Deepa chapter 1 (Detailed estiment of culverts and brides)

R.C.C. SLAB CULVERTS - 1.5 METRE SPAN

Example 1. — Prepare a detailed estimate of a slab culvert of 1.50 metre span and 4.00 metre roadway from the given drawing (Fig. 8.5). The general specifications are as follows :—

Foundation concrete shall be of cement concrete 1 : 3 : 6 with stone ballast and coarse sand. Masonry shall be of first class brickwork in 1 : 4 cement coarse sand mortar. Slab shall be of R.C.C. 1 : 2 : 4 with reinforcement as per drawing. Exposed surface of brick masonry shall be cement pointed 1 : 2. Road shall be provided with 10 cm thick wearing coat of 1 : 2 : 4 cement concrete. Assume suitable rates.

R.C.C. SLAB CULVERT 1.50 m SPAN with standard modular bricks

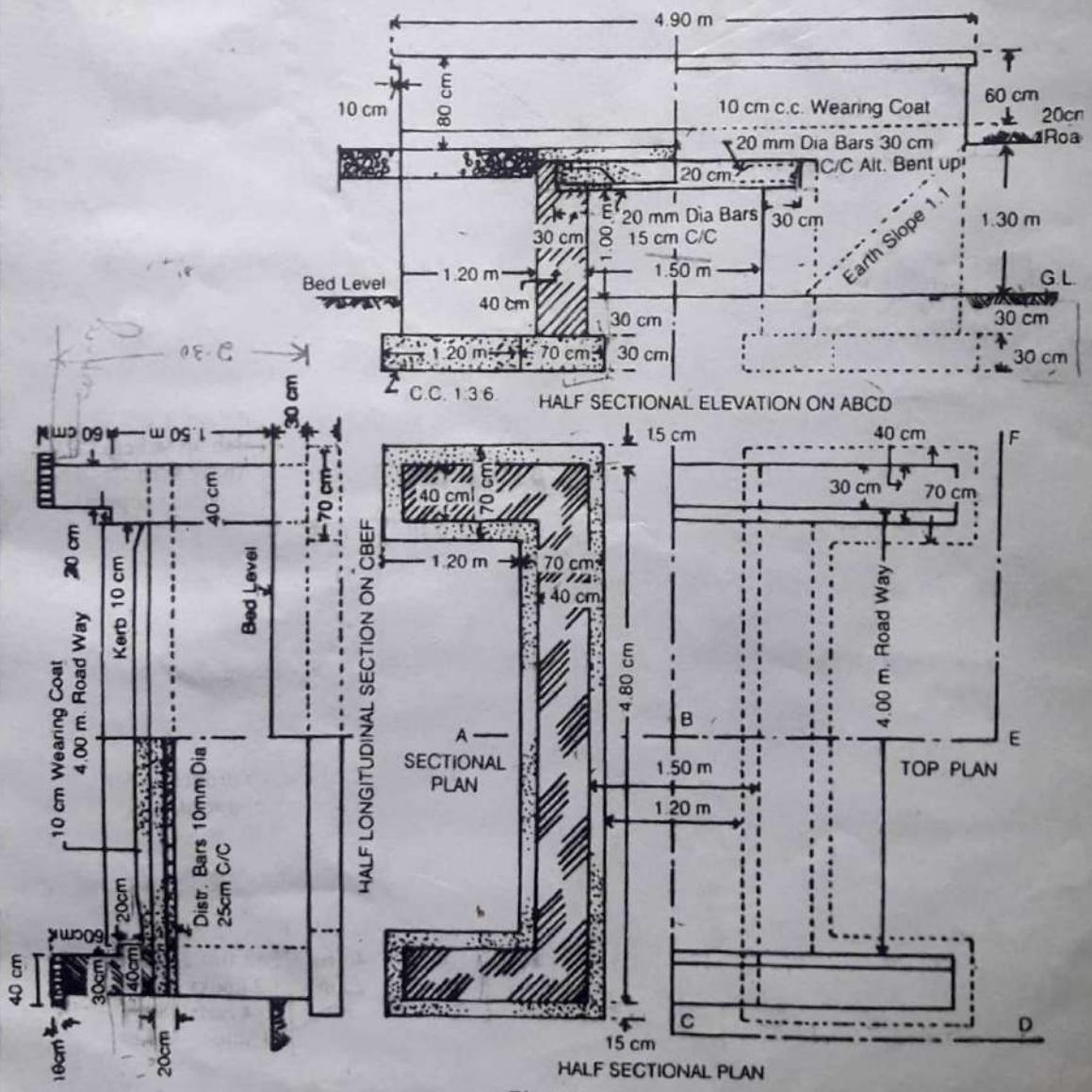


Fig. 8-5

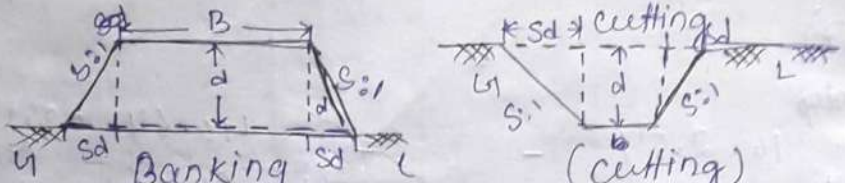
Item No	Particular of Item	NO	Length	Breath	Hight	Quantity	C.N
1	Earth work excavation in Foundation						
	Abutment	2	5.10	.7	.6	4.284	4.80+.15 +.15
	wing wall	4	1.2	.7	.6	2.016	
					Total=	6.3 m^3	
2	Lime concrete in Foundation						
	Abutment	2	5.10	.7	.3	2.142	
	wing wall	4	1.2	.7	.3	1.008	
					Total=	3.15 m^3	
3	1st class brick in 1:4 cement mortar						
	Abutments	2	4.8	.4	1.5	5.76	
	wing wall	4	1.2	.4	1.5	2.88	
	Parapets up to kerb	2	4.70	.4	.3	1.128	
	Parapets above kerb	2	4.70	.3	.5	1.41	
	parapet coping	2	4.9	.4	.1	0.392	
					Total=	11.57 m^3	
	Deduct Bearing of R.C.C slab in abutment	2	4.8	.3	.2	-0.576	
					Total=	11 m^3	
4	R.C.C. work 1:2:4 in slab exceeding steel fit bending but including centering shuttering & binding steel.	1	4.8	2.1	.2	2.016 m^3	1.5+.3+.3 =2.1
5.	Steel bars including bending in R.C.C. work 20 mm dia bars -						

	bars main straight bars 30 cm c/c (No = 4.80/.30 = 16 (16+1=17)	17	2.38	—	—	40.46	L = B-2 sides cover + 2 hook 2.1-(2x.04+.02 (2x9x.02) = 2.34 m
	main bent up bar - 4.80/.3 = 16	16	2.54	—	—	40.64	2.38+8x.02 (8D)
					total	81.1 m	
6	10 mm dia bar Distributing bottom bars 25 cm c/c 2.1/.25 = 8.4 (9)	9	4.9	—	—	44.1 m ?	4.8-2x.04 +2x9x.01
	Distribution top bar l/5 9/2 = 4.5	4.5	4.9	—	—	~~22.05 m~~ 19.8 m	

Chapter-3

Road estimate earth work :—

Cross Section of earth-work of road in banking or in cutting usually in the form of trapezium. & the quantity of earth-work may be calculated by the following methods :—



Sectional area = Area of central rectangular portion + 2 side triangular portions.

$$= B \times D + 2 \times \left(\frac{1}{2} \times Sd \times d\right)$$

$$= BD + Sd^2$$

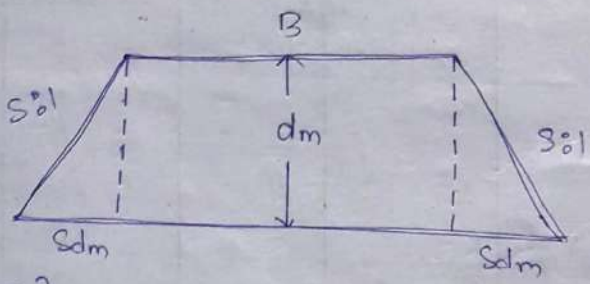
S:1 is the ratio of side slopes as horizontal : vertical. For 1 vertical, horizontal is S. for d vertical horizontal is Sd.

$$\text{Quantity} = (Bd + Sd^2) \times L$$

D 1:1 : 3:1 9

Method-1

mid Sectional area method



$$Bdm + Sdm^2$$

method - 2

mean Sectional area method :—

$$A_1 = Bd_1 + Sd_1^2$$

$$A_2 = Bd_2 + Sd_2^2$$

the mean Sectional area $\frac{A_1 + A_2}{2}$

$$\text{Quantity} = \frac{A_1 + A_2}{2} \times l$$

Method -3

Prismoidal formula method ;-

$$A_1 = Bd_1 + Sd_1^2$$

$$A_2 = Bd_2 + Sd_2^2$$

$$d_m = \frac{d_1 + d_2}{2}$$ (cross section at midle) (d_m)

$$A_m = (Bd_m + Sd_m^2)$$

$$\text{Quantity} = \frac{l}{6}(A_1 + A_2 + 4A_m)$$

Question

Problem-1

Calculate the Quantity of Earthwork for 200m. length for a person of a road in an uniform ground the high of banks at the ends being 1m & 1.6m The formation width is 10mm & side slope 2:1 assume that there is no transverse slope.

Given Data ;-

$l = 200\ m$

$d_1 = 1\ m$

$d_2 = 1.6\ m$

$b = 10\ m$

$S = 2:1$

method -1

mid sectional area

$Bdm + Sdm^2 \times l$

$10 \times 1.3 + 2 \times 1.3^2 \times 200$

$= 16.38 \times 200 = 3276\ m^3$

$$dm = \frac{d_1 + d_2}{2} = \frac{1 + 1.6}{2} = 1.3$$

Method - 2

mean Sectional area method;-

$A_1 = Bd_1 + Sd_1^2$

$= 10 \times 1 + 2 \times 1^2$

$= 12$

$A_2 = Bd_2 + Sd_2^2$

$= 10 \times 1.6 + 2 \times 1.6^2$

$= 21.12$

mean sectional area

$$\frac{A_1 + A_2}{2} = \frac{12 + 21.12}{2} = 16.56$$

$$\text{Quantity} = \frac{A_1 + A_2}{2} \times l$$

$= 16.56 \times 200$

$= 3312 \, m^3$

Method - 3

Prismoidal formula method;-

$A_1 = 12$

$A_2 = 21.12$

$A_m = Bd_m + Sd_m^2$

$= 10 \times 1.3 + 2 \times 1.3^2$

$= 16.38$

$$\text{Quantity} = \frac{l}{6}(A_1 + A_2 + 4A_m)$$

$$= \frac{200}{6}(12 + 21.12 + 4 \times 16.38)$$

$= 3288 \, m^3$

9.3.18

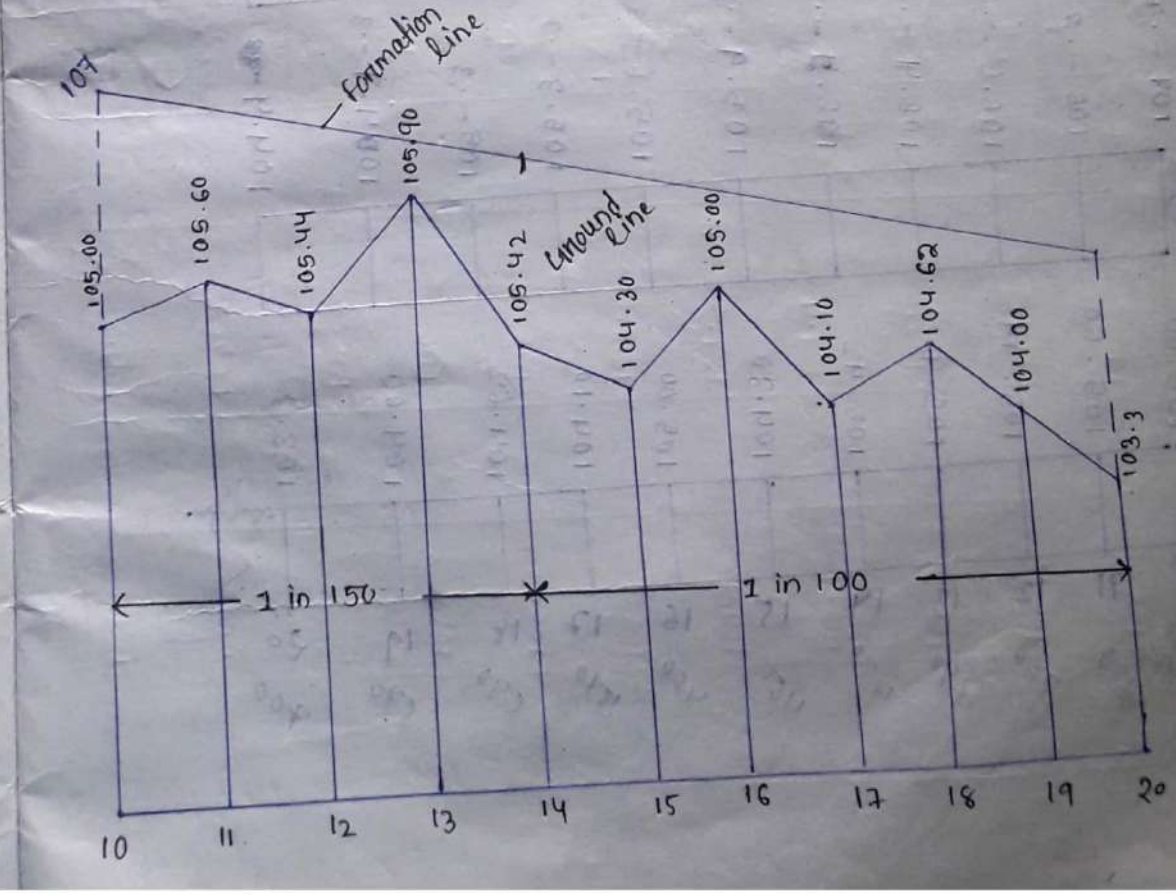
Q-3

Reduced level (R.L) of ground along the centre line of a ~~chainage 20~~ proposed road from change 10 to chainage 20 are given below. The formation level at the 10th chainage is 107 & the road is in downward gradient of 1 in 150 up to the chainage 14 & then the gradient changes to 1 in 100 down ward formation width on road is 10 meter & side slopes of banking are 2:1 (Horizontal : vertical) length of the chain is 30 meter.

Draw longitudinal section of the road & a typical cross-section & prepare an estimate of earthwork at the rate of RS:-275% cum

(1) Find also the area of the side slopes & the cost of turfing the side slopes at the rate of RS:- 60.00 % sqm.

Chainage	10	11	12	13	14	15	16	17	18	19	20
R.L of ground											



Given Data

Distance = 300 m

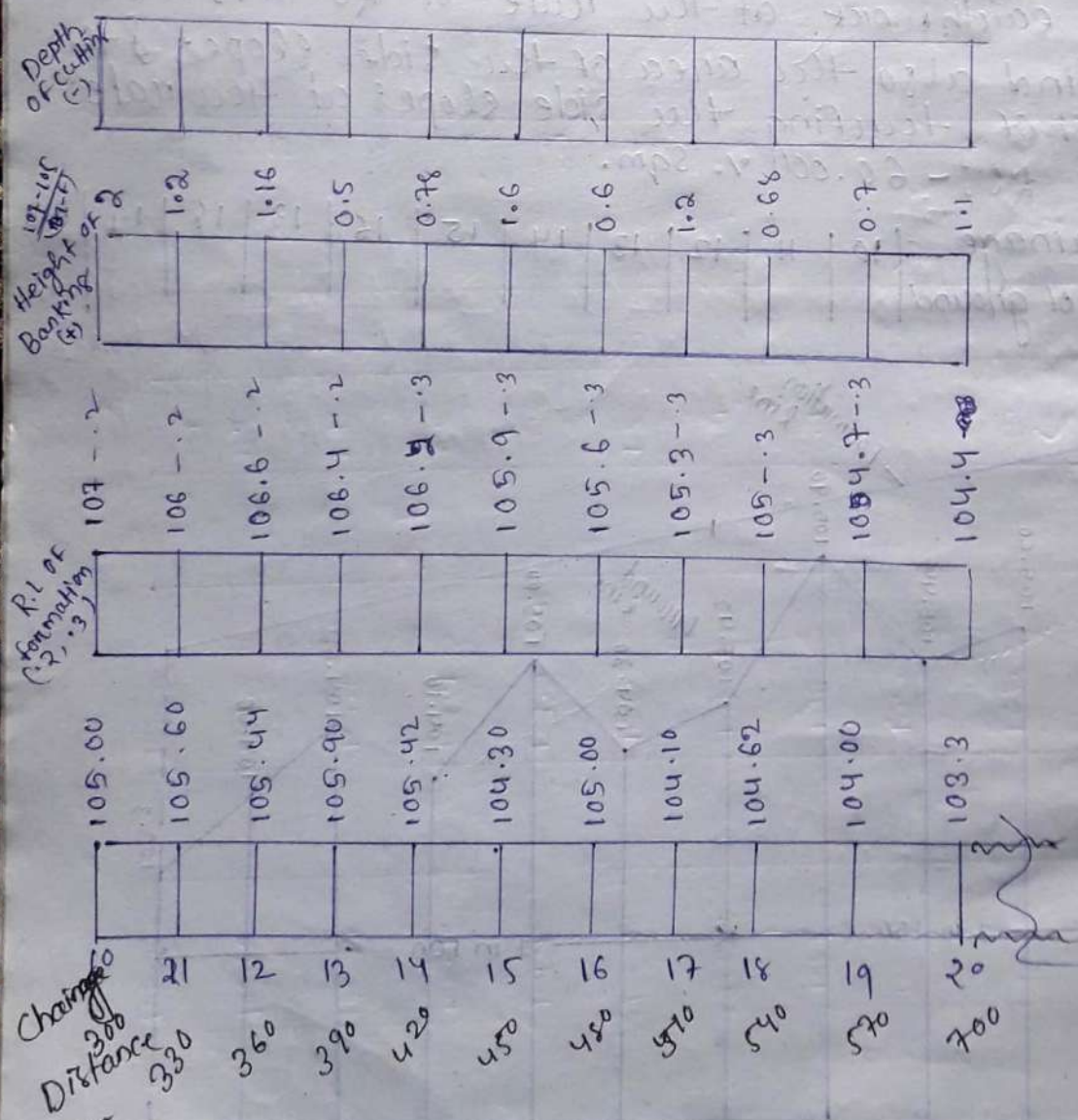
length of chain = 30 m

S = 2 : 1

R.L. of formation = $\frac{1}{150} \times 30 = .2$

$\frac{1}{100} \times 30 = .3$

B = 10 m



Stations or Chainage

m

10

11

12

13

14

15

16

17

18

19

20

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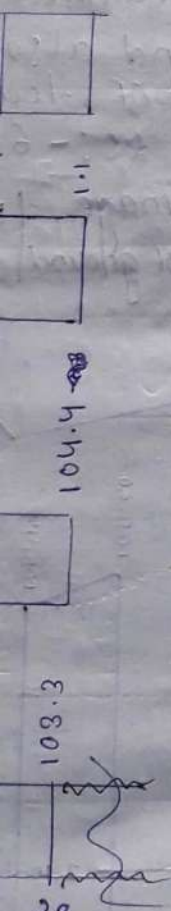
Stations or Chainage m	Length m	Height or Depth Diff. of G.L & F.L m	$\frac{d_1+d_2}{2}$ mean height or Depth (d) m	Central area Bd m^2	Side area sd^2 m^2	Total set area $Bd+sd^2$ m^2	Length in b/w Station m^2	Quantity $(Bd+sd^2)\frac{L}{2}$ Banking m^3	Cutting m^3
10	300	2	—	—	—	—	—	—	—
11	330	1.2	1.6	16	5.12	21.12	30	633.6	—
12	360	1.16	1.18	11.8	2.78	14.58	30	437.4	—
13	390	.85	.83	8.3	1.38	4.68	30	290.4	
14	420	.78	.64	6.4	.82	7.22	30	216.6	
15	450	1.69	1.19	11.9	2.83	14.73	30	441.9	
16	480	0.6	1.1	11	2.42	13.42	30	402.6	
17	510	1.2	.9	9	1.62	10.62	30	318.6	
18	540	0.88	.94	9.4	1.25	9.15	30	274.5	
19	570	0.79	.69	6.9	.58	5.98	30	179.4	
20	600	1.9	.9	9	1.62	10.62	30	318.6	

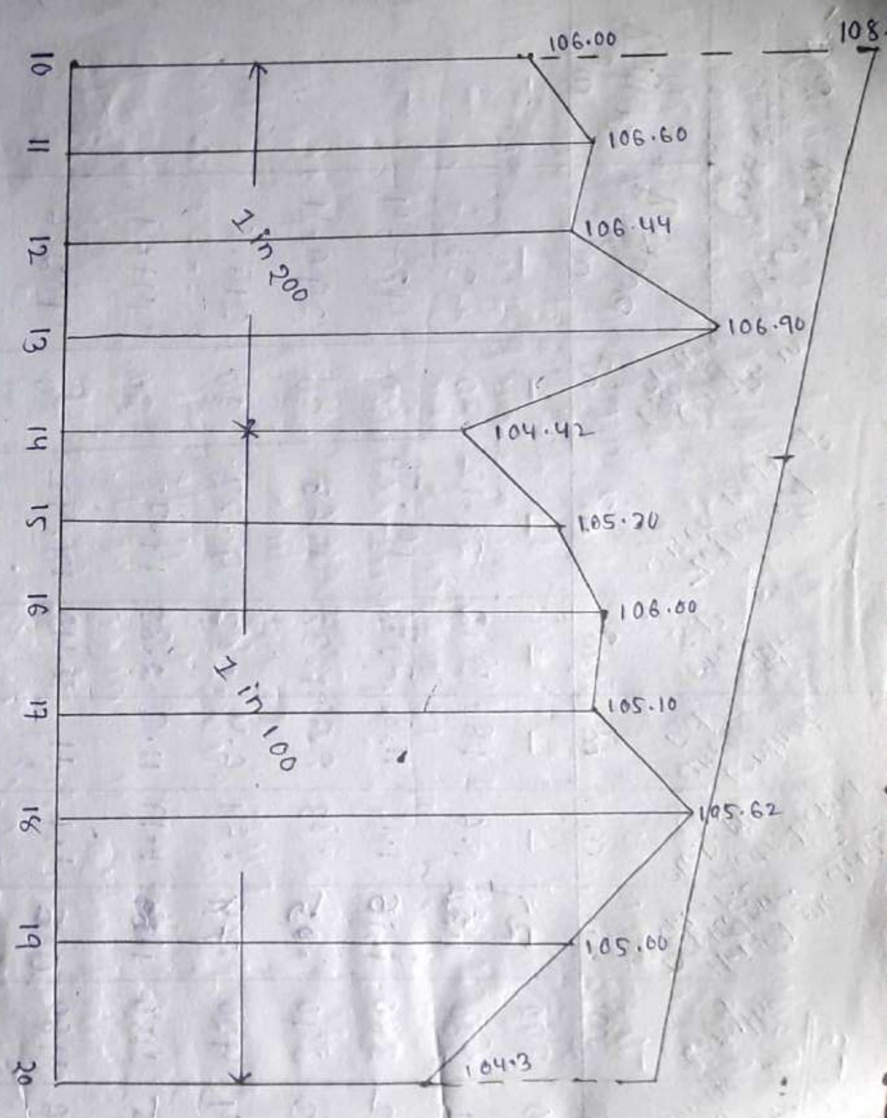
Total = 3513.6 m^3



Problem – 4

Chainage	10	11	12	13	14	15	16	17	18	19	20
R.L of ground	106.00	106.60	106.44	106.90	104.42	105.30	106.00	105.10	105.62	105.00	104.3

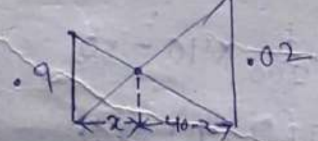
R.L. of Formation – 108.00 m
Down Gradient – 1 in 200 – (10–14)
Down Gradient – 1 in 100 – (15–20)
B = 20 m , S = 2:1
length of chain – 40 m
Distance – 300 m



Chainage	Distance	R.L. of ground	R.L of Formation	Height of Banking
10	300	106.00	108 -.2	2
11	340	106.60	107.8	1.2
12	380	106.44	107.6	1.16
13	420	106.90	107.4	0.5
14	460	104.42	107.2 -.4	2.78
15	500	105.30	106.8	1.5
16	540	106.00	106.4	0.4
17	580	105.10	106	0.9
18	620	105.62	105.6	-0.02
19	660	105.00	105.2	0.2
20	700	104.3	104.8	0.5

Stations or Chainage	Length	Height or Depth of G.L. & F.L.	mean height or Depth (d) $\frac{d_1+d_2}{2}$	Central area Bd	Side area Sd^2	Total set area $Bd+Sd^2$	Length in b/w Stations L	Quantity $(Bd+Sd^2)\times L$ Banking	Cutting
m	m	m	m	m^2	m^2	m^2	m^2	m^3	m^3
10	300	2	—	—	—	—	—	—	
11	340	1.2	1.6	32	5.12	37.12	40	1484.8	
12	380	1.16	1.18	23.6	2.78	26.38	40	1055.2	
13	420	.5	.83	16.6	1.37	17.977	40	716	
14	460	2.78	1.64	32.8	5.37	38.17	40	1526.8	
15	500	1.5	2.14	42.8	9.15	51.95	40	2078	
16	540	0.4	.95	19	1.80	20.805	40	832	
17	580	0.9	.65	13	0.84	13.84	40	553.6	
Passes from banking to cutting	619	0	.45	9	0.40	9.40	39	366.6	
18	620	.02	0.01	0.2	2×10^{-4}	0.20	1		.20
19	660	.2	.11	2.2	0.02	~~88.88~~ 2.227	40	88.8	
20	700	.5	.35	7	0.24	7.24	40	289.6	

Total = ~~8677.8 m^3~~ 8990.2 m^3 | .20 m^3



$$\frac{x}{.9} = \frac{40-x}{.02} \quad \text{or} = .9(40-x)$$

$$\Rightarrow .02x = 36 - .9x$$

$$\Rightarrow .92x = 36$$

$$\Rightarrow x = \frac{36}{.92} = 39.1 m \simeq 39 m$$

Therefore length of banking portion is 39 m & the length of cutting portion is 40 − 39 = 1 m

Problem-5

Estimate the cost of earthwork for a portion of road for 400 metre length from the following data -

formation width of the road is 10 metre. Side slopes are 2:1 in banking 1½:1 in cutting.

Station	Distance in meter	R.L of ground	R.L of formation
25	1000	51.00	52.00
26	1040	50.90	
27	1080	50.50	
28	1120	50.80	
29	1160	50.60	Down word gradient of 1 in 200
30	1200	50.70	
31	1240	51.20	
32	1280	51.40	
33	1320	51.30	
34	1360	51.00	
35	1400	50.60	

Given Data :-

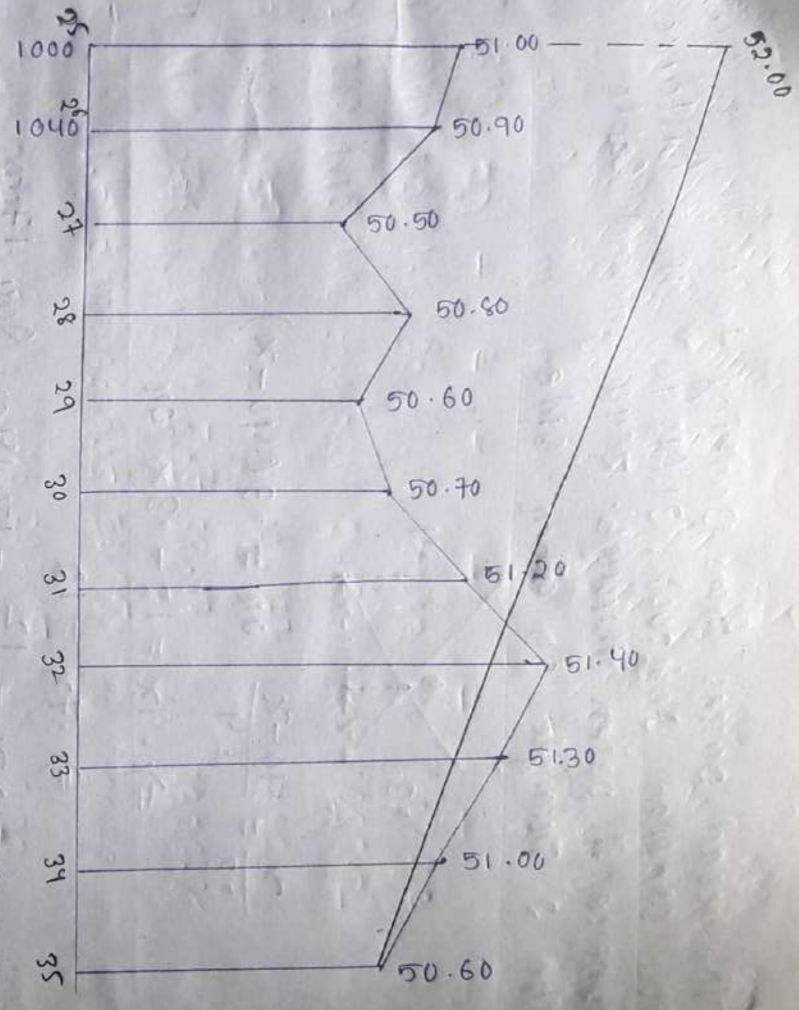
R.L of formation = 52.00

Down gradient = 1 in 200 = $\frac{1}{200} \times 40 = 0.2$

B = 10 m , S = Banking (2:1) = 2

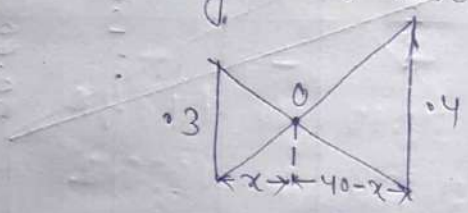
Cutting (1½) = 1.5

length of chain = 40 m



Chainage	Distance	Ground R.L.	R.L. of Formation	Height of Banking	Depth of cutting
25	1000	51.00	52.00 - .2	1	
26	1040	50.90	51.8	0.9	
27	1080	50.50	51.6	1.1	
28	1120	50.80	51.4	0.6	
29	1160	50.60	51.2	0.6	
30	1200	50.70	51	0.3	
31	1240	51.20	50.8		0.4
32	1280	51.40	50.6		0.8
33	1320	51.30	50.4		0.9
34	1360	51.00	50.2		0.8
35	1400	50.60	50		0.6

The road passes from Banking to cutting in b/w the station 30(1200), 31(1240) the Distance where it pasess through zero ground lable the 2 Triangle on either side



$$\frac{x}{\cdot 3} = \frac{40-x}{\cdot 4} \quad \text{or} \quad = \cdot 3(40-x)$$

$$\Rightarrow \cdot 4x = 12 - \cdot 3x \text{ or}$$

$$\Rightarrow \cdot 7x = 12$$

$$\Rightarrow x = \frac{12}{\cdot 7} = 17.14\text{m} \text{ Say } 17\text{ m}$$

Therefore length of Banking persion is 17m.
& length of cutting persion is 40-17 = 23 m

station	Distance Km m	Height of Depth Diff. of G.L & F.L	mean Ht or Depth (d) m	Lenthual area Bd m	Area of sides Sd^2 m^2	Total section area Bd+Sd^2 m^2	Distance b/w station m	Quantity (Bd+Sd^2)xL Banking m^3	Quantity (Bd+Sd^2)xL cutting m^3
25	1000	1.00	—	—	—	—	—	—	
26	1040	0.90	·95	9.5	1.80	11.30	40	452.2	
27	1080	1.10	1	10	2	12.00	40	480.0	
28	1120	0.60	·85	8.5	1.4	9.94	40	397.6	
29	1160	0.60	.6	6	.72	6.72	40	268	
30	1200	0.30	·45	4.5	·40	4.9	40	196	
Zero from Point Cutting	1217	0	0.15	1.5	·04	1.54	17	26.18	
31	1240	0.4	·2	2	.06	2.06	23		47.38
32	1280	0.8	0.6	6	·54	6.54	40		261.6
33	1320	0.9	·85	8.5	1.08	9.58	40		383.2
34	1360	·8	·85	8.5	1.08	9.58	40		383.2
35	1400	·6	0.7	7	·73	7.73	40		309.2
							Total =	1820 m^3	1384 m^3

in b/w
istance
able

17m.
=23 m

Quantity (Bd+sD)xL	
Banking m3	Cutting m3
—	
452.2	
480.0	
397.6	
268	
196	
26.18	

Problem :-

Station	Distance in meter	R.L of ground	R.L of Formation
25	1000	51.00	52.00
26	1040	50.90	⋮
27	1080	50.50	⋮
28	1120	50.80	⋮
29	1160	50.60	Down word gradient
30	1200	50.70	of 1 in 200
31	1240	51.20	⋮
32	1280	51.40	⋮
33	1320	51.30	⋮
34	1360	51.00	⋮
35	1400	50.60	

Longitudinal Section of the road & type cross-Section are as given in the exp can, however, be solved with out the help of L Section & cross section.

CHAPTER – 4 PWD accounts works

Work :- For any original work the Engineering Department prepares a proposal on the basis of preliminary estimate, from the requirments & information supplied by the Department concerned. The Department after due & consideration approves the proposal with respect to the work. & Convey their approval on administrative Sanction to the engineering department.

Classification of work according to their nature :-

The works according to their nature are classified under the two main classes as original work & repair or maintenance work.

Original :- The original work may be of different types :-

(1) Entirely new construction of new building, bridge, road, damp, project etc...

(2) Additions & alterations to the existing work will increase the value of the property as - Addition of room or rooms, conversion of verandah into room. dividing a big room into two rooms, etc.

(3) Special repairs for renovation or for thorough repairs of the damaged work - as changing of roof, changing of floor, changing of doors & windows etc...

Repair work :-

The repair works may be of the following types :-

(i) The repairs required to maintain the work in proper condition as annual repairs to buildings roads, etc. as - Annual repairs, white washing colour washing etc...

(ii) Minor addition & alterations, with certain monetary limit (say Rs - 200.00), which will not increase the value of the property as - opening a door, providing Sunshades providing shelves, etc...

(iii) Special repair, monoon Damage repair. etc...

Classification of works according to their cost:-

With respect to the cost, the original work is classified as major work, minor work & petty work.

major work:- The work costing more than Rs. 2 lakhs is termed as major work, & estimate for such work is known as major estimate.

minor work:- The work costing more than Rs. 50,000,00 but not exceeding Rs. 2 lakhs is known as minor work.

Petty work:-

The work whose cost does not exceed Rs. 50,000,00 is known as petty work & Estimate is known as petty estimate.