BHARTIYA INSTITUTE OF ENGINEERING & TECHNOLOGY
SIKAR

DEPARTMENT OF CIVIL ENGINEERING

LAB MANUAL

6CE4-23 : QUANTITY SURVEYING & VALUATION

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LAB MANUAL – QUANTITY SURVEYING AND VALUATION (6CE4-23)

CONTENTS

* Types of estimate :-

i) Rough cost estimate / preliminary estimate / approx. estimate / Abstract esti.
ii) Plinth area estimate.
iii) cube rate estimate.
iv) Approximate quantity method estimate.
v) detailed estimate / Item rate estimate.
vi) Revised estimate
vii) supplementary estimate
viii) Supplementary and revised estimate.
ix) Annual repair or maintance estimate.

1) Preliminary Estimate :

It is required for preliminary studies of various aspect of a work, to decide the financial position or policy for administrative sanction by the competant administrative authority.

Preliminary estimate may be prepared by various ways for different structures and works.

eg : buildings, roads and highways, irrigation channels, bridge and culverts, sewarage project and water supply project.

2) Plinth Area Estimate :-

This is prepared on the basis of plinth area of building, the rate being deducted from the cost of similar building having similar specification, height and construction in the locality.

Plinth area is calculated by finding the plinth area of the building and multiplying by the plinth area rate. The plinth area should be calculated for the covered area by taking external dimension of the building at the floor level. courtyard and other open area should not be included in the plinth area. Plinth area estimate is only approximate, an is preliminary estimate to know the approximate cost before hand.

eg : The approximate cost of a building having the plinth area of

$100m^2$. Rs $900/m^2$ workout as 90,000.

3) Cube Rate Estimate :

It is a preliminary estimate or an approximate estimate, and is prepared on the basis of the cubical contents of the buildings the cube rate being deducted from the cost of the similar building having similar specification and construction, in the locality.

The approximate cost of a building of cubic content (volume) of $400m^3$ at the rate rupees (Rs) $180/m^3$ comes to Rs. 72,000.

Note : Cube rate estimate is more accurate as compair to plinth area estimate as the height of the building is also compaired.

4) Approximate quantity method Estimate :

In this method approximate total length of the wall is found running metre and this total length multiply by the rate per running metre of wall gives a fairly cost.

For this method the structure may be devided into two parts;

i) foundation including plinth.

ii) Super structure.

The running metre cost for foundation and super structure should be calculated first and this running metre rate should be multiply by the total length of walls.

5) Detailed Estimate :

It is an accurate estimate and consist of working out the quantities of each items of work, and working the cost.

The dimension, length, breadth and height of each item are taken out correctly from drawing and quantities of each items are calculated, and abstracting and billing are done.

The detail estimate is prepared in two stages;

details of measurement and calculation of quantities.
Abstract of estimated cost.
The detailed estimate is accompanied with ;

i) Report
ii) General specifications
iii) detail specifications.
iv) Drawings. : Plan, elevation, sectional elevation, detailed drawing, site plan or lay out plan or index plan, etc.
v) Calculation and design : design of foundation, beam, slab, lintel, design of channel in case of irrigation channel, design of thickness of metal crust in case of road, etc.
vi) Analysis of rates.

6) Revised Estimate :
Revised estimate is detailed estimate and is required to be prepared under any one of the following circumstances.

→ when the original sanction estimate is exceeded by more than 5%.
→ when the expenditure on a work exceeds by the amount of more than 10 %.
→ When their are material deviation from the original proposal.

7) Supplementary Estimate :
Supplementary estimate is detailed estimate and is prepared when additional works are required to supplement the original works, or when further development is required during the progress of work.

8) Supplementary and Revised Estimate :
when a work is partially abandened and the estimate cost of the remaining work is less than 95% of the original work, that is less than 95% of the original sanction estimate. A supplementary and revised estimate is then prepare.

9) Annual Repair and maintanance estimate :-

Annual repair or maintanance estimate is detailed estimate and is prepared to maintain the structure and safe condition. For buildings this include white washing, colour washing, painting minor repairs, etc.

★ General idea in percentage for priliminary estimate for building work :-

1) Cost of labour and material
   i) Cost on account of labour → 30 to 35% of whole cost
   ii) Cost on account of materials → 70 to 65% of whole cost.

2) Direct cost and overhead cost
   i) Direct cost on actual work → 85% of whole cost
   ii) Overhead cost due to establishment, supervision, incidentes, etc → 15% of the whole work.

3) i) Cost of foundation and plinth → 10 to 15% of whole cost.
   ii) Cost of superstructure → 90 to 85% of whole cost.

4) Cost of second storey → 85% to 95% of the first storey.

5) cost of different parts or % breakup of building (excluding sanitary and electrical works).
   i) Earthwork in excavation & filling → 1/2 % of whole ~~work~~ cost
   ii) Concrete in foundation → 5% of the whole ~~work~~ cost.
   iii) Damp prost courese → 1% "
   iv) Brick work → 34 % "
   v) Roofing → 20% "
   vi) flooring → 6% "
   vii) Doors and windows → 16 % "
   viii) Plastering and pointing → 10 % "
   ix) white washing, colour washing, paint, etc → 2% "
   x) miscellaneous → 5 1/2 % of the whole work cost

Total = 100% of the whole cost.

6) Cost of sanitary and electrical works :

i) sanitary and water supply installation → 8% of building cost.

ii) Electric installation excluding fan → 8% of the building cost.

Ques) Prepare a preliminary estimate of a building project with a total plinth area of all building of 1500 sq.m. Given that ;

i) Plinth area rate - Rs 950.00 per sq.m.

ii) Extra and special architectural treatment - 1½ % of the building cost.

iii) Extra for water supply and sanetary installation - 5% of the building cost.

iv) Extra for internal installation - 14% of the building cost

v) Extra for services - 6% of the building cost.

vi) Conting encies - 3%.

vii) Supervision charges - 8%.

Sol:- i) Building cost - 1500 sqm @ 950 Rs per sq.m

$= 1500 \times 950 =$ Rs 1425000.00

ii) special authitect treatment $= 1425000 \times \frac{1.5}{100} =$ Rs 21375.00

iii) water supply and sanetry installation. $= 1425000 \times \frac{5}{100}$

$=$ Rs 71250.00

iv) Internal electrical installation $= 1425000 \times \frac{14}{100} = 199500.00$

v) Other services $= 1425000 \times \frac{6}{100} =$ Rs 85500.00

Total = Rs 1802625.00

Contingencies → 3% of overall

$= 1802625 \times \frac{3}{100} = 54078.75$

Supervision charge ⇒ 8% of overall

$= 1802625 \times \frac{8}{100} = 144210.00$

→ Total estimated cost = 1802625 + 54078.75 + 144210.00

= 2000913.75//

Plinth Area estimate :

Ques/ Prepare a preliminary estimate of a four storeyed office building having carpet area of 2000 sq.m. for obtaining the administrative approval of the govt. given the following data it may be assumed that 30% of the buildup will be taken up by the corridors, verendahas, lavatories, staircase, etc and 10% of the build up area will be occupied by walls.

i/p Plinth area rate is = Rs 950.00 sq.m.

ii/p extra for special architect treatment = 0.5% of building cost

iii/p Extra due to deep foundation at site = 1% of building cost

iv/p Extra for water supply & sanitary installation = 6% of the building cost

v/p Extra for electric installation = 12.5% of the building cost

vi/p Extra for other services = 5% of the building cost.

vii/p Contingencies = 0.5%.

viii/p supervision = 8%

Sol:- Built up area or Plinth area : carpet area + area occupied by corridor, verandas, lavaratories, staircase, etc. + area occupied by the wall

let x be the build up area or plinth area.

then, $x = 2000 \text{ sq.m} + \frac{30}{100} x + \frac{10}{100} x$

$$x = 2000 + \frac{3x}{10} + \frac{x}{10}$$

$$10x - 4x = 2000$$

$$x = 3333\ 1/3 \text{ sq.m.}$$

Building Cost = 3333 1/3 sq.m @ Rs 950.00 sq.m
= 3333 1/3 x 950
= Rs 3166663.50

Extra for deep foundation = 01 % building cost
= $3166663.50 \times \frac{1}{100}$
= 31666.65

special Architectural treatment = 0.5 % of building Cost
= $3166663.50 \times \frac{0.5}{100}$
= 15833.32

water supply and sanitation installation = 6% of building cost
= $3166663.50 \times \frac{6}{100}$
= 189999.81

Electric installation = 12.5% of building Cost
= $3166663.50 \times \frac{12.5}{100}$ ⇒ 395832.93

other services = 5% of building cost

$= 3166663.50 \times \frac{5}{100}$

$= 158333.17$

Total ⇒ 3166663.50 + 31666.65 + 1583.32 + 189999.81 + 395832.93 + 158333.17

⇒ Rs 3958328.22/-

Contingencies = @ 1/2% of overall

$= 3958328.22 \times \frac{0.5}{100}$

$= 19791.64$

Supervision charges = 8% of overall

$= 3958328.58 \times \frac{8}{100}$

$= 316666.30$

Grand Total = 3958328.22 + 19791.64 + 316666.30

⇒ 4373953.00/-

ues) Prepare a rough cost estimate for the civil work required for a school requiring a total carpet area of 5000 sq m this include the actual floor area required for class rooms, labs, offices and stores, etc. Suitable extra provision should be made for walls verandas, corridors, lavatories, stair case etc the plinth area rates @ Rs 1500 per sq m for that area suitable extra provision may be made for special architectural features water supply and sanitary connection, for internal power and electrical connections and for the other services.

Cubical Content method :-

Ques: Prepare the rough estimate for a proposed commercial complex for a municipal corporation for the following data.

Plinth area = 500 sq.m / floor

Height of each storey = 3.5 m

No. of storey = G + 2

cubical content rate = Rs 1000 / m^3.

Provide for a following as a percentage of structured cost.

a) water supply sanitary arrangement = 8% cost of building.

b) Electrification = 6% of the building cost

c) fluctuation of rates = 5% of the building cost

d) Contractor profit = 10%

e) Petty supervision & Contingencies = 3%

Sol:- Cubical Content = No. of storey (Plinth area) x height of each storey

= 3 (500 x 3.5) = 5250 m^3.

structural cost or building Cost = 5250 x 1000

= 5250000 Rs.

Other provision :

a) water supply and sanitation = $5250000 \times \frac{8}{100} \Rightarrow 420000$

b) Electrification = $5250000 \times \frac{6}{100} \Rightarrow 315000$

c) Fluctuation of rates = $5250000 \times \frac{5}{100} \Rightarrow 262500$

Structural Cost total = 997500 + 5850000

= 6847500

d) P/s & contigencies = $6847500 \times \frac{3}{100}$

= 187400

e) Contractor Profit = $6247500 \times \frac{10}{100}$

= 624750

Total Cost = 6847500 + 187400 + 624750

= 7059600 Rs.

★ Methods of taking out Quantities :-

i) Long wall - short wall method.

ii) Centre line method.

i) Long wall - short wall method :

In this method the wall along the length of the room is considered to be long wall while the wall perpendicular to the long wall is said to be short wall. to get the length of long wall or short wall Calculate first the centre line, length of individual walls. Then the length of long wall (out to out) may be calculated after adding half breadth at each end to its centre line length. The length of short wall measured in to in may be found by deducting half breadth from its centre length at each end.

ii) Centre line method :

This method is suitable for walls of similar cross-section here the total centre line length is multiplied by breadth and depth of respective items of to get the total quantity at a time when cross walls or portion walls join with main wall the centre line length gets reduced by half of breadth for each junction.

★ Details of measurement & Calculation of Quantities :-

The complete work is devided into various items of work such as earth work concreting, brick work, R.C.C. plastering etc. the detail of measurement are taken from drawing and entered in respective columns of prescribed pre-formed.

S.No.	Particulars or description of items.	No. of items.	length	breadth	height or thickness	Quantity	Remark or explanatory Notes.

★ Abstract of estimate form :-

item No. or S.No.	Particular or Description of items.	Quantity	Unit	Rate	per unit Rate	Amount.

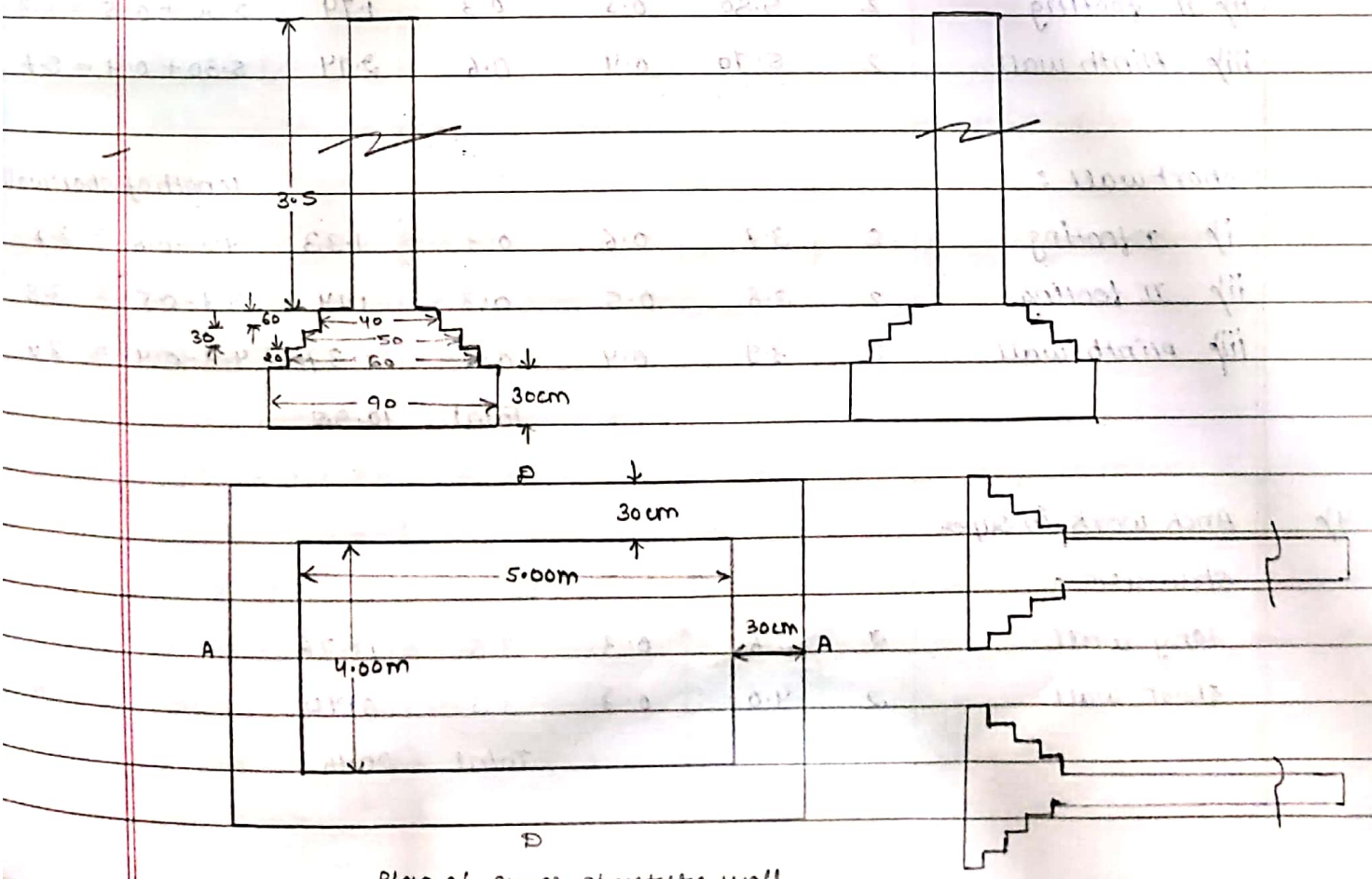
Ques) In fig. the plan represents the plan of superstructure wall of a single room building of (5x4)m & section represent the cross-sec^n of the walls with foundation. estimate the quantities of :

i) earth work in excavation in foundation.

ii) Concrete in foundation.

iii) Brick work in foundation plinth.

iv) Brick work in super structure.



Plan of Super structure wall

S.No.	Particular or description of items	No. of item	length (m)	width (m)	height or thickness	Quantity (m^3)	Remark or explanatory notes.
1)	Earthwork in excavation in foundation: long wall	2	6.20	0.90	0.90	10.044	length of long wall = 5.50 + .9 ⇒ 6.20
	short wall.	2	3.40	0.90	0.90	5.51	short wall = 4.30 − 0.9 ⇒ 3.40
					Total →	15.55 m^3	
2)	Concrete in found.						
	long wall	2	6.20	0.9	0.3	3.35	
	short wall	2	3.40	0.9	0.3	1.83	
					Total →	5.18	
3)	Brick work in foundation and plinth						
	long wall :						length of long wall :
	i) I footing	2	5.90	0.6	0.3	2.13	5.30 + 0.6 = 5.9
	ii) II footing	2	5.80	0.5	0.3	1.74	5.30 + 0.5 = 5.8
	iii) plinth wall	2	5.70	0.4	0.6	2.74	5.30 + 0.4 = 5.7
	short wall :						length of short wall :
	i) I footing	2	3.7	0.6	0.3	1.33	4.3 − 0.6 = 3.7
	ii) II footing	2	3.8	0.5	0.3	1.14	4.3 − 0.5 = 3.8
	iii) plinth wall	2	3.9	0.4	0.6	1.87	4.3 − 0.4 = 3.9
					Total	10.95	
4)	Brick work in super structure.						
	long wall	2	5.6	0.3	3.5	11.76	
	short wall	2	4.0	0.3	3.5	8.40	
					Total	20.16	

S.NO.	Particular or description of items.	No. of items	length (m)	breadth (m)	height or (m) thickness	Quantity (m^3)	Remark.
1)	Earth work in excavation in foundation.	1	19.2	0.9	.90	15.55	
2)	Concrete in foundation	1	19.2	0.90	0.30	5.18	
3)	Brick work in foundation and plinth.						
	i) I^c footing	1	19.2	0.60	0.30		
	ii) II footing	1	19.2	0.50	0.30	10.94	
	iii) plinth wall.	1	19.2	0.40	0.60		
4)	Brick work in super structure.	1	19.2	0.30	3.5	20.16	

This is the solution of problem by centre line method.

Ques) Estimate the quantities of the following items of a two room building from the given plan and section.

i) Earth work in excavation in foundation.

ii) lime concrete in foundation.

iii) first class brick work in cement mortar 1:6 in foundation & plinth.

iv) 2.5 cm cement concrete damp proof course.

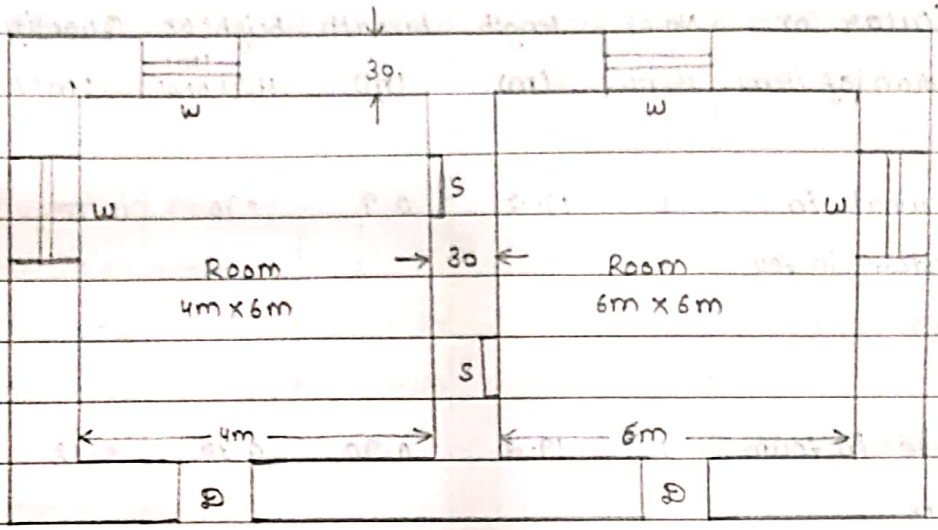
v) first class brick work in lime mortar in super structure.

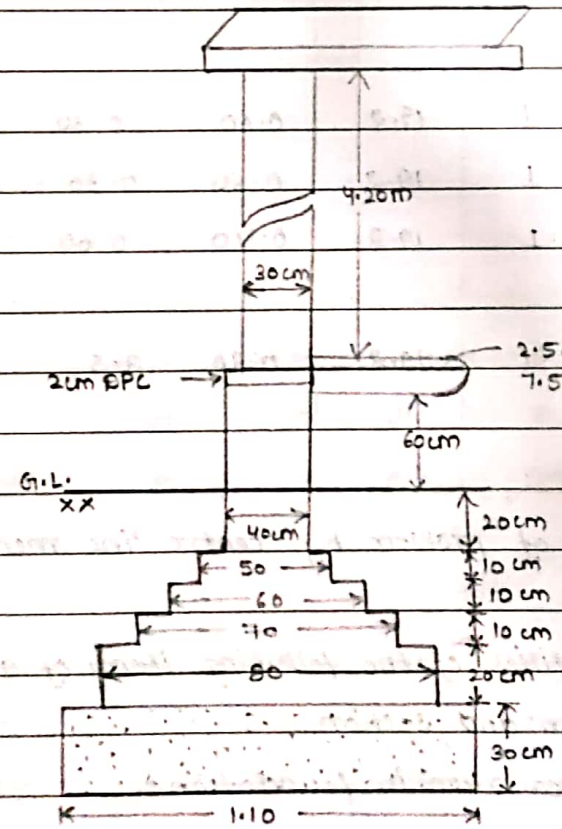
All walls of same section; lintal over doors, w & s are 15cm thick R.B.

Doors : 1.20m × 2.10m

window : 1.00 × 1.50 m

sawage : 1.00 × 1.50 m





Sol:-

S.No.	Particular or description of items	No. of items	length	breadth	height or thickness	Quantity	Remark
1/p	Earth work in excavation in foundation						length of long wall: $10.6 + \frac{1.10}{2} + \frac{1.10}{2}$
	long wall:	2	11.70	1.10	1.00	25.74	length of short wall

	short wall :	3	5.20	1.10	1.00	17.16	$6.3 - \frac{1.10}{2} - \frac{1.10}{2}$
2)	concrete in foundation						
	long wall :	2	11.40	1.10	0.30	7.72	
	short wall :	3	5.20	1.10	0.30	5.14	
					Total →	12.86	
3)	1st class brick work						
	in cement mortar 1:6						
	in foundation.						
	long wall :						
	i) I footing	2	11.40	0.80	0.2	3.65	
	ii) II footing	2	11.30	0.70	0.10	1.58	
	iii) III footing	2	11.20	0.60	0.10	1.34	
	iv) IV footing	2	11.10	0.50	0.10	1.11	
	v) plinth.	2	11	0.40	0.80	7.04	
	short wall :						
	i) I footing	3	5.5	0.80	0.2	2.64	
	ii) II footing	3	5.6	0.70	0.10	1.17	
	iii) III footing	3	5.7	0.60	0.10	1.02	
	iv) IV footing	3	5.8	0.50	0.10	0.87	
	v) plint.	3	5.9	0.40	0.80	5.66	
					Total →	26.08	
4)	2.5 cm cement conc.						
	damp proof course.						
	long wall :	2	11.00	0.40		8.80 m^2	
	short wall :	3	5.70	0.40		7.08	
	deduct door sills :	2	1.20	0.40		-0.96	
					Total →	14.92	

5)	First class brick work in lime mortar in super structure.					
	long wall :	2	10.9	0.30	4.20	27.47
	short wall :	3	6.00	0.30	4.20	22.68
					Total →	50.15
	deduction in :					
	doors	2	1.20	0.30	2.10	1.51
	windows	4	1.00	0.3	1.5	1.80
	salvage	2	1.0	0.2	1.5	0.60
	lintel over :					
	doors	2	1.50	0.30	0.15	0.14
	windows	4	1.30	0.30	0.15	0.23
	salvage	2	1.30	0.30	0.15	0.12
					Total deduction =	4.40
					Total →	45.75 m^3

Ques) Estimate by centre line method the quantities of the following items of a two room building (previous ques.)

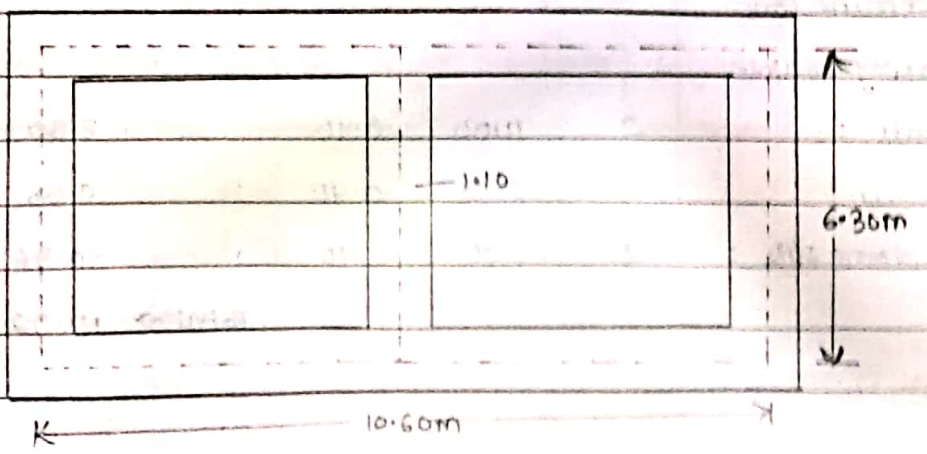
i) earth work in excavation in foundation.

ii) lime concrete in foundation.

iii) first class brick work in cement mortar 1:6 in foundation & plinth.

iv) 2.5cm c/c damp proof course.

v) first class brick work in lime mortar in super structure.



Note :- For rectangular, circular, polygonal [hexagonal, octagonal, etc) building having no interior cross wall this method is quite simple. for building having cross or partition walls for every junctions of partition or cross walls with mash walls special consideration shall have to be made to find the correct quantity for each junctions half breadth of the respective item or footing is to be deducted from the total centre length. In the case of a building with one partition wall or cross wall having two junctions for earthwork in foundation trench & foundation concrete deduct one breadth of trench or concrete from the total centre length for footing similarly deduct one width of footing for two junction from the total central length & so on.

S.No.	Particulars or description of items	No. of items	length	breadth	Height OR thickness	quantity	Remark
1)	Earth work in foundation in excavation.	1	39	1.10	1.00	42.9	
2)	lime concrete in foundation.	1	39	1.10	0.30	12.87	
3)	I class brick work in foundation & plinth.						
	I footing	1	39.3	0.80	0.20	6.29	
	II. footing	1	39.4	0.70	0.10	2.76	
	III footing	1	39.5	0.60	0.10	2.37	
	IV footing	1	39.6	0.50	0.10	2.00	
	Plinth.	1	39.7	0.40	0.80	12.70	
					Total →	26.12 m³	
4)	D.P.C. 2.5 cm C/C.	1	39.7	0.4	–	15.88	
						- 2x0.48	
					Total →	14.92 m²	
5)	F.C.B.W. in Super Str.	1	39.8	0.3	4.2	50.14	

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Date __/__/____

Labour required for different works :

i) Earthquake per 28.3 m^3 (1000 cubic feet) :-

→ Excavation in foundation, trenches etc. in ordinary soil including disposal upto 30m (100 feet) & lift 1.5m (5 feet) = 5 beldar and 1 mazdoors can do 28.3 m^3.

→ Refilling excavated earth in foundation, plinth etc. including consolidation in 15cm layer = 3 baldar, 2 mazdoor and 1/2 Bisti can do 28.3 m^3.

→ Disposal of surplus earth with in a bad of 30m (100 feet) = 1 mazdoor can do 28 m^3/day.

ii) Cement concrete work per 28.30 m^3/day :
Laying cement concrete = 2 baldar, 3 mazdoor, 3/4 bristi and 1/4 mason can do 2.83 m^3/day.

iii) RCC work :

→ Laying reinforced concrete = 3 beldar, 3 Mazdoor, 1 & 1/2 bristi and 1/2 Mason can do 28.3 m^3/day.

→ Shettering, shuttering for plate surface = 4 beldar & 4 carpenter (II class) can do 9.6 m^2/day.

→ Reinforce work for RCC. = 1 black smith, 1 beldar can bald and placed in position 1 quintal of steel/day.

iv) Brick work per 2.83 m^3 (100 cubic feet) :
first class brick work in 1:4 cement mortar in super structure partition walls, junction of roofs, perapates = 2 & 1/4 Masony, 4 & 1/2 mazdoors and bristi can do 2.83 m^3/day.

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v) Random rubble masonry with stone in foundation 1 mason, 3 beldar, 2 mazdoor & 1/4 bhisti can do 2.83 m^3/day

Rates of materials & labour during 2012 in lucknow :-

Materials	Rates
Brick I class	Rs. 4500 per thousand
Brick II class	Rs. 4000 per thousand
Brick's ballast (Roda 40 mm size)	Rs. 650 / m^3
Brick's ballast (25 mm)	Rs. 700 / m^3
stone ballast (40 mm)	Rs. 1800 / m^3
stone ballast (20 mm)	Rs. 1800 / m^3
Stone ballast (12 mm)	Rs. 1700 / m^3
Stone ballast (8 mm)	Rs. 1500 / m^3
Cement	Rs. 260 per bag
Steel	Rs. 4400 / quintal
white or stone lime (unslack)	Rs. 650 / quintal
white or stone lime (slack)	Rs. 800 / m^3
Surkhi	Rs. 500 / m^3
Local sand	Rs. 700 / m^3
Sand coarse	Rs. 1500 / m^3

Labour	Rates
i) Head mason (mistry)	Rs. 350 / day
ii) Mason	Rs. 300 / day
iii) Beldar, mazdoor	Rs 220 / day
iv) Boys & women coolies	Rs 800 / day
v) Bhisti	Rs. 200 / day
vi) Carpenter, Blacksmith, painter	Rs. 500 / day

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Ques/ Lime concrete in foundation for floor with 40mm guage stone blast, white lime and sand (1:2:4) unit $1m^3$.

Sol:-

	Particulars.	Quantity	Rate	Cost.
1/	material			
i/	stone ballast of 40mm gauge	8.57	1800/-	15426
ii/	sand (local)	4.28	700/-	2996
iii/	white lime	2.14	800/-	1712
			Total	20134
2/	Labour			
i/	Head mason	1/2	350/-	175
ii/	mason	1	300/-	300
iii/	mazdoor	12	220/-	2640
iv/	woman coolie	10	200/-	2000
v/	Bhisti	2	200/-	400
vi/	Tool & plans, petty expenses.	lumpsump	100 L.S.	100
			Total	5615

Total cost = 25749

10% of contractor profit = 0.10 x 25749 = 2574.9/-

1.5% of water charge = 0.015 x 25749 = 386.23/-

total cost for $10m^3$ = 28710.13/-

total cost for $1m^3$ = 2871.013/-

Ques/ Lime Concrete in terrace roof with brick

a/ with white lime and surkhi (1:2:6)

b/ with kankar line (45% mortar) unit 1 cu.meter ($1m^3$).

Sol:-

Sol:- a)

	Particulars	Quantity	Rate	Cost
1/p	Material.			
i/p	Brick ballast of 95mm gauge.	10	700/-	7000
ii/p	Surkhi	3.22	500/-	1600
iii/p	white lime slaked	1.67	800/-	1336
iv/p	Gur	12 kg	30/-	360
v/p	Bail fruit in solution	lumpsump	100/-	100
			Total	10396
2/p	Labour			
i/p	Head mason	1/2	350/-	175
ii/p	mason	2	300/-	600
iii/p	Mazdoor	12	220/-	2640
iv/p	woman coolie	24	200/-	4800
v/p	Bhishi	2	200/-	400
vi/p	T&P petty expenses.	Lumpsump	100/- L.S.	100
			Total	8715

Total cost = 10396 + 8715

= 19111/-

10% contractor profit = 0.10 × 19111 ⇒ 1911.1/-

0.5% water charge = 0.015 × 19111 ⇒ 286.66/-

Total cost for $10\,m^3$ ⇒ 19111 + 1911.1 + 286.66

⇒ 21308.76/-

cost for $1\,m^3$ ⇒ $\frac{21308.76}{10}$

⇒ 2130.876/-

b)	Particulars	Quantity	Rate	Cost
1)	material :			
i)	kankar lime mortar.	4.5	800/-	3600/-
ii)	Brick ballast 25mm.	10	700/-	7000/-
iii)	Gur.	10 kg.	30/-	300/-
iv)	Bail fruit in soln.	1 lumpsump	200/-	200/-
			Total	11100/-

2) labour :

same as white lime = 8715/-

So, Total cost = 11100 + 8715 ⇒ 19815

10% of builder profit ⇒ 0.10 × 19815 ⇒ 1981.5/-

1.5% of water charge ⇒ 0.015 × 19815 ⇒ 297.225/-

total cost for $10m^3$ ⇒ 22093.72/-

cost for $1m^3$ ⇒ 2209.37/-

Ques) Cement concrete (1:5:10) in foundation or floor with brick ballast with 40mm brick gauge unit $1m^3$.

Sol:-	Particulars	Quantity	Rate	Cost.
1)	material			
i)	cement ($1m^3$ = 30 bags)	30 bags	260/-	7800/-
ii)	sand	5	700/-	3500/-
iii)	Brick ballast 40mm	10	650/-	6500/-
			Total	17800/-
2)	labour :			
i)	Head mason	1/2	350/-	175/-
ii)	mason	1	300/-	300/-
iii)	majdoor	12	220/-	2640/-
iv)	bhisti	2	200/-	400/-
v)	boys and women coolie	10	200/-	2000/-

vi)p	petti expenses.	lumpsump	200/-	200/-
			Total	5385/-

Total cost = 23185/-

10% of builder profit = 0.10 × 23185 = 2318.5/-

1.5 of water charge = 0.015 × 23185 = 347.77/-

total cost for $10m^3$ = 25851.77/-

total cost for $1m^3$ = 2585.19/-

Ques)p Cement Concrete work (1:2:4) including formwork Unit $1m^3$ take $10m^3$.

Sol:-	Particulars	Quantity	Rate	Cost.
1)p	Material :			
i)p	Cement	66 bags	260/-	17160/-
ii)p	Sand	4.34	700/-	3038
iii)p	Stone ballast of 40mm	8.68	1800/-	15624
			Total	35822
2)p	Labour :			
i)p	Head meson	1/2	350/-	175
ii)p	meson	1	300/-	300
iii)p	majdoor	12	220/-	2640
iv)p	boy & girls coolie	10	200/-	2000
v)p	bhishi	2	200/-	400
vi)p	petti's expenses.	lumpsump	200/-	200
vii)p	Formwork.	lumpsump	1500/-	1500
			Total	6858/-

Total cost of work = 42680/-

10% of contractor profit = 0.10 × 42680 = 4268/-

1.5% of water charge = 0.015 × 42680 = 640.2/-

Total cost of $10m^3$ work = 47588.2/-

Ques/p R.C.C. work in beams, slab, etc 1:2:4 unit $1m^3$ take $10m^3$.

Sol:-	Particulars	Quantity	Rate	Cost
1/p	material :			
i/p	stone ballast 20mm gauge.	2.171	1800	3908.57
ii/p	sand (coarse)	4.34	700	3040
iii/p	cement (66 bags)	8.68	260	17160
iv/p	steel, mild steel (1%)	7.85q	4400/q	34540
	1cum = 78.5q 1cum 10, 7.85q.			
v/p	Binding wire.	12kg	65/kg	780
			Total	58778.5/-
2/p	Labour :			
i/p	Head mason	1/2	350	175
ii/p	mason	2	300	600
iii/p	mazdoor	12	220	2640
iv/p	women & boys coolie.	20	200	4000
v/p	Bhish	5	200	1000
vi/p	T & P & petty expenses.	L.S.	100 L.S.	100
			Total	8515/-
3/p	Bending, cranking, binding of steel bars in position.			
i/p	Blacksmith	8	300	2400
ii/p	mazdoor	8	220	1760
iii/p	T & P petty expenses.	L.S.	100	100
			Total	4260/-

4/p	Centring and shuttering (Both eraction and dismantelling)			
i/p	timber plans and ballies.	L.S.	1500 L.S.	1500
ii/p	Carpenter (II Class)	4	300	1200
iii/p	Mazdoor (Beldars)	4	220	880
iv/p	Nails.	L.S.	100	100
v/p	T & P and petty expenses.	L.S.	100	100
			Total	3780/-

Total cost/- = 4260 + 3780 + 58778.5 + 885

= 60431.85/-

10% of contractor profit = 0.10 × 60431.85 = 6043.185/-

1.5% of water charge = 0.015 × 60431.85 = 906.47/-

Total cost of $10m^3$ = 67381.505/-

Total cost of $1m^3$ = 6738.15/-

Ques/p RCC work in column 1 : 1.5 : 3 unit $1m^3$

Sol:-

	Particulars	Quantity	Rate	Cost.
1/p	Material :			
i/p	Stone ballast 20mm gauge	8.29	1800	14922
ii/p	sand (coarse)	4.14	700	2898
iii/p	cement	2.7 ⇒ 83 bags	260	21580
iv/p	steel, mild steel (2%) 1cum = 78.5q/cum	1.57q.	4400/q	69080
v/p	Binding wire	2kg	65/kg.	130
			Total	108610/-

2/p labour will be same as previous que Rs 8515/-

3/p Rs 4260/- and 4/p centring & shuttering will be 3780/-

Total cost = 108610 + 8515 + 4260 + 3780 ⇒ 125165

10% of contractor profit = 125165 × 0.10 = 12516.5

1.5 % of water charge = 125165 × 0.015 = 1877.47

Total cost of $10m^3$ = 139558.97 /-

Total cost of $1m^3$ = 13955.89 /-

Ques First class brick work in foundation and plinth with 90×10×10 (nominal size) bricks with cement, sand, mortar 1:6 - unit $1m^3$. take $10m^3$.

Note : For cement mortar $3m^3$ dry mortar and for lime mortar $3.5m^3$ of dry mortar are taken for $10m^3$ brick work. As an approximate 30% dry mortar may be taken.

Sol:-

	Particulars			
1)p	Material :			
i)p	Bricks Ist class (500 Nos in1cum)	5000	4500	22500/-
ii)p	cement (14 bags)	$0.45\left(\frac{3}{1+6}\right)$	260	3640/-
iii)p	sand	$0.7\left(\frac{3}{1+6}\right)\times 6$	700/-	1890/-
			Total	28030/-
2)p	labour :			
i)p	Head mason	1/2	350/-	175/-
ii)p	mason	7	300/-	2100/-
iii)p	Majdoor	7	220/-	1540/-
iv)p	boy & girls coolie	7	200/-	1400/-
v)p	Bhisti	2	200/-	400/-
vi)p	Petti expenses	lumpsump	200/-	200/-
			Total	5815/-

Total cost = 28030 + 5815 = 33845

10% of contractor profit = 33845 × 0.10 = 3384.5/-

0.5% of water charge = 33845 × 0.015 = 507.67/-

Total cost of $10 m^3$ = 37337.17/-

Ques/p First class brick work in superstructure with 20 × 10 × 10 cm brick with 1:6 cement, sand mortar take unit $1 m^3$. take $10 m^3$.

Sol:- i/p Total cost of material = 28030/- (previous question)

	Particulars	Quantity	Rate	cost
ii/p	labour			
i/p	Head mason	1/2	350/-	175/-
ii/p	mason	7	300/-	2100/-
iii/p	Majdoor	7	220/-	1540/-
iv/p	Boy & girls coolie	10	200/-	2000/-
v/p	Bhishi	2	200/-	400/-
vi/p	Petty expenses	lumpsump	200/-	200/-
vi/p	scaffolding	lumpsump	300/- Total	6415+300

Total cost = 34445/- + 300/-

10% of contractor profit = 34445 × 0.10 = 3444.5/-

1.5% of water charge = 34445 × 0.015 = 516.67/-

Total cost of $10 m^3$ = 38406.17/-

Total cost of $1 m^3$ = 3840.6/-

Ques: Half brick wall (10cm thick Partition wall) with 1:3 cement mortar unit $1m^2$ take $100m^2$.

Sol:-

	Particulars	Quantity	Rate	Cost
1)	Material			
i)	brick first class (500 Nos in cum)	5000	4500/-	2250/-
ii)	cement (23 bags)	$0.75\left(\frac{3}{1+3}\right)$	960/-	5980/-
iii)	sand (coarse)	$2.25\left(\frac{3}{1+3}\right)\times 3$	1500/-	3375/-
iv)	mild steel bar 6mm ϕ every four layer	40kg	44/kg	1760/-
			Total	33615/-
2)	labour			
i)	Head mason	1/2	350/-	175/-
ii)	mason	12	300/-	3600/-
iii)	mazdoor	8	220/-	1760/-
iv)	coolie	10	200/-	2000/-
v)	Bhisti	2	200/-	400/-
vi)	scaffolding	L.S.	400/-	400/-
vii)	P L T Petty expenses.	L.S.	100/-	100/-
			Total	8435

Total cost = 33615 + 8435
= 42050/-

10% contractor profit = 42050 × 0.10 = 4205/-
1.5% of water charge = 42050 × 0.015 = 630.75/-

Total cost of $100m^2$ = 46885.75/-

Total cost of $1m^2$ = 468.85/-

Ques/ Coarse Rubble stone masonry in superstructure ~~with~~ different in 1:4 cement, sand, mortar unit $1m^3$. take $10m^3$.
stone = 12.5 cum. dry mortar 4 cu.m

Soli-

	Particulars	Quantity	Rate	Cost
1/p	Material :			
i/p	Stone	12.5 cu.m	1200	15,000
ii/p	Cement (24 bags)	0.8 $(\frac{4}{1+4})$	260	6240
iii/p	Sand (local)	3.2 $(\frac{4}{1+4})\times 9$	700	2240
			Total	23,480
2/p	labour			
i/p	Head mason	1/2 nos.	350	175
ii/p	mason	10	300	3000
iii/p	mazdoor	16	220	3520
iv/p	Coolie	10	200	2000
v/p	Bhisti	2.	200	400
vi/p	scaffolding.	L.S.	400	400
vii/p	T & P	L.S	100	100
			Total	9420

Total cost = 23480 + 9420
= 32900 /-

10% Contractor profit = 0.10 X 32900 = 3290 /-

1.5% water charge = 0.015 x 32900 = 493.5 /-

Total cost of $10m^3$ = 36683.5/-

Total cost of $1m^3$ = 3668.35/-

Ques Ashlar masonry in superstructure in 1:6 cement sand mortar. unit $1m^3$, take $10m^3$, Mortar dry = 4.5 cum (45%)

Sol:-

	Particulars	Quantity	Rate	Cost.
1)	Material			
i)	Stone (undressed)	12.6 cum	1000/-	12500
ii)	cement (11 bag)	0.35 $(\frac{2.5}{1+6})$	800/-	2800
iii)	sand	2.1 $(\frac{2.5}{1+6})$ 1/4	700/-	1470
			Total	16830/-
2)	Labour.			
i)	Head mason	1/2	350	175
ii)	mason	28 nos.	300	8400
iii)	Mazdoor	20	220	4400
iv)	women coolie	20	200	4000
v)	Bhisti	2	200	400
vi)	scaffolding	L.S.	400	400
vii)	T & P	L.S.	100	100/-
			Total	17925/-

Total Cost = 16830 + 17925

= 34755/-

10% contractor profit = 3475.5/-

1.5% water charge = 521.32/-

Total cost of $10m^3$ = 38751.82/-

Total cost of $1m^3$ = 3875.18/-

Note : material required for plastering with different mortar of various proportions for 100 m^2.

→ For 12mm thick plastering, total dry volume 2 m^3.

→ For 20mm thick plastering, total dry volume 3 m^3.

Ques/ 12 mm plastering 1:6 unit 1 m^2. Take 100 m^2.

Sol:-

	Particular	Quantity	Rate	Cost.
1/	Material :			
i/	Cement (9 bags)	0.28 $\left(\frac{2}{1+6}\right)$	260	2340
ii/	Sand. (local)	1.68 $\left(\frac{2}{1+6}\right)^2$	700	1176
			Total	3516
2/	Labour			
i/	Head mason	1/2	350	175
ii/	mason	10	300	3000
iii/	Mazdoor	15	220	3300
iv/	Bhishi	1	200	200
v/	Scaffolding	L.S.	400	400
vi/	T & P	L.S.	100	100
			Total	7175

Total cost = 3516 + 7175
= 10691/-

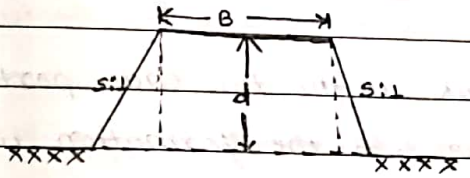
10% Contractor profit = 1069.1/-
1.5% water charge = 160.36/-

Total cost of 100 m^2 = 11920.46/-
Total cost of 1 m^2 = 119.20/-

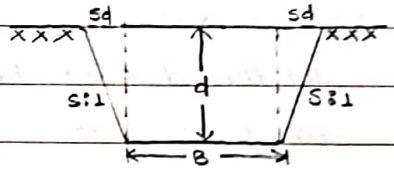
Road Estimate

★ **Earthwork :**

Cross section of earthwork of road in banking or in cutting is usually in the form of trapezium and the quantity of earthwork may be calculated by the following method.



Banking

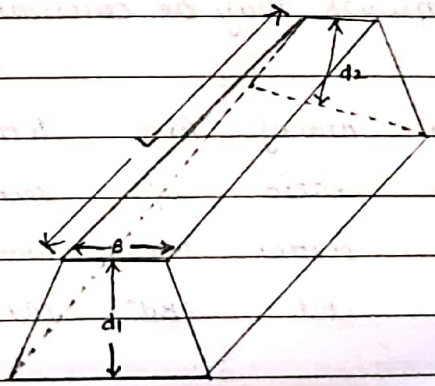


Cutting.

Quantity or Volume = sectional area x length.

sectional area = $Bd \times sd^2$

Quantity = $(Bd \times sd^2) \times L$



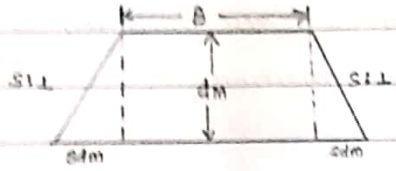
mean depth = $\frac{d_1 + d_2}{2}$

The quantity of earthwork may be calculated by the various method of menguration.

Method - I :-

Mid sectional Area method :-

Quantity = Area of mid section x length.



Let the d_1 & d_2 height of bank at the two ends portion of embankment. L is the length of section, B the formation width and S:1 the side slope then,

Area of mid section $= Bdm + \frac{1}{2} Sdm^2 + \frac{1}{2} Sdm^2$

$= Bdm + Sdm^2$

Quantity of earth work $= (Bdm + Sdm^2) \times L$

The quantity of earthwork may be calculated in a tabular form.

Station or chainage	Depth or height	mean depth	Area of centre portion (Bd)	Area of sides (Sd^2)	Total section area ($Bd+Sd^2$)	length b/w station (L)	Quantity $(Bd+Sd^2)L$ embankment	cutting

method II :-

Mean sectional Area method :

Quantity = mean sectional area x length.

sectional area at one end = $A_1 = Bd_1 + Sd_1^2$

sectional area at other end = $A_2 = Bd_2 + Sd_2^2$

The mean section area = $A = \frac{A_1 + A_2}{2}$

Quantity $Q = \left(\frac{A_1 + A_2}{2}\right) \times$ length.

The quantity of earthwork may be calculated in tobular form.

section or chainage	Height or depth (d)	Area of centre portion (Bd)	Area of sides portion (Sd^2)	Total sectional area ($Bd+Sd^2$)	mean sectional area.	length b/w station (L)	Quantity $(Bd+Sd^2)L$	
							embank-ment	cutting

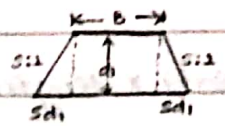
Method III :-

Prismoidal formula method :

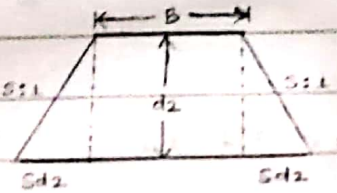
Quantity or volume = $\frac{L}{6}(A_1 + A_2 + 4A_m)$

Here,

A_1 = cross section area of one end $(Bd_1 + Sd_1^2)$



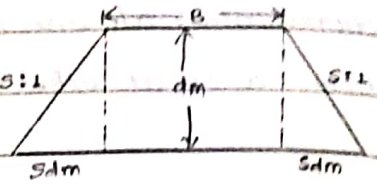
$A_2 = Bd_2 + Sd_2^2$



$Am = Bdm + Sdm^2$

Here,

$dm = \frac{d_1 + d_2}{2}$



Prismoidal formula is more accurate than calculated by the previous two method.

Area of Side sloping Surface :-

The mean sloping breadth $= \sqrt{(Sd^2) + d^2} \Rightarrow d\sqrt{S^2+1}$

$\because d$ = stands for mean depth.

Area of both side slopes $= 2 \times \left(d\sqrt{S^2+1}\right) \times L$

$\Rightarrow 2L\left(d\sqrt{S^2+1}\right)$.

Ques Calculate the quantity of earthwork for 200 meters length for a portion of a road in an uniform ground the heights of banks at the two ends being 1.00 m and 1.60 m. The formation width is 10 metre and side slopes 2:1 (Horizontal : Vertical) Assume that is no transverse slope.

Sol:- Method I : $\because B = 10m, S = 2, L = 200m$

Quantity $= (Bd + Sd^2) \times$ length

$\because d$ = mean depth $= \frac{1.00 + 1.60}{2} = 1.30$ m

So,

Quantity $= (10 \times 1.3 + 2 \times 1.3^2) \times 200$

$= 3276$ cu.m.

method II :

A_1 = sec. area at one end = $Bd_1 + Sd_1^2$ = $10 \times 1 + 2 \times 1^2$ = 12 sq.m

A_2 = sec. area at other end = $Bd_2 + Sd_2^2$ = $10 \times 1.60 + 2 \times 1.60^2$ = 21.12 sq.m.

mean sec. area = $\frac{A_1 + A_2}{2}$ = $\frac{12 + 21.12}{2}$ = 16.56 sq.m.

Quantity = mean sec. area × length = 16.56 × 200

= 3312 cu.m

method III → by Prismoidal Formula :

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

A_1 = 12 sq.m

A_2 = 21.12 sq.m

A_m = mid sec. area = $Bd_m + Sd_m^2$

where, d_m = $\frac{1.00 + 1.60}{2}$ = 1.30m

A_m = $10 \times 1.30 + 2 \times 1.30^2$ = 16.38 sq.m.

∴ Quantity = $\frac{200}{6}(12 + 21.12 + 4 \times 16.38)$ = 3308 cu.m

Note : The difference by Method I and III is less than ½ percent the difference by methods II and III is less than 1 percent.

Ques ii) Calculate the area of the side slope of portion of a bank for a length of 200 metre the heights of banks at the two ends being 2.50 m and 3.50m and the ratio of the side slope 2 : 1.

ii) If the side slopes area to be provided with 15cm thick stone

Calculate the cost of pitching at the rate of Rs - 150/- per cum.m

Sol:- i)p mean height, $d = \frac{2.5 + 3.5}{2} = 3m$

sloping breadth at the mid-section = $d\sqrt{(S^2+1)} = 3\sqrt{(2^2+1)}$

$\Rightarrow 6.71$

Area of the two sides slopes = $2L \times d\sqrt{(S^2+1)}$

$= 2 \times 200 \times 6.71 = 2684$ sq.m.

ii)p Quantity of pitching = Area x thickness

$= 2684 \times .15 = 402.6$ cu.m.

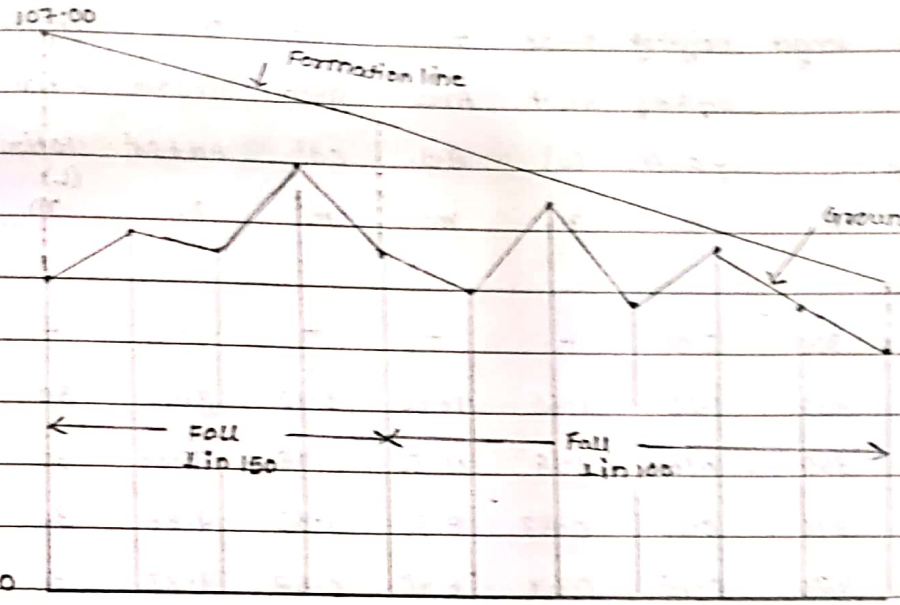
cost of stone pitching = 402.6×150.00 = Rs 60390.00/-

Ques)p Reduced level (R.L.) of ground along the centre line of a proposed road from chainage 10 to chainage 20 are given below. The formation level at the 10th chainage is 107 and the road is in downward gradient of 1 in 150 up to the chainage 14 and then the gradient changes to 1 in 100 downward. Formation width of road is 10m and side slope of banking are 2:1 (Horizontal : vertical). length of the chain is 30 metre.

Draw longitudnal section of the road and a typical cross section and prepare an estimate of earthwork at the rate of Rs 275.00/- cu.m.

i)p Find also the area of the side slopes and the cost of turfing the side slopes at the rate of Rs. 60.00 % sq.m.

chainage	10	11	12	13	14	15	16	17	18	19	20
R.L. of ground.	105.00	105.60	105.44	105.90	105.42	104.30	105.00	104.10	104.62	104.00	103.3
R.L. of formation	107.										



Depth of cutting											
Height of Bank	2·00	1·20	1·16	0·50	0·78	1·64	0·60	1·20	0·38	0·10	1·10
R.L. of formation	107·00	106·80	106·60	106·40	106·20	105·00	105·60	105·40	105·00	104·80	104·40
R.L. of Ground	105·00	105·60	105·44	105·90	105·42	104·36	105·00	104·10	104·62	104·00	103·30
Distance in m.	300	330	360	390	420	450	480	510	540	570	600
Chainage	10	11	12	13	14	15	16	17	18	19	20

Calculation of quantities of earthwork :

$B = 10m$, $S = 2$

Station or Chainage m.	Length m.	Height of cut/fill (depth diff.) m.	Mean depth (d) m.	Central Area B·d m²	Side area Sd² m²	Total sectional area Bd+Sd² m²	Length in b/w station (L) m	Quantity (Bd+Sd²)L Banking m³	Quantity (Bd+Sd²)L cutting m³
10	300	2·00	–	–	–	–	–	–	–
11	330	1·20	1·60	16·00	5·12	21·12	30	633·6	–
12	360	1·16	1·18	11·80	2·78	14·58	30	437·4	–
13	390	0·50	0·83	8·30	1·38	9·68	30	290·4	–
14	420	0·78	0·64	6·40	0·82	7·22	30	216·6	–
15	450	1·60	1·19	11·90	2·83	14·73	30	441·9	–
16	480	0·60	1·10	11·00	2·42	13·42	30	402·6	–
17	510	1·20	0·90	9·00	1·62	10·62	30	318·6	–
18	540	0·38	0·79	7·90	1·25	9·15	30	274·5	–
19	570	0·70	0·54	5·40	0·58	5·98	30	179·4	–
20	600	1·10	0·90	9·00	1·62	10·62	30	318·6	–
							Total	3513·6 cum	

Abstract of Estimated Cost :

Item No.	Particulars of items.	Quantity	Unit	Rate Rs. P.	per	Cost Rs. P.
1.	Earthwork in banking	3513·6	cu.m.	275·00	% cum	9662·40
				Total		9662·40
	Add 5% (3% for contingencies & 2% for workcharged)...					483·12
				Grand Total		Rs 10145·52

Calculation of Areas of sides slopes : $S = 2$, $\sqrt{S^2+1} = 2.236$

station or chainage.	Height of depth.	mean Ht. or depth d m.	sloping breadth of side slopes $d\sqrt{S^2+1}$ m.	length L m.	Area of both side slopes $2Ld\sqrt{S^2+1}$ m.
10	2.00	–	–	–	–
11	1.20	1.60	3.58	30	214.80
12	1.16	1.18	2.64	30	158.40
13	0.50	0.83	1.86	30	111.60
14	0.78	0.64	1.43	30	85.80
15	1.60	1.19	2.66	30	159.60
16	0.60	1.10	2.46	30	147.60
17	1.20	0.90	2.01	30	120.60
18	0.38	0.79	1.77	30	106.20
19	0.70	0.54	1.21	30	72.60
20	1.10	0.90	2.01	30	120.60
				Total	1297.80 sq. m.

Abstract of Cost of turfing :

Turfing side slopes 1297.80 @ 60.00 per % sq.m ⇒ 12.97 X 60.00

⇒ 778.68

Add 5% for Contingencies, etc. Rs 38.93

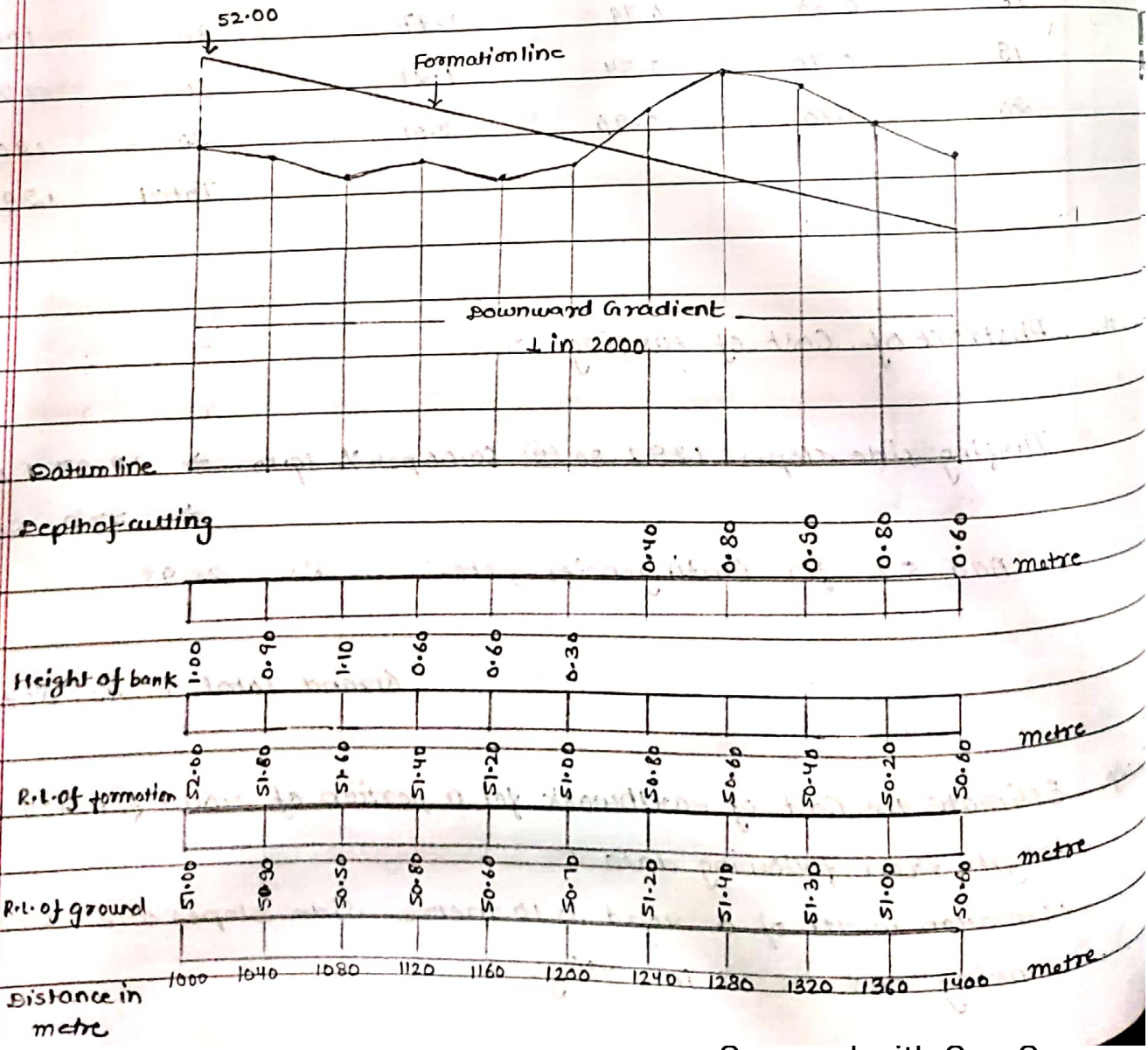
Grand Total : Rs 817.61.

Ques/ Estimate the Cost of earthwork for a portion of road for 400 meters length from following data :

Formation width of a road is 10 metre. Side slopes are 2:1 in banking and 1.5 : 1 in cutting.

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

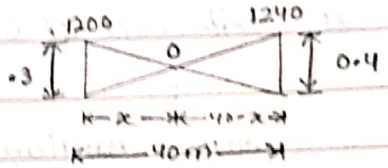
Sol:-



The road passes from banking to cutting in b/w the station 30 (1200m) and 31 (1240m). The distance where it passes through zero. i.e. ground level, may be determined as follows :

The two triangles on either side of zero point are symmetrical

$$\frac{x}{.3} = \frac{40-x}{.4}$$



or $.3(40-x) = .4x$

$x = 17.14\,m = 17\,m$ say.

∴ length of banking portion is 17m and the length of cutting portion is $40 - 17 = 23\,m$.

Calculation of quantities : (calculation of earthwork)

B = 10m, S = 2 for banking, S = 1.5 for cutting.

Station	Distance Km m.	Height or depth diff of G.L & F.L.	mean ht. or depth d m.	central area (Bd) m.	Area of sides (sd^2) m^2	Total sec. area (Bd+sd²) m^2	Dist. in b/w station (L) m.	Quantity (m^3) $(Bd + sd^2)L$ Banking	Cutting
25	1000	1.00	–	–	–	–	–	–	–
26	1040	0.90	0.95	9.50	1.81	11.31	40	452.40	–
27	1080	1.10	1.00	10.00	2.00	12.00	40	480.00	–
28	1120	0.60	0.85	8.50	1.45	9.95	40	398.00	–
29	1160	0.60	0.60	6.00	0.72	6.75	40	268.80	–
30	1200	0.30	0.45	4.50	0.41	4.91	40	196.40	–
asses	from banking to cutting.								
–	1217	0.00	0.15	1.50	0.05	1.55	17	26.35	–
31	1240	-0.40	-0.20	2.00	0.06	2.06	23	–	47.38
32	1280	-0.80	-0.60	6.00	0.54	6.54	40	–	261.60

33	13.80	-0.90	-0.85	8.50	1.08	9.58	40	-	383.20
34	1360	-0.80	-0.85	8.50	1.08	9.58	40	-	383.20
35	1400	-0.60	-0.70	7.00	0.74	7.74	40	-	309.60
	(- sign indicates cutting)						Total	1821.95 cu.m.	1384.98 cu.m

Abstract of Cost :

Item No.	Particulars of items.	Quantity	Unit	Rate Rs. P	per	Cost Rs. P.
1.	Earthwork in banking...	1821.95	cu.m	275.00	% cum	5010.36
2.	Earthwork in Cutting....	1384.98	cum	350.00	% cum	4847.43
					Total	9857.79
	Add 3% for contingies.... & Add 2% workcharged establishment..					295.73 & 197.16
					Grand Total	10350.68.

Years Purchase : Year's purchase is defined as the capital sum required to be invested in order to receive an annuity of Re 1/- at certain rate of Interest.

$$\text{Years Purchase} = \frac{100}{\text{Rate of Interest}}$$

Obsolescence : The value of property at structures become less by its becoming out of date in style, in structure, in design etc and this is termed as obsolescence.

Annuity : Annuity is the annual periodic payments for repayments of the capital amount invested by a party.

Rateable Value : Rateable value is the net annual letting value of a property which is obtained after deducting the amount of yearly repair from the gross income.

Methods of valuation :

1) **Rental Method of valuation :** In this method the net income by way of rent is findout by deducting all outgoings from the gross rent.
A suitable rate of interest as prevailing in the market is assumed and years purchase is calculated. This net income multiplied by Y.P.

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purchase gives the capitalized value or valuation of the property. This method is applicable only when the rent is known.

iii) **Direct comparison with the capital value:** This method may be adopted when the rental value is not available from the property concerned. In such case, the capitalized value of the property is fixed by direct comparison with capitalized value of similar property in locality.

iii) **Valuation based on profit:** This method of valuation is suitable for buildings like hotels, cinemas, theatres etc. which the capitalized value depends on the profit.

iv) **Valuation Based on cost:** In this method, the actual cost of incurred in constructing the building or in possessing the property is taken as basis to determine the value of property. In such cases, necessary depreciation should be allowed and points of obsolescence should also be considered.

v) **Development method of valuation:** This method of valuation is used for the properties which are in the underdeveloped stage or partly developed or partly underdeveloped stage. If a large piece of land is required is to be divided into plot after providing for roads, parks etc. this method of valuation is adopted.

If a building is required to be renovated by making additional changes, alternations or improvements the development method of valuation may be used.

vi) **Depreciation method of valuation:** According to this method of valuation the building should be divided into four parts;

a) wall b) Roofs c) Floors d) Doors and windows.

and the cost of each part should first be calculated on the present day rates by detailed measurement.

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Ques) An old building has been purchased by a person at a cost of Rs 30000 per excluding the cost of the land. calculate the amount of annual sinking fund of 4% interest assuming the future life of building as 20 years and scrap value of building as 10% of the cost of purchase. find out the annual installment of sinking fund.

Soln) S = Total amount of sinking fund at the end of 20 years.

$$S = 30000 \times \frac{90}{100}$$

$$S = 27000$$

Now,

$$\text{Annual Installation } (I) = \frac{Si}{(1+i)^n - 1}$$

$$i = \frac{4}{100} = 0.04$$

$$n = 20$$

So,

$$I = \frac{27000 \times 0.04}{(1+0.04)^{20} - 1}$$

$$I = 907.56$$

Ques A property fetched a net annual income of Rs. 900 deducting all outgoing workout the capitalised value of the property if the rate of interest is 6% per anum.

Sol:- Capitalized value = Net annual Income × year purchase

$= 900 \times \frac{100}{6}$

$= 15,000.$

Ques A three storey building is standing on a plot of length measuring at 800 m^2 the plinth area of each storey each 400 m^2 the building is of R.C.C. frame structure and the future life may be taken as 70 years. the building fetches a gross rate of Rs 1500/month. workout the capitalised value of property on the basis of 6% net yield. For sinking fund 3% compound interest may be assumed. Cost of land may be taken Rs 40/m^2. other data require may be assumed suitably.

Sol:- Gross income per year = 1500 × 12

= 18,000

Outgoings :

→ repairs (10%) = 1800

→ municipal tax (20%) = 3600

→ management charges (7%) = 1260

→ other miscellaneous charges @ 2% of grass rate = 360

→ sinking fund (S) = 400 × 3 × 150 × 90% ⇒ 162,000

Assume 150 is Rs/m^2 cost

$$I = \frac{Si}{(1+i)^n - 1}$$

$i = 3\%$.

$$I = \frac{162,000 \times 0.03}{(1+0.03)^{70} - 1} \Rightarrow 702.53$$

(Annual sinking fund)

Total outgoings = 7728.

→ So, Net income = Gross income − outgoings
= 18,000 − 7728.
= 10277

→ Capitalized value = Net annual income × $\frac{100}{6}$

= $10277 \times \frac{100}{6}$

= 171291.11

→ Whole value of the property = Capitalized value + Cost of land
= 171291.11 + 800 × 40
= 203291.11

To Calculate the value of property :

Ques: A coloniser intends to purchase a land of 1,00,000 sq.m. area located in the suburb of a big city to develop it into plots of 700 sq.m each after providing necessary roads and parks and other amenities. The current sale prices of small plots in the neighbourhood is Rs. 30.00 per sq.m. The colonier wants a net profit of 20%. workout the maximum price of the land at which coloniser may purchase the land.

Sol:- Total area of land = 1,00,000 sq.m.
deduct 30% for roads parks, etc = 30,000 sq.m.

(for plot) Net area = 70,000 sq.m.

No. of plots at 700 sq.m per plot = $\frac{70,000}{700}$ = 100.

Selling price per plot @ Rs 30.00 sq.m = 700 × 30 = 21,000

Total price from sale of all plots = 21000 × 100 = 21,000,00

Deduct expenses :

i) Cost of improving of land and dressing @ Rs 0.25 per sq.m = 25,000

ii) Cost of providing metalled roads, drainage water supply and electrification @ Rs. 3.00 per square m. of whole land (100000 × 3) = 300000

iii) Engineer's and architect fees for surveying, planning, sub dividing and supervising @ 3% on the sale price = 2100000 × $\frac{3}{100}$ = 63,000

iv) other miscellaneous expenses @ 1% on the price = 21,00000 × $\frac{1}{100}$ = 21,000

v) Colonizer profit @ 20% on the sale price = 2100000 × $\frac{20}{100}$ = 4,200,00

Total expenditure ₹ 8,29,000

maximum price of land in the undeveloped stage ⇒

= 2100000 − 8,29,000

= 12,71,000

Maximum rate of purchase of land

= $\frac{1271000}{100000}$ = 12.71 Rs Per sqm. =

Ques:- A city Corporation has to acquire an area of 3,50,000 sq.m. for the development of a new colony. After developing the area it is Proposed to be sold at Rs 3000.00 Per sq.m. workout the maximum compensation which can be given to the owners, whose land is to be acquired for the development of the colony assuming ;

i)- The corporation establishment charges = 15% of sale price.

ii)- 40% area is to provided for roads, parks, and other public amenities.

iii)- Colony improvement expenditure = Rs 130 per sq.m.

iv)- Engineer's and architect fee for surveying and planning the colony = 4% on the sale of flats.

Sol:- Total area of land = 3,50,000 sq.m

Deduct 40% area for parks, roads, etc = 1,40,000 sq.m

Net area = 2,10,000 sqm

Selling price per sq.m = Rs 3000

Total price from sale = 2,10,000 X 3000

= 63,00,00,000

Deduct expenditure :

i)- Corporation establishment charges @ 15% on sale price $\left(63,00,00,000 \times \frac{15}{100}\right)$ = 9,45,00,000

ii)- Colony improvement expenditure @ 130 per sq.m (130 X 3,50,000) = 4,55,00,000

iii)- Engineer's and architect fee for surveying and planning the colony @ 4% on sale $\frac{4}{100} \times 63,00,00,000$ = 2,52,00,000

Total expenditure = 16,52,00,000

maximum price of land = 63,00,00,000 - 16,52,00,000

= 46,48,00,000

maximum rate of purchase = $\frac{46,48,00,000}{3,50,000}$

= Rs 1328 per sq.m.