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**17/ENG03/049**

**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 |  |  | 159.771 | 161 | 10 |
| 0.802 |  | 1.52 | 159.053 | 158.251 | 20 |
|  | 2.311 |  |  | 156.742 | 30 |
| 3.580 |  | 1.990 | 160.643 | 157.063 | 40 |
|  | 1.220 |  |  | 159.423 | 50 |
|  | 3.675 |  |  | 156.968 | 60 |
| 2.408 |  | 4.020 | 159.031 | 156.623 | 70 |
|  | 0.339 |  |  | 156.692 | 80 |
| 0.780 |  | 0.157 | 159.654 | 158.874 | 90 |
|  | 1.535 |  |  | 158.119 | 100 |
|  | 1.955 |  |  | 157.699 | 110 |
|  | 2.430 |  |  | 157.224 | 120 |
|  | 2.985 |  |  | 156.669 | 130 |
| 1.155 |  | 3.480 | 157.329 | 156.174 | 140 |
|  | 1.960 |  |  | 155.369 | 150 |
|  | 2.365 |  |  | 154.964 | 160 |
| 0.935 |  | 3.640 | 154.624 | 153.689 | 170 |
|  | 1.045 |  |  | 153.579 | 180 |
|  | 1.630 |  |  | 152.994 | 190 |
|  |  | 2.545 |  | 152.079 | 200 |
| =10.431 |  | =17.352 |  |  |  |

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

=6.921=6.921

HC= RL + BS

HC(1) = 159+0.771=159.771

RL = HC-FS

RL(1)=159.771-1.52=158.251

HC(2)= 158.251+ 0.802=159.053

RL(2)= 159.053 – 2.311 =156.742

RL(3)=159.053-1.990=157.063

HC(3)=157.063+3.580=159.643

RL(4)=160.643-1.220=159.423

RL(5)=160.643-3.675=156.968

RL(6)=160.643-4.020=156.623

HC(4)=156.623+2.408=157.031

RL(7)= 154.031-0.339=158.692

RL(8)= 159.031-0.157=158.874

HC(5)=159.654+0.780=159.654

RL(9)= 159.654-1.535=158.119

RL(10)= 159.654-1.955=157.699

RL(11)= 159.654-2.430=157.224

RL(12)= 159.654-2.985=156.669

RL(13)= 159.654-3.480=156.174

HC(6)=157.329+1.155=155.329

RL(14)= 157.329-1.960=153.369

RL(15)= 157.329-2.365=153.964

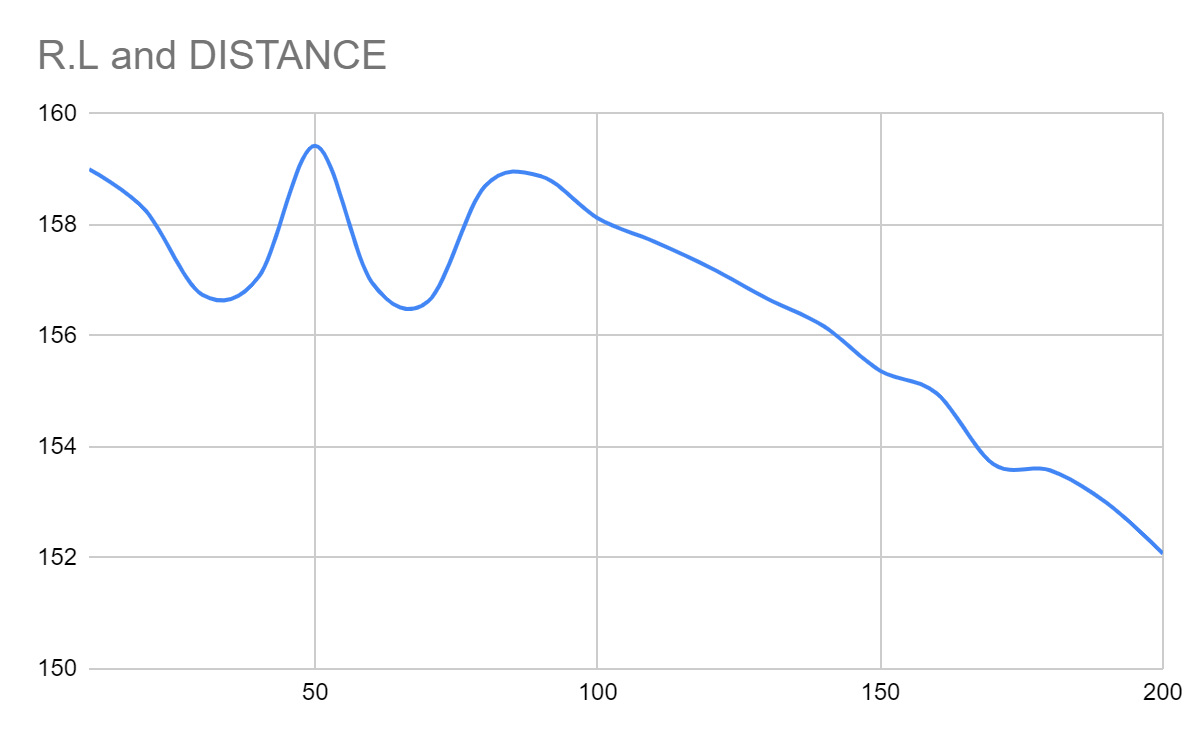
RL(16)= 157.329-3.640=153.689

HC(7)=153.689+0.935=154.624

RL(17)= 154.624-1.045=153.579

RL(17)= 154.624-1.630=152.994

RL(17)= 154.624-2.545=152.079



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 |

Using Mid-ordinate rule:

A=hd

h1= =1.325m

h2= =3.225m

h3= =3.775m

h4= =4.2m

h5= =4.125m

h6= =4.3m

h7= =5.4m

h8= =5.9m

h9= =5.925m

38.175m

d=30m

A=

=

A=

Using average ordinate rule

A=

n=9

d=30

41.2m

A=

A=

Using trapezoidal rule

A=

A=

A=

A=

Using Simpson's rule

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

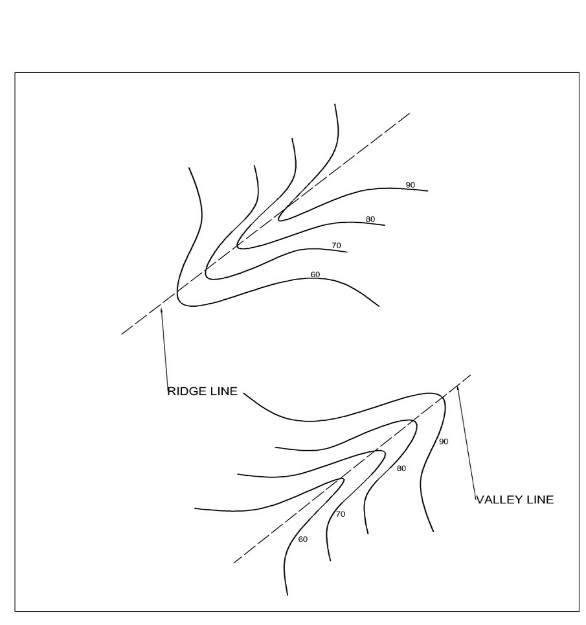
Calculating for last offset using trapezoidal rule

A=

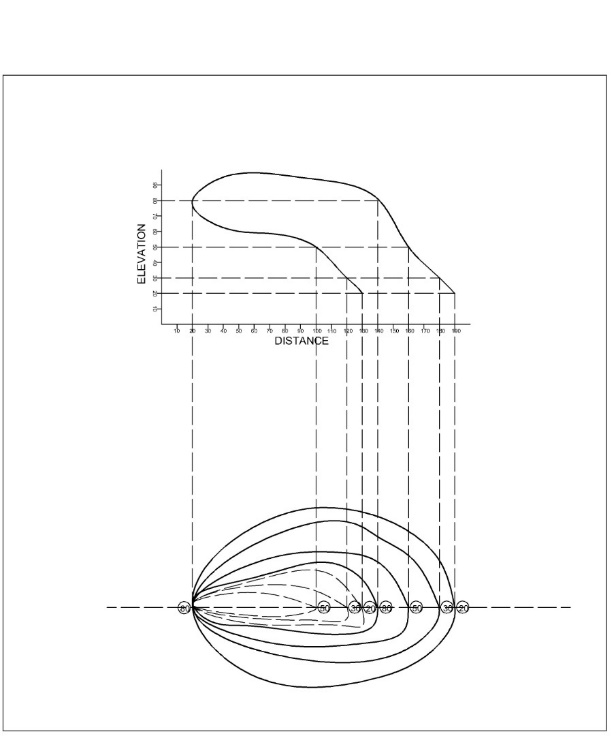
Therefore

2b) Characteristics of contour lines include:

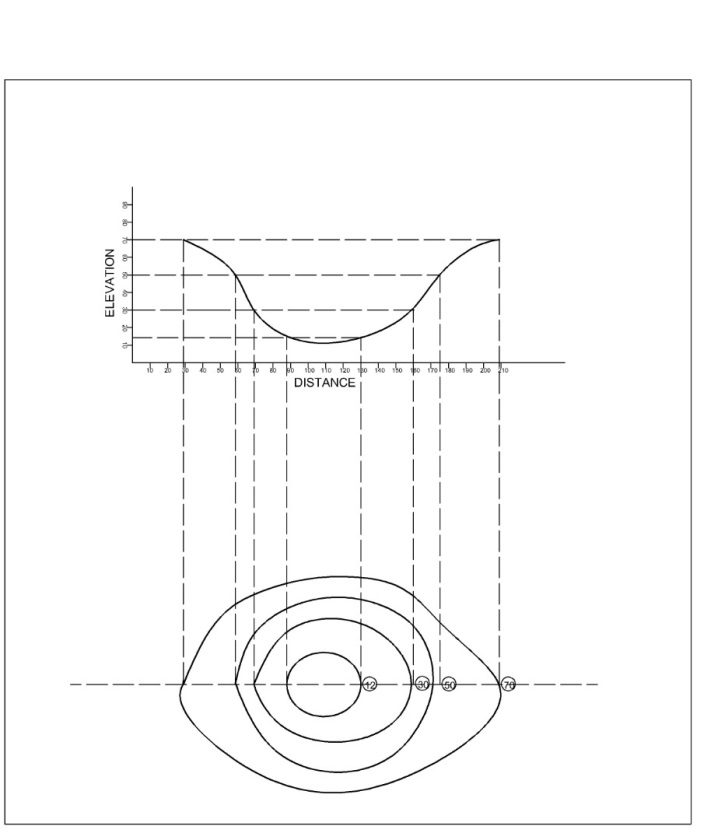
1. Contour lines cross a watershed or ridge line at right angles. They form curves of U-shape round it with the concave side of the curve towards the higher ground.



1. Contour lines with V-shaped with convexity towards higher ground at right angles indicate valley.
2. Contour lines meeting at a point indicate a vertical cliff.



1. A series of closed contour lines on the map indicates a depression if the higher values are outside.



1. A series of closed contour lines on the map represents a hill, if the values are inside.

