CHUKWUDULUE JEDIDIAH
17/ENG03/014
CIVIL ENGINEERING

1a) Methods of levelling
Height of collimation system
Advantages
- It is rapid as it involves few Calculation
- There are two checks on the accuracy of RL calculation
- This system is suitable for longitudinal leveling where number of intermediate sights
- Visualization is not necessary regarding the nature of the ground

Disadvantages
- There is no check on the RL of the intermediate sight
- Errors in the intermediate RLs cannot be detected.

Rise and fall system
Advantages
- There is a check on the RL of the intermediate points
- Errors in the intermediate RLs can be detected as all the points are correlated
- There are three checks on the accuracy of RL calculation
- This system is suitablewhere there are no intermediate sights

Disadvantages
- It is laborious involving several calculations.
- Visualization is necessary regarding the nature of the ground

1b)
RL=110+matric No.=110+14=124

B.S	I.S	F.S	H OF C	R.L	DISTANCE	REMARKS
0.771			124.771	124	0	RL
0.802		1.52	124.053	123.251	10	CP
	2.311			121.742	20	
3.580		1.990	125.643	122.063	30	CP
	1.220			124.423	40	
	3.675			121.968	50	
2.408		4.020	124.031	121.623	60	CP
	0.339			123.692	80	

0.780		0.157	124.654	123.874	90	CP
	1.535			123.119	100	
	1.955			122.699	110	
	2.430			122.224	120	
	2.985			121.669	130	
1.155		3.480	122.329	121.174	140	CP
	1.960			120.369	150	
	2.365			119.964	160	
0.935		3.640	119.624	118.689	170	CP
	1.045			118.579	180	
	1.630			117.994	190	
		2.545		117.079	200	
Σ=10.431		Σ=17.352				

HC=RL+BS
HC(1)=124+0.711=124.771
RL=HC-FS
RL(1)=124.771-1.52=123.251
HC(2)=124.053+0.802=124.053
RL(2)=124.053-2.311=121.742
RL(3)=124.053-1.990=122.063
HC(3)=122.063+3.580=125.643
RL(4)=125.643-1.220=124.423
RL(5)=125.643-3.675=121.968
RL(6)=125.643-4.020=121.623
HC(4)=121.623+2.408=124.031
RL(7)=124.031-0.339=123.692
RL(8)= 124.031-0.157=123.874
HC(5)=123.874+0.780=124.654
RL(9)=124.654-1.535=123.119
RL(10)= 124.654-1.955=122.699
RL(11)= 124.654-2.430=122.224
RL(12)= 124.654-2.985=121.669
RL(13)= 124.654-3.480=121.174
HC(6)=121.174+1.155=122.329
RL(14)=122.329-1.960=120.369
RL(15)= 122.329-2.365=119.964
RL(16)= 122.329-3.640=118.689
HC(7)=118.689+0.935=119.624
RL(17)=119.624-1.045=118.579
RL(18)= 119.624-1.630=117.994
RL(19)= 119.624-2.545=117.079

QUESTION 2

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

<u>Using Mid-ordinate rule:</u>
$A = \Sigma hd$

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

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

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

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

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

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

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

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

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

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

$\Sigma h = 38.175m$

$d = 30m$

$A = \Sigma hd$

$= 38.175 \times 30$

$A = 1145.25m^2$

Using average ordinate rule

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

$n = 9$

$d = 30$

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

$\Sigma O = 41.2m$

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

$A = 112.4m^2$

Using trapezoidal rule

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

$$d = 30$$

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

$A = 30(38.275)$

$A = 1148.25m^2$

Using Simpson's rule

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

$$d = 30$$

Note: Last offset was removed because number of offsets were even

$$A = \frac{30}{3}[(0 + 6.10) + 4(2.65 + 3.75 + 3.60 + 5,80) + 2(3.80 + 4.65 + 5.00)]$$

$$A = 962 m^2$$

Calculating for last offset using trapezoidal rule

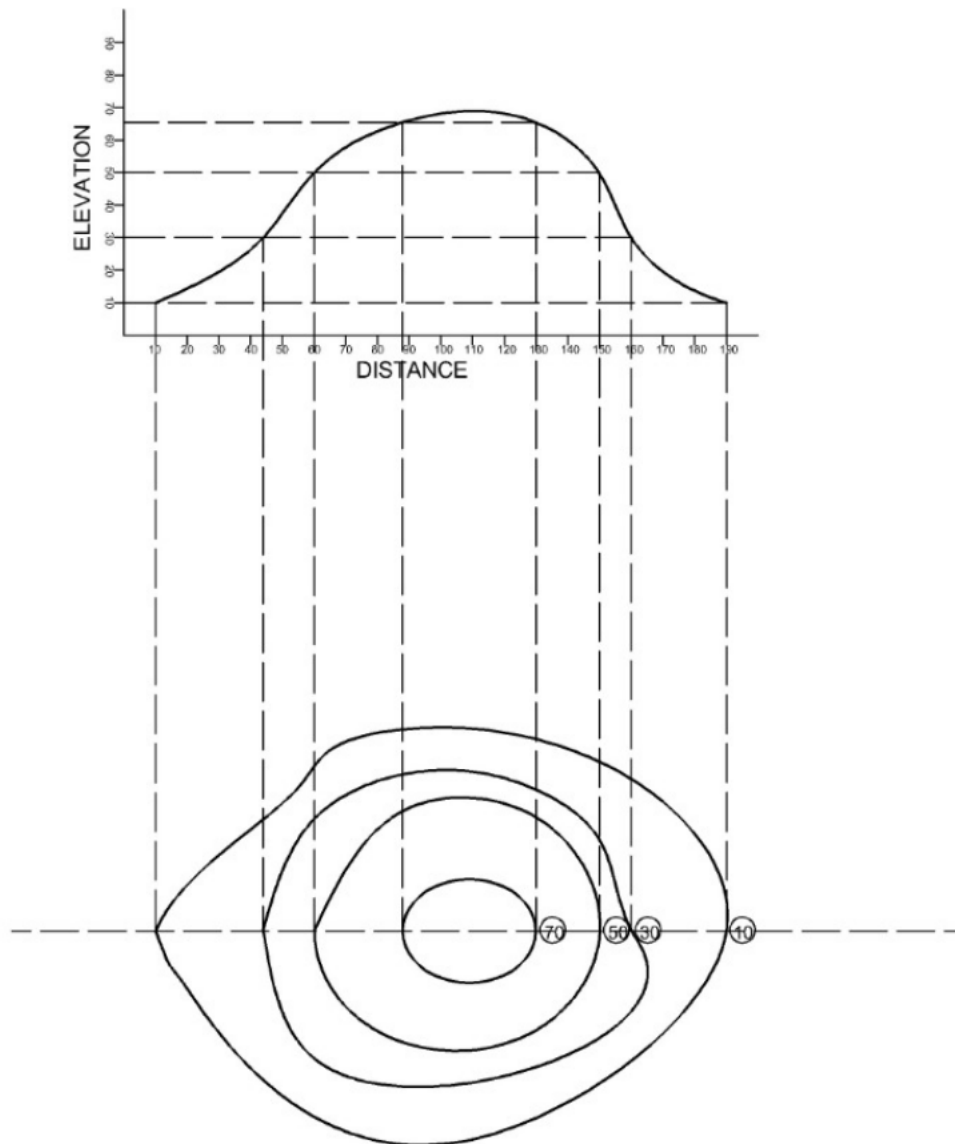$$A = d\left(\frac{O_1 + O_n}{2} + O_2 + O_3 + O_4 \ldots \ldots O_{n-1}\right)$$

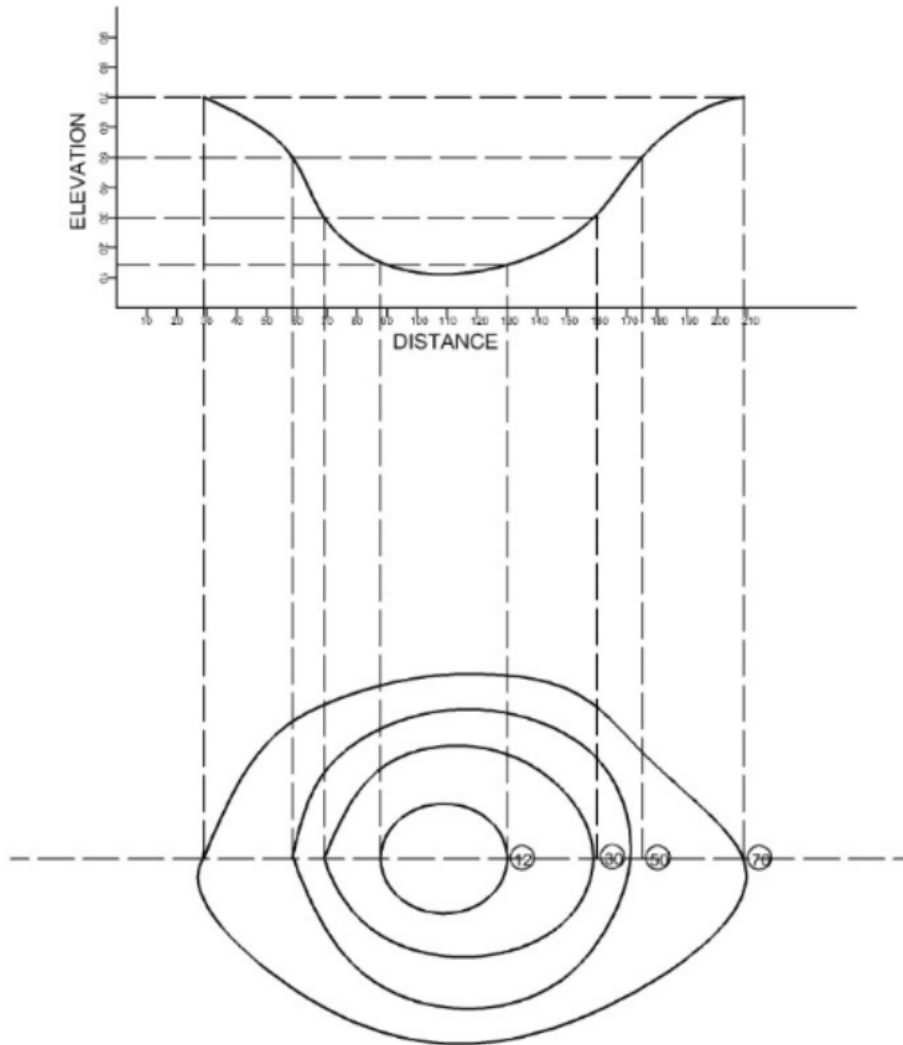$$A = 30\left[\frac{6.40 + 5.85}{2}\right]$$

$$A = 183.75 m^2$$

Therefore $\Sigma A = 962 + 183.75$

$$A = 1145.75 m^2$$

2b.

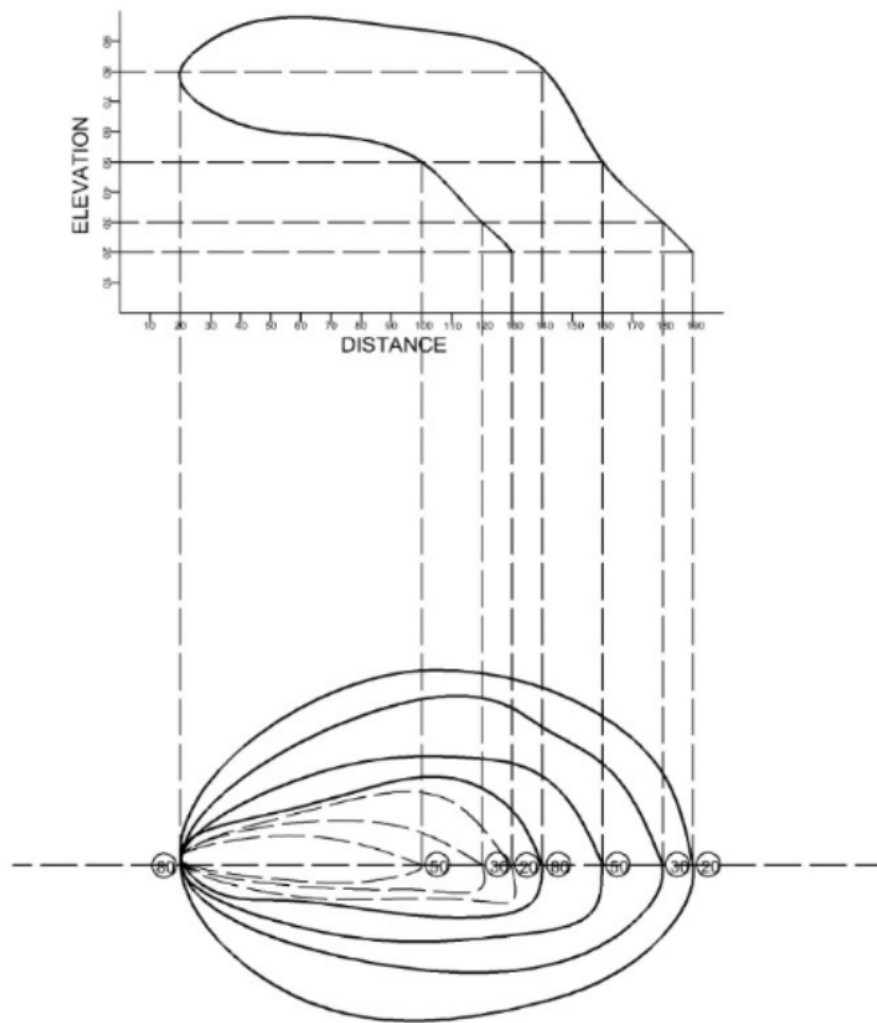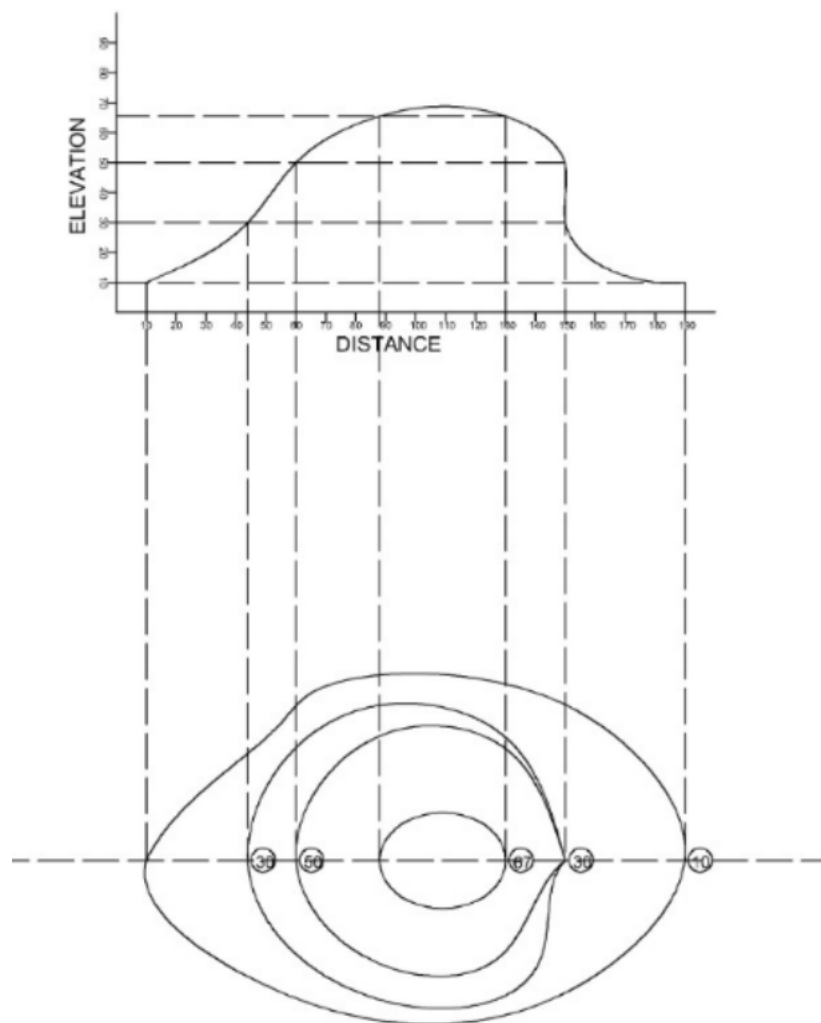A series of close contour lines represents a hill if the higher values are inside as shown above.

A series of close contours on a map indicates a depression if the higher values are outside as shown above.

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

Contours never run into one another except in the case of a vertical cliff. In this case several contours coincide and the horizontal equivalent becomes 0.
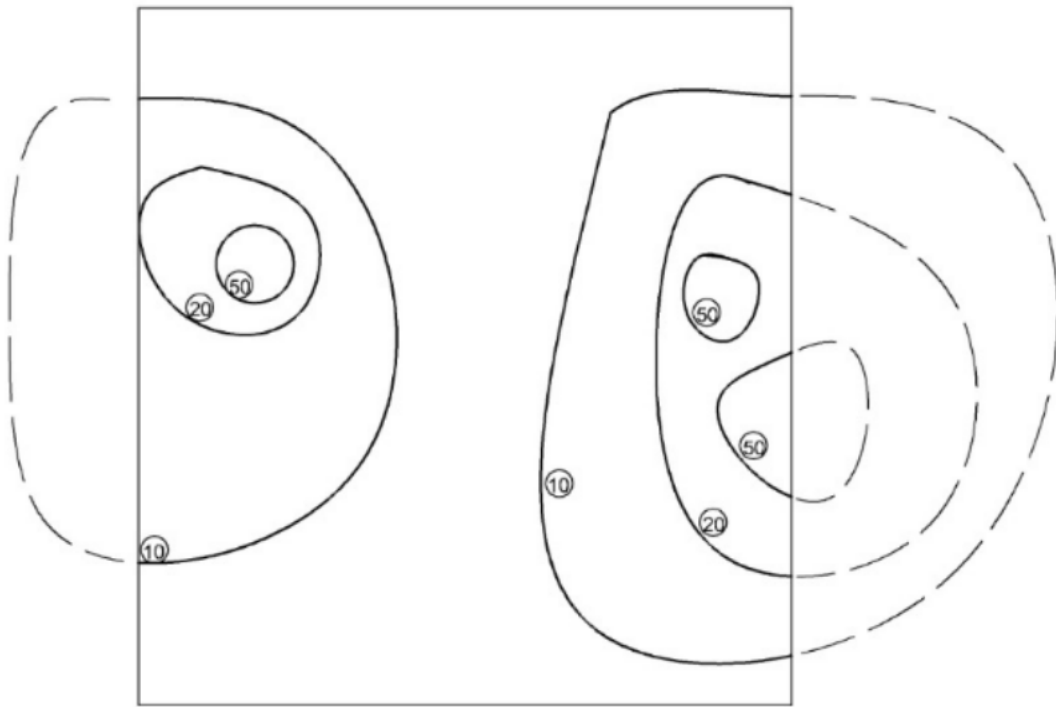
Contour lines cannot end anywhere but close on themselves either within or outside the limits of the map.