.624	159.689	170 CP
	1.045			159.579	180
	1.630			158.994	190
		2.545		158.079	200

$\Sigma = 10.481$ $\Sigma = 17.352$

HC = RL + BS

HC (1) = 165 + 0.711 = 165.711

RL = HC - FS

RL (2) = 164.251 + 0.802 = 165.053

RL (1) = 165.711 - 1.52 = 164.251

RL (2) = 165.053 - 2.311 = 162.742

RL (3) = 165.053 - 1.990 = 163.063

HC (3) = 163.063 + 3.580 = 166.643

RL (4) = 166.643 - 3.220 = 165.423

RL (5) = 166.643 - 3.675 = 162.968

RL (6) = 166.643 - 4.020 = 162.623

HC (4) = 162.623 + 2.408 = 165.031

RL (7) = 165.031 - 0.339 = 164.692

RL (8) = 165.031 + 0.154 = 165.185

HC (5) = 165.654 + 0.488 = 166.142

RL (9) = 165.654 - 1.535 = 164.119

RL (10) = 165.654 - 1.955 = 163.699

RL (11) = 165.654 - 2.430 = 163.224

RL (12) = 165.654 - 2.985 = 162.669

RL (13) = 165.654 - 3.480 = 162.174

HC (6) = 163.329 + 1.155 = 164.484

RL (14) = 163.329 - 1.960 = 161.369

RL (15) = 163.329 - 2.365 = 160.964

RL (16) = 163.329 - 3.640 = 159.689

RL of axis

HC(7) = 159.689 + 0.935 = 160.624

RL(17) = 160.624 - 1.045 = 159.579

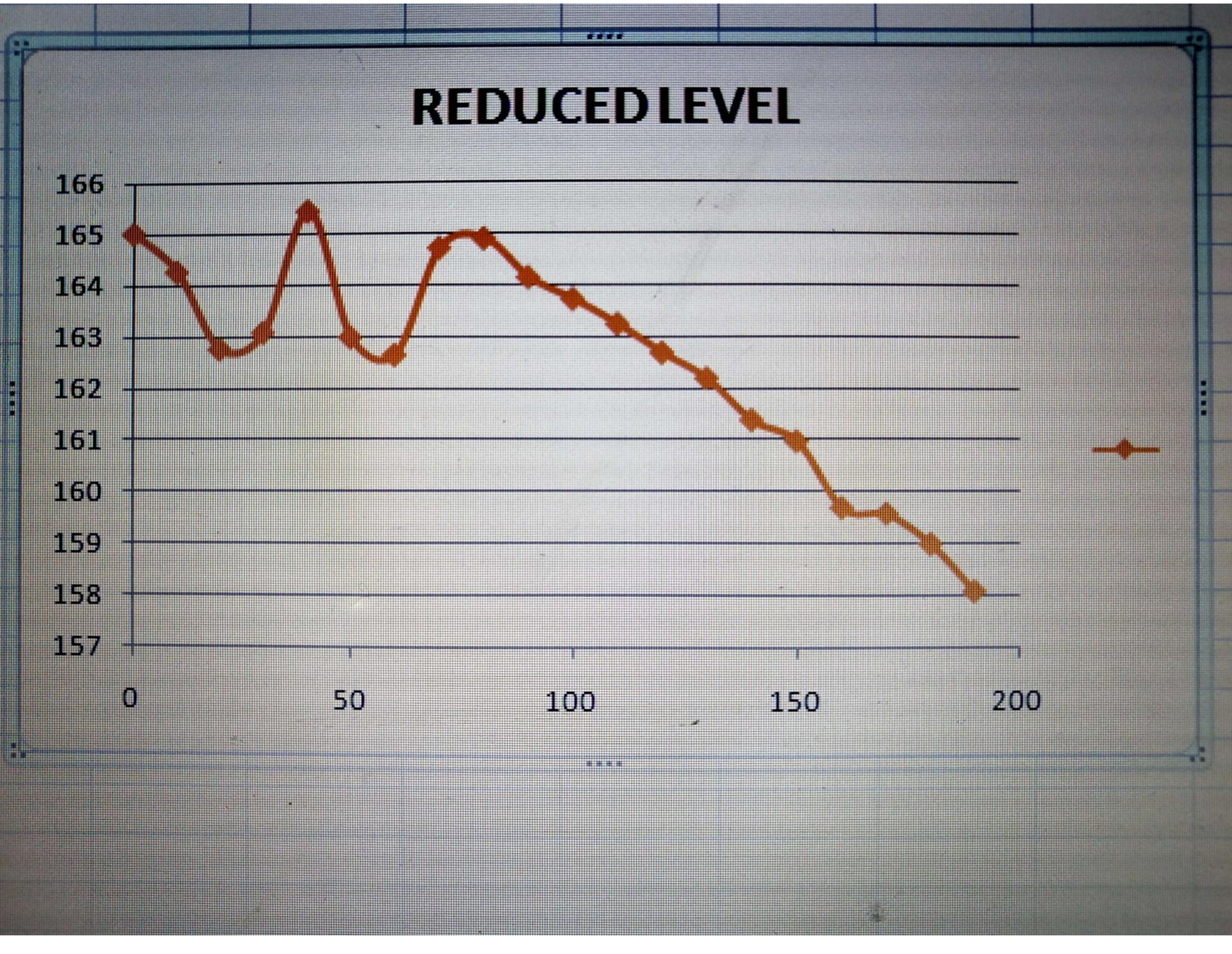
RL(18) = 160.624 - 1.630 = 158.994

RL(19) = 160.624 - 2545 = 158.079

check = Σfos - ΣB.S = R.L at first point

R.L at last point

= 6.921 = 6921



Question 2

(a) The following perpendicular offsets were taken from a chain line to an irregular boundary

chainage (m)	0	30	60	90	120	150	180	210	240	270
offset length (m)	0	2.65	3.80	3.75	4.65	3.60	5.00	5.80	6.10	5.85

Calculate the area btw the chain line and the irregular boundary by average ordinate rule, mid-ordinate rule, trapezoidal rule and Simpson's rule

Solution

Using average ordinate rule

$$A = \frac{nd\Sigma O}{n+1}$$

$n = 9$

$d = 30$

$\Sigma O = 0 + 2.65 + 3.80 + 3.75 + 4.65 + 3.60 + 5.00 + 5.80 + 6.10 + 5.85$

$\Sigma O = 41.2m$

$$A = \frac{9 \times 30 \times 41.2}{9+1}$$

$A = 112.4 m^2$

Using Mid-ordinate rule:

$A = \Sigma hd$

$h_1 = \frac{0 + 2.65}{2} = 1.325m$

$h_2 = \frac{2.65 + 3.80}{2} = 3.225m$

$h_3 = \frac{3.80 + 3.75}{2} = 3.775m$

$h_4 = \frac{3.75 + 4.65}{2} = 4.2m$

$h_5 = \frac{4.65 + 3.60}{2} = 4.125m$

$h_6 = \frac{3.60 + 5.00}{2} = 4.3m$

$h_7 = \frac{5.00 + 5.80}{2} = 5.4m$

$h_8 = \frac{5.80 + 6.00}{2} = 5.9m$

$$h_9 = \frac{6.00 + 5.85}{2} = 5.925\,m$$

$$\Sigma h = 1.325 + 3.225 + 3.775 + 4.2 + 4.125 + 4.3 + 5.4 + 5.9 + 5.925$$

$$\Sigma h = 38.175\,m$$

$$d = 30m$$

$$A = \Sigma hd$$

$$= 38.175 \times 30$$

$$A = 1145.25m^2$$

Using trapezoidal rule

$$A = d\left(\frac{O_1 + O_n}{2} + O_2 + O_3 + O_4 \ldots O_{n-1}\right)$$

$$d = 30$$

$$A = 30\left(\frac{0 + 5.85}{2} + 2.65 + 3.80 + 3.75 + 4.65 + 3.60 + 5.00 + 5.80 + 6.10\right)$$

$$A = 30\,(38.275)$$

$$A = 1148.25m^2$$

Using simpson's rule

$$A = \frac{d}{3}[(O_1 + O_n) + 4(O_2 + O_4 + \dots O_{n-1}) + 2(O_3 + O_5 \dots O_{n-2})]$$

$$d = 5m$$

NB: Last offset was removed because num-
er of offsets were even

$$A = \frac{30}{3}[(0 + 6.10) + 4(2.65 + 3.75 + 3.60 + 5.80) + 2(3.80 + 4.65 + 5.00)]$$

$$A = 762m^2$$

Calculation for last offset using trapez-
oidal rule

$$A = d\left(\frac{O_1 + O_n}{2} + O_2 + O_3 + O_4 \dots O_{n-1}\right)$$

$$A = 30\left[\frac{6.40 + 5.85}{2}\right]$$

$$A = 189.75m^2$$

Therefore $\Sigma A = 762 + 189.75$

$$A = 1145.75m^2$$

b Explain four characteristics of contour with well dimensioned diagrams [Use CAD for drawings]

1 A series of closed contours on a map indicate a depression if the higher values are outside as shown

2 A series of closed contour on a map represent a hill if the high values are inside

3 Contour lines cannot merge or cross one another on a map except in the case of an over hanging cliff.

4 Contour line crosses a ridge or valley at a right angle. If the higher values are inside the border loop in the contour it represented a riolge and if the higher values are outside the bend or loop in the contour it a valley

5 Contours do not run into one another except in the case of a vertical cliff, in this case serival contours coincide and the horizontal equivalent becomes zero