**EJALONIBU OLUWADAMILOLA**

**17/ENG03/019**

**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 suitable where there are no intermediate sights

**Disadvantages**

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

**1b)**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **B.S** | **I.S** | **F.S** | **H OF C** | **R.L** | **DISTANCE** |
| **0.771** |  |  | **129.771** | **129** | **10** |
| **0.802** |  | **1.52** | **129.053** | **128.251** | **20** |
|  | **2.311** |  |  | **126.742** | **30** |
| **3.580** |  | **1.990** | **130.643** | **127.063** | **40** |
|  | **1.220** |  |  | **129.423** | **50** |
|  | **3.675** |  |  | **126.968** | **60** |
| **2.408** |  | **4.020** | **129.031** | **126.623** | **70** |
|  | **0.339** |  |  | **128.692** | **80** |
| **0.780** |  | **0.157** | **129.654** | **128.874** | **90** |
|  | **1.535** |  |  | **128.119** | **100** |
|  | **1.955** |  |  | **127.699** | **110** |
|  | **2.430** |  |  | **127.224** | **120** |
|  | **2.985** |  |  | **126.669** | **130** |
| **1.155** |  | **3.480** | **127.329** | **126.174** | **140** |
|  | **1.960** |  |  | **125.369** | **150** |
|  | **2.365** |  |  | **124.964** | **160** |
| **0.935** |  | **3.640** | **124.624** | **123.689** | **170** |
|  | **1.045** |  |  | **123.579** | **180** |
|  | **1.630** |  |  | **122.994** | **190** |
|  |  | **2.545** |  | **119.079** | **200** |
| $Σ$**=10.431** |  | $Σ$**=17.352** |  |  |  |

RL=110+matric No.=110+19=129

HC=RL+BS

HC(1)=129+0.711=129.771

RL=HC-FS

RL(1)=129.771-1.52=128.251

HC(2)=155.251+0.802=129.053

RL(2)=129.053-2.311=126.742

RL(3)=129.053-1.990=127.063

HC(3)=127.063+3.580=127.643

RL(4)=127.643-1.220=126.423

RL(5)=127.643-3.675=123.968

RL(6)=127.64-4.020=123.623

HC(4)=123.623+2.408=126.031

RL(7)= 126.031-0.339=125.692

RL(8)= 126.031-0.157=125.874

HC(5)=125.874+0.780=126.654

RL(9)= 126.654-1.535=125.119

RL(10)= 126.654-1.955=124.699

RL(11)= 126.654-2.430=124.224

RL(12)= 126.654-2.985=123.669

RL(13)= 126.654-3.480=123.174

HC(6)=124.329+1.155=124.329

RL(14)= 124.329-1.960=122.369

RL(15)= 124.329-2.365=121.964

RL(16)= 124.329-3.640=120.689

HC(7)=120.689+0.935=121.624

RL(17)= 121.624-1.045=120.579

RL(17)= 121.624-1.630=119.994

RL(17)= 121.624-2.545=119.079

Check=$ΣF.S-ΣB.S$=R.L at first point-R.L at last point

 =6.921=6.921

Figure

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 |

Using Mid-ordinate rule:

A=$Σ$hd

h1= $\frac{0+2.65}{2}$=1.325m

h2= $\frac{2.65+3.80}{2}$=3.225m

h3= $\frac{3.80+3.75}{2}$=3.775m

h4= $\frac{3.75+4.65}{2}$=4.2m

h5= $\frac{4.65+3.60}{2}$=4.125m

h6= $\frac{3.60+5.00}{2}$=4.3m

h7= $\frac{5.00+5.80}{2}$=5.4m

h8= $\frac{5.80+6.00}{2}$=5.9m

h9= $\frac{6.00+5.85}{2}$=5.925m

$$Σh=1.325+3.225+3.775+4.2+4.125+4.3+5.4+5.9+5.925$$

$Σh=$38.175m

d=30m

A=$Σhd$

= $38.175×30$

A= $1145.25m^{2}$

Using average ordinate rule

A=$\frac{ndΣO}{n+1}$

n=9

d=30

$$ΣO=0+2.65+3.80+3.75+4.65+3.60+5.00+5.80+6.10+5.85$$

$ΣO=$41.2m

A=$\frac{9×30×41.2}{9+1}$

A=$112.4m^{2}$

Using trapezoidal rule

A=$d(\frac{0\_{1}+0\_{n }}{2}+0\_{2}+0\_{3}+0\_{4}............0\_{n-1})$

$$d=30$$

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

A=$30(38.275)$

A=$1148.25m^{2}$

Using Simpson's rule

$$A=\frac{d }{3 }\left[\left(0\_{1}+0\_{n}\right)+4\left(0\_{2}+0\_{4}+.........0\_{n-1}\right)+2\left(0\_{3}+0\_{5}........0\_{n-1}\right)\right]$$

$$d=30$$

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

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

$$A=962m^{2}$$

Calculating for last offset using trapezoidal rule

A=$d(\frac{0\_{1}+0\_{n }}{2}+0\_{2}+0\_{3}+0\_{4}............0\_{n-1})$

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

$$A=183.75m^{2}$$

Therefore $ΣA=962+183.75$

$$A=1145.75m^{2}$$