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**17/ENG03/002**

**CIVIL ENGINEERING**

**1a) Methods of leveling**

**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)**

RL=110+matric No=110+2=112

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| B.S | I.S | F.S | H OF C | R.L | DISTANCE | REMARKS |
| 0.771 |  |  | 112.771 | 112 | 0 | RL |
| 0.802 |  | 1.52 | 112.053 | 111.251 | 10 | CP |
|  | 2.311 |  |  | 1109.742 | 20 |  |
| 3.580 |  | 1.990 | 113.643 | 110.063 | 30 | CP |
|  | 1.220 |  |  | 112.423 | 40 |  |
|  | 3.675 |  |  | 108.968 | 50 |  |
| 2.408 |  | 4.020 | 112.031 | 109.623 | 60 | CP |
|  | 0.339 |  |  | 111.692 | 80 |  |
| 0.780 |  | 0.157 | 112.654 | 111.874 | 90 | CP |
|  | 1.535 |  |  | 111.119 | 100 |  |
|  | 1.955 |  |  | 110.699 | 110 |  |
|  | 2.430 |  |  | 110.224 | 120 |  |
|  | 2.985 |  |  | 109.669 | 130 |  |
| 1.155 |  | 3.480 | 110.329 | 109.174 | 140 | CP |
|  | 1.960 |  |  | 108.369 | 150 |  |
|  | 2.365 |  |  | 107.964 | 160 |  |
| 0.935 |  | 3.640 | 107.624 | 106.689 | 170 | CP |
|  | 1.045 |  |  | 106.579 | 180 |  |
|  | 1.630 |  |  | 104.994 | 190 |  |
|  |  | 2.545 |  | 105.079 | 200 |  |
| =10.431 |  | =17.352 |  |  |  |  |

Check==R.L at first point-R.L at last point

 =6.921=6.921



QUESTION (2a)

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 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 $ΣA=962+183.75$

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

QUESTION (2b)

CHARACTERISTICS OF CONTOURS WITH WELL DIMENSIONED DIAGRAMS

1. A series of closed contour lines represent a hill, if the higher values are inside as shown.
2. A series of closed contour on a map indicate a depression if the higher values are outside as shown.
3. Contour lines cannot end anywhere but close on themselves either within or outside the limit of the map.
4. Contour lines are not merged or cross one another on a map or less in a case of overhanging cliff.
5. Contour will not run into one another except in the case of vertical cliff. In this several contours corniced and there horizontal equivalent becomes zero.

 