GOVT. POLYTECHNIC, JAGATSINGHPUR

CIVIL ENGINEERING DEPARTMENT

LEARNING MATERIAL OF **ESTIMATION & COST EVALUATION - I**

3RD SEMESTER

FACULTY NAME – SUMAN SAHOO

Estimated cost:-

All Engineering work, it is required to know before the Probable cost in construction known as the estimated cost.

Methods of estimating:-

Estimate:-

→ Before undertaking the construction of a Project it is neccessery to know its Probable cost which is worked out by estimating.

→ An estimate is a computation on calculation of the quantity required and expenditures eigthey to be quite in the construction.

→ It is Proble costs of a wall with it is determine the theoritical and mathematical calculation based on the Plan and during current reate.

→ It is two types

       a) Approximate estimate

       b) Detailed estimate.

→ Accureate estimate is Prepared by detailed estimate method.

Actual cost:-

The actual cost of work is known as the completion of work. Account of all expenditure is maintain day to day during the work in the account section.

Sreman Sahoo

Plinth area :-

→ It is the plinth of covered level is was measured at floor level of any storage.

→ It is calculated the external diameter at the floor level.

→ Excluding plinth offset if any courtyard, open areal, balcony and cantilever projection are not included in the plinth area.

floor area :-

→ It is of a building if the total area of floor in between walls and consist of all rooms, varendah, staircase, corrider, entrance hall, kitchen, bath & latrin (wc) etc. of doors and opening are not included in the floor area,

→ Area occupied by wall, pillar and other intermmediate supports are not included floor area.

carpet area :-

→ carpet area of a building if the useful area, there is the total floor area - the circulat area, varendah, stain case lift, entrance hall and sanitary system (bath & wc)

→ for the office building carped area is the area on use area and for residential building carpet area is the area and shoul exclude for kitchen etc.

→ which are not used in living purpose.

Sreman Sahoo

Nominal brick size = 190mm x 90mm x 90mm
= 19cm x 9cm x 9cm

Modular brick size = 200mm x 100mm x 100mm
= 20cm x 10cm x 10cm.

Purpose of estimate :

→ To know the cost required

→ To know the category of the worker required.

→ To know the requirement of tool.

→ To know the amount of quantity or material required to complete the work.

→ To fix completion period the project.

→ To do the construction shedule.

Different types of estimate :-

following are the different types of estimate.

1) Priliminary or Approximate estimate

2) plinth area estimate.

3) cubic rate estimate with approximate

4) Quantity estimate

5) Detailed estimate

6) Revised estimate

7) supplementary estimate.

8) Annual repair or maintenance estimate.

1) Priliminary or Approximately estimate :-

→ It is required to study the various work of a project are called Priliminary estimate.

→ It is prepared by unit basic.

2) Plinth Area estimate :-

→ It is prepared by on basis of plinth area of a building.

→ Plinth area should be calculated for the plinth on rate of building in similar location.

3) Cubic rate estimate :-

→ In this method the volume cubic contain of the purpose building is work out and multiply by the rate per cubic volume the similar building in that locality constructed estimate.

$$\text{Total volume} = \text{Length} \times \text{breadth} \times \text{height} \ (L \times b \times h)$$

4) Approxime quantity estimate :-

→ In this method the approximate the length of wall in running metre is found out and then multiplied with the rate per running rate which give the accurate cost nearer to the original cost

5) Detailed estimate :-

→ It is the accurate estimate consists of working out the quantity is individual item and their cost

→ The dimension of length, breadth, height of the each item is taken out from the plan.

→ The detailed estimate is prepared by into stages.

　i) Details of measurement of calculation of quantity.

　ii) Abstract of estimate is cost

i) Details of measurement of calculation of quantity :-

ITEM NO	DESCRIPTION OF ITEM	NO	LENTH IN (me)	BREADTH IN (m)	HEIGHT IN (m)	QUANTITY	EXTRAORDINARY NOTE	

→ The whole work is devided into no. of item and works such as earth work escavation. Line, line concrete, footing.

→ The items are clauified into different schedule & the total quantity is multiplied with the cost on item breadth and to the calculate the cost of structure.

ii) Abstract of estimate cost :-

ITEM NO	DESCRIPTION OF ITEM	QUANTITY	UNIT	RATE	AMOUNT	

→ The cost under item of work is calculated from quantity alea already computed at workable rate and the total cost is worked out is the describe from & table.

6) Revised estimate :-

It is reclined estimate and it is required to the prepared under any of the following :-

a) when the original sanction estimate is exceeded or lignaly exceeded more than 5%

b) when the expanding to on the way expanded on lightly expanded more than 10% of the amount sanction by ad. authority.

c) when there is material required for the original purpose for lost move varly for the sanction amount.

7) Suplimentary estimate :-

It is detailed estimate and it is prepared when addition work on item work or when, from the development is required when the progress of work

8) ~~Required~~ Annual repair for maintainance estimate :-

i) It is detailed estimate and it is calculate to maintain the structure and work is prepare order and safe condition of a building.

ii) For a building includes while washing, colour washing, minor required for a road the path reparing and the prepared of parapet bridge and culvert.

Main items of the work :-

a) Earth of Excavation.

b) Sand filling in foundation.

c) concrete in foundation.

d) First class brick working.

e) R.C.C. wall.

f) Shoring

g) Roofing

h) Plastoring and pointing.

i) Doors and windows.

j) frame wall.

k) Painting

l) Pannel or frame or window.

m) Inside and outside white washing

n) Inside and outside colour washing.

Units of different work / item :-

Item	Units
1) Earth work ⟶	Per cubic m. (m³)
2) sand filling ⟶	cubic m. (m³)
3) First class brick work ⟶	m³ cubic m
4) D.P.C ⟶	sq. m × P.O
5) First class brick working super structure ⟶	cubic m.
6) Roofing ⟶	cubic m.
7) R.C.C ⟶	cubic m.
8) Flooring ⟶	sq. m.
9) Painting ⟶	sq. m.
10) Plastering ⟶	sq. m.
11) Doors & widows	
↳ chowkhat ⟶	cubic m.
↳ frame ⟶	sq. mt.
12) Inside & out side white washing ⟶	sq. m.
13) stone work ⟶	cubic m.
14) steel work in quintal roofing (AC shock) ⟶	sq. m.
15) cement - concrete ⟶	cubic m.
16) Aggregate ⟶	m³
17) Timbering ⟶	sq. m.
18) Iron work in truss ⟶	quintal.
19) shutter ⟶	sq. m.
20) cement mortar ⟶	sq. m.

Standard size of doors & windows:-

Doores	windows	chowkhat
1.2 × 2.10 m	1 × 1.50 m	12 × 7.5 cm
1.1 × 2.00 m	0.7 × 1.20 m	10 × 10 cm
1 × 1.90 m		10 × 7.5 cm
0.9 × 1.80 m		7.5 × 7.5 cm
0.75 × 1.80 m		

Methods of
METHODS OF ESTIMATING :-

There are two methods :-

1) Long wall or short wall method or individual method or separate method.

2) centre line method

1) Long wall or short wall method :-

→ These method is known as long wall or short wall method. The short wall is known as cross wall.

→ In those method the long wall or short wall is calculate as length of long wall. out to out
out to out

✱

Long wall length out to out

= centre to centre length + $\frac{1}{2}$ breadth on one side
    + $\frac{1}{2}$ breadth on the other side
= centre to centre length + one breadth

For short or cross wall subtract from the centre length one breadth of wall, which gives the length in-to-in.

> Short wall length in-to-in =
> = centre to centre – one breadth
> or centre to centre length + one breadth

Problem - 1

The plan represent the plan of superstructure wall of a single room building of 5m × 4m and section represent the crosssection of the wall with foundation. Estimate the quantities of

i) Earth work in excavation in foundation.
ii) concrete in foundation.
iii) Brick work in foundation and plinth.
iv) Brick work in super structure.

Solution:-
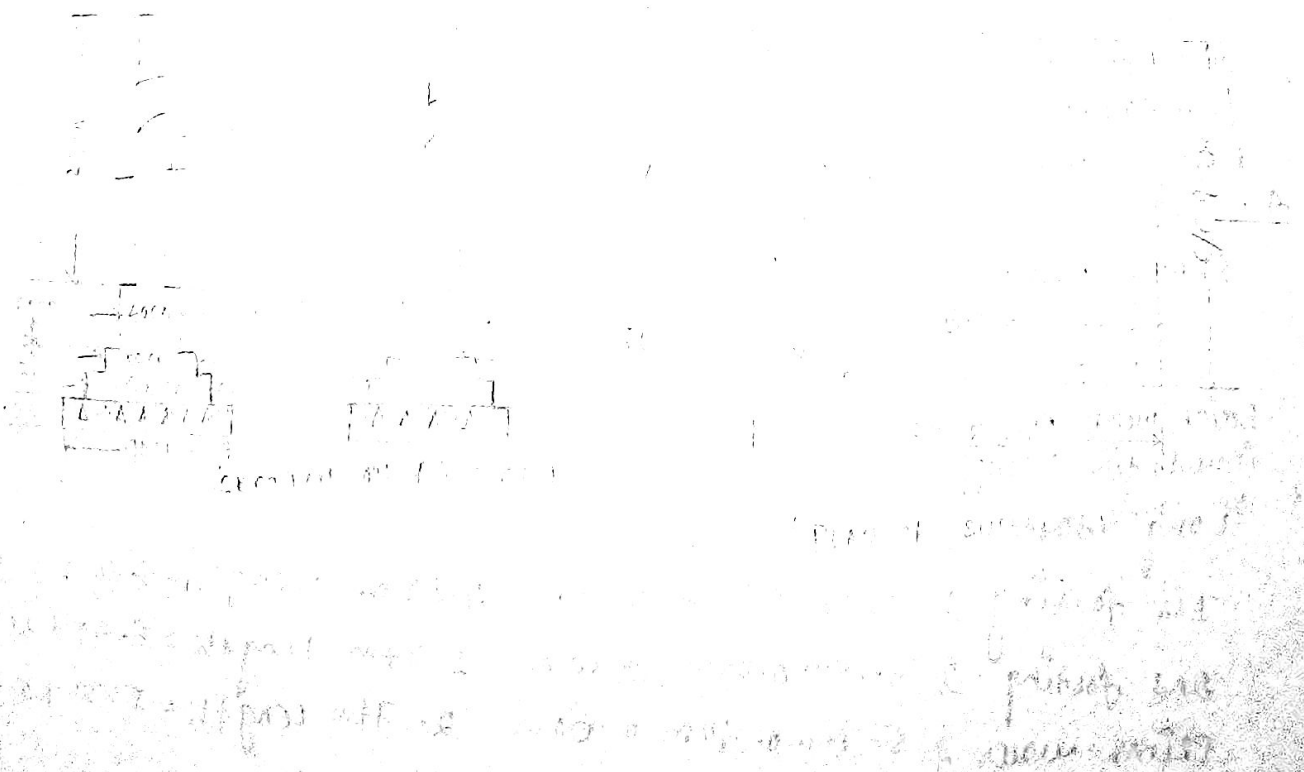
Length of long wall centre to centre (c/c)

$$= 5m + \frac{0.3}{2} + \frac{0.3}{2}$$

$$= 5.30 m$$

Length of short wall c/c

$$= 4m + \frac{0.3}{2} + \frac{0.3}{2} = 4.30 m$$

Item No.	Particulare of Item	No.	Length	breadth	Height on depth	Quantity & explanatorey note
1.	Earth work in excavation in foundation					
	Long wall	2	6.20m	0.90m	0.90m	2×6.20× 0.90×0.90 = 10.04 m Length = 5.30 + 0.90 = 6.20m
	Short wall	2	3.40m	0.90m	0.90m	2×3.40 ×0.90×0.90 = 5.51m breadth = 4.30 − 0.9 = 3.40m
					Total	10.04 + 5.51 = 15.55 cub.m
2.	concrete in foundation					
	Long wall	2	6.20m	0.90m	0.30m	3.35m Length = 6.20m.
	Short wall	2	3.40m	0.90m	0.30m	1.84m
					Total	3.35 + 1.84 = 5.19 cub.m. breadth = 3.40m.
3.	Brick work in foundation & Plinth					
	Long wall					
	1st footing	2	5.90m	0.60m	0.30m	2.12m Length=5.30+0.60=5.90
	2nd footing	2	5.80m	0.50m	0.30m	1.74m Length=5.30+0.50=5.80
	Plinth walls	2	5.70m	0.40m	0.60m	2.74m Length=5.30+0.40=5.70

Short wall						
1st footing	2	3.70m	0.60m	0.30m	1.33 m	Length = 4.30 - 0.60 = 3.70m.
2nd footing	2	3.80 m	0.50m	0.30m	1.14 m	Length = 4.30-0.50 = 3.80m.
plinth wall	2	3.90m	0.40m	0.30m	1.87 m	Length = 4.30-0.40 = 3.90
				Total	10.74 cu.m	
BRICK WORK in super- structure						
4. Long wall	2	5.60 m	0.30	3.60m	11.76 m	Length = 5.30+0.30 = 5.60m
Short wall	2	4.00 m	0.30m	3.50m	8.4 m	Length = 4.30-0.30 = 4.00m.
				Total	20.16 cum	

Solution:

Length of the long wall centre to centre (C/C)

$$= 4m + \frac{0.2}{2} + \frac{0.2}{2}$$

$$= 4.20m.$$

Length of the short wall centre to centre (C/C)

$$= 6m + \frac{0.2}{2} + \frac{0.2}{2}$$

$$= 6.20m.$$

ITEM No.	Particular in Item	No.	Length	breadth	Height or depth	Quantity	Explanatory notes
1	Earth brick work in door excavation in foundation						
	Long wall	2	5.10 m	0.90m	0.90m	8.26 M	Length = 4.20 + 0.90m = 5.10m
	Short wall	2	5.30m	0.90m	0.90m	8.59 8.59m	Length = 6.20 - 0.9 = 5.30m
						Total 16.85 cum	
2	concrete in foundation						
	Long wall	2	5.10m	0.90m	0.30m	2.75 M	Length = 4.20 + 0.70m = 5.10m
	Short wall	2	5.30m	0.90m	0.30m	2.86 M	Length = 6.20 - 0.90m = 5.30m
						Total 5.61 cum	
3	Brick work in foundation & plinth						
	Long wall						
	1st footing	2	4.80m	0.60m	0.30 m	1.73m	Length = 4.20 + 0.60 = 4.80m
	2nd footing	2	4.70m	0.50m	0.30m	1.41m	Length = 4.20 + 0.50 = 4.70m
	3rd Plinth wall	2	4.60m	0.40m	0.30m	1.10m	Length = 4.20 + 0.40 = 4.60m
	Short wall -						
	1st footing	2	5.60m	0.60m	0.30m	2.01m	Length = 6.20 - 0.60 = 5.60m
	2nd footing	2	5.70m	0.50m	0.30m	1.71m	Length = 6.20 - 0.50 = 5.70m
	Plinth wall	2	5.80m	0.40m	0.30 m	1.40m	Length = 6.20 - 0.40 = 5.80m
4	Brick work in super-structure						
	Long wall	2	4.50m	0.30m	3.50m	9.45m	Length = 4.20 + 0.30 = 4.50m
	Short wall	2	5.90m	0.30m	3.50m	12.40m	Length = 6.20 - 0.30 = 5.90m
						Total 21.84 cu.m	

Problem-3.

To estimate the quantities of the following items of a 2 roomed building from the given plan and section.

1) Earth work excavation in foundation.
2) Lime concrete in foundation
3) First class brick work in cement mortar 1:6 in foundation & plinth.
4) 2.5 cm e.c. damp proof course.
5) First class brick work in lime mortar in super structure.

Solution:-

~~TWO ROOMED~~ BUILDING   TWO ROOMED BUILDING
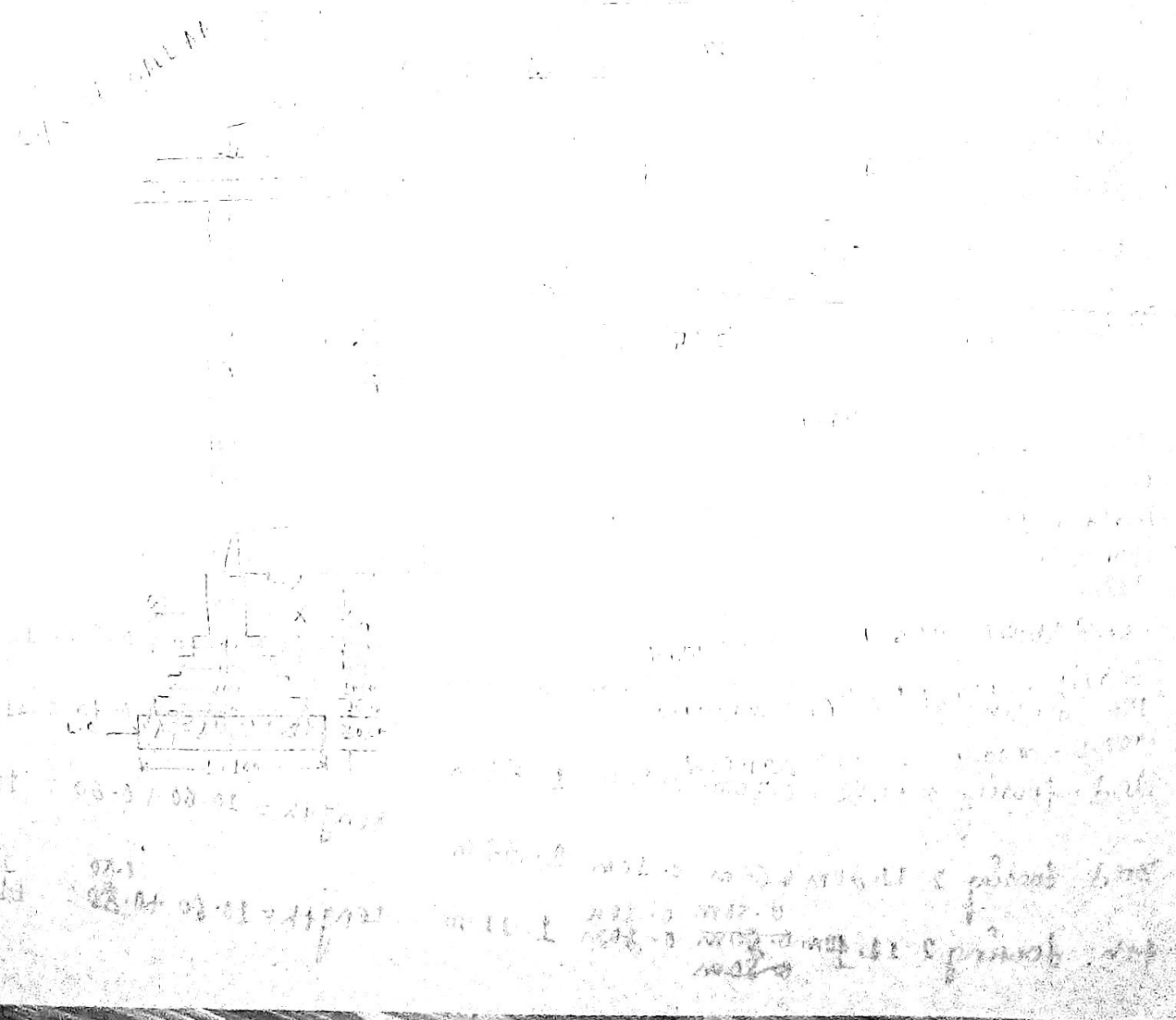
Length of the Long wall C/C

$$= 6 + 4 + 2 \times \frac{0.30}{2} + 0.3$$

$$= 10.60 \, m$$

Length of the short wall of C/C

$$= 6 + 2 \times \frac{0.30}{2}$$

$$= 6.30 \, m.$$

ITEM No.	Particular of Item	No.	Length	breadth	Height or depth	Quantity	Explanatory notes
1.	Earth work excavation in foundation						
	Long wall	2	11.70m	1.10m	1.00m	25.74 cu.m.	Length = 10.60 + 1.10 = 11.70
						12.87 cu.m.	
	Short wall	3	5.20m	1.10m	1.00m	17.16 m	Breadth = 6.30 - 1.10 = 5.20m
				Total	42.90 cu.m.		
2.	Lime concrete in foundation						
	Long wall	2	11.70m	1.10m	0.30m	7.72 m	Length = 11.70 m
	Short wall	3	5.20m	1.10m	0.30m	5.15 m	Length = 5.20 m.
				Total	12.87 m		
3.	1st class brick work in cement mortar 1:6 in foundation & Plinth.						
	Long wall -						
	1st footing	2	11.40m	0.80m	0.20m	3.65 m	Length = 10.60 + 0.80 = 11.40 m
	2nd footing	2	11.30m	0.70m	0.10m	1.58 m	Length = 10.60 + 0.70 = 11.30m
	3rd footing	2	11.20m	0.60m	0.10m	2.34 m	Length = 10.60 + 0.60 = 11.20m
	4th footing	2	11.10m	0.50m 0.80m 0.90m	0.10m	1.11 m	Length = 10.60 + 0.50 = 11.10m

Item	No.	Length	Breadth	Height	Quantity	Remarks
Plinth wall	2	11.00 m	0.40 m	0.80 m	5.28 m / 7.04 m	Length = 10.60 + 0.40 = 11.00
Short wall					2.64 m	
1st footing	3	5.50 / 9.80 m	0.80	0.20 m	4.70 m / 1.18 m	Length = 10.60 − 0.80 = 9.80 m / 5.50 m / 6.30
2nd footing	3	5.60 / 9.90 m	0.70	0.10 m	2.08 m / 1.030 m	Length = 10.60 − 0.70 = 9.90 m / 5.60 m / 6.30
3rd footing	3	5.70 / 10.00 m	0.60 m	0.10 m	1.85 m / 0.87	Length = 10.60 − 0.60 = 10.00 m / 5.70 m / 6.30
4th footing	3	5.80 / 10.10 m	0.50	0.10 m	1.51 m / 5.66 m	Length = 10.60 − 0.50 = 10.10 m / 5.80 m / 6.30
Plinth wall	3	5.90 / 10.20 m	0.40	0.80 m	2.79 m	Length = 10.60 − 0.40 = 10.20 / 5.90 / 6.30
					Total = 26.18 cu.m	

Damp proof
course 2.5 cm
thick C.C.

4.

Item	No.	Length	Breadth		Quantity	Remarks
Long wall	2	11.00 m	0.40 m	—	8.80 m	Length = 10.60 + 0.40 = 11.00 m
Short wall	3	5.90 m	0.40 / 0.40	—	7.08 m	Length = 6.30 − 0.40 = 5.90 m
Deduct door sills	2	1.20	0.40		0.96 m	Length =
					Total = 16.84 sq.m	

1st class brick
work in lime
mortar in

5. Super structure

Item	No.	Length	Breadth	Height	Quantity	Remarks
Long wall	2	10.90 m	0.30 m	4.20 m	27.47	Length = 10.60 + 0.30 = 10.90 m
Short wall	3	6.00 m	0.30 m	4.20 m	22.68	Length = 6.30 − 0.30 = 6.00 m
					Total 50.15 cu.m	
Deduct door openings	2	1.20 m	0.30 m	2.10 m	1.51 m	
Windows	4	1.00 m	0.30 m	1.50 m	1.80 m	
Shelves	2	1.00 m	0.20 m	1.50 m	0.60 m	
Lintel over Door	2	1.50	0.30 m	0.15 m	0.14 m	Bearing 15 cm.
Lintel over window	4	1.30	0.30 m	0.15 m	0.23 m	Bearing 15 cm.
Lintel over shelves	2	1.30	0.30 m	0.15 m	0.12 m	Bearing 15 cm.
					Total = 4.40 cu.m	
				Net total	= 45.75 cu.m.	

Problem - 4
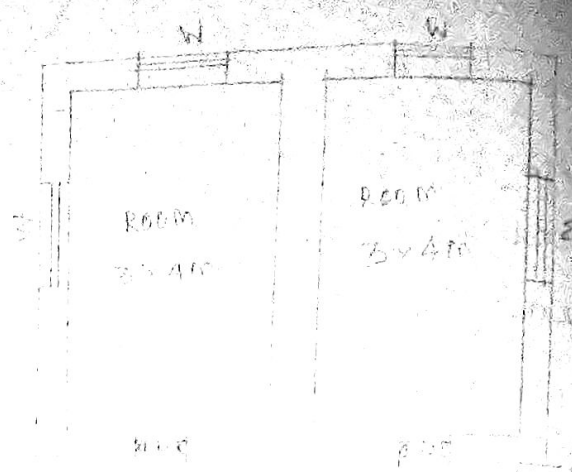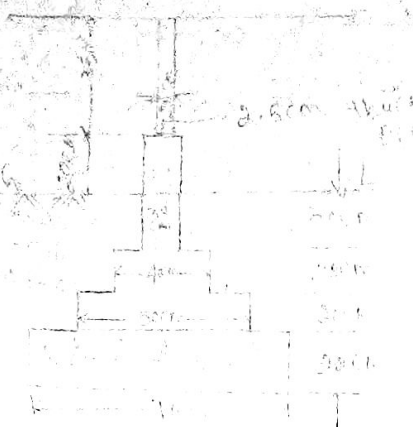
Two roomed building source of plan and cross-section of wall of a building estimate the following item :-

1) Earth work in excavation foundation.
2) Lime concrete in a foundation.
3) First class brick in foundation & plinth.
4) 2.5 cm D.P.C
5) First class brick work in cement mortar super structure.

-Solution:-

Length of the long wall c/c

$$= 3 + 3 + 2 \times \frac{0.2}{2} + 0.2$$

$$= 8.30 m \quad 6.40 m.$$

Length of the short wall c/c

$$= 4 + 2 \times \frac{0.2}{2}$$

$$= 0.20 m. \quad 4.020 m.$$

Item No.	Particular of Item	No.	Length	Breadth	Height or Depth	Quantity	Explanatory notes
1	Earth work to excavation foundation						
	Long wall	2	7.10 m	0.70 m	0.90 m	8.95 m	Length = 6.40 + 0.70 = 7.10 m
	short wall	3	3.50 m	0.70 m	0.90 m	6.61 m	Length = 4.20 + 0.70 = 3.50 m
					Total	15.56 cu.m	
2	Lime concrete in foundation excavation						
	Long wall	2	7.10 m	0.70 m	0.30 m	~~1.99 m~~ ~~1.98 m~~	Length = 6.40 + 0.70 = 7.10 m
	short wall	3	3.50 m	0.70 m	0.30 m	~~1.47 m~~ ~~2.20 m~~	Length = 4.20 - 0.70 = 3.50 m
					Total	~~5.18 cu.m~~ 3.46 cu.m	
3	First class brick in foundation & Plinth.						
	Long wall -						
	1st footing	2	6.90 m	0.50 m	0.20 m	1.38 m	Length = 6.40 + 0.50 = 6.90 m
	2nd footing	2	6.80 m	0.40 m	0.20 m	1.09 m	Length = 6.40 + 0.40 = 6.80 m
	Plinth wall	2	6.70 m	0.30 m	0.50 m	~~6.80 m~~ 2.01 m	Length = 6.40 + 0.30 = 6.70 m
	short wall -						
	1st footing	3	3.70 m	0.50 m	0.20 m	1.11 m	Length = 4.20 + 0.50 = 3.70 m
	2nd footing	3	3.50 m	0.40 m	0.20 m	0.91 m	Length = 4.20 - 0.40 = 3.80 m
	Plinth wall	3	3.70 m	0.30 m	0.50 m	1.75 m	Length = 4.20 - 0.30 = 3.90 m
					Total	8.25 cu.m	
4	2.5 D.P.C						
	Long wall	2	6.70 m	0.30 m	—	~~5.36 m~~ 4.02 m	Length = 6.40 + 0.30 = 6.70 m
	short wall	3	3.90 m	0.30 m	—	~~4.68 m~~ 3.51 m	Length = 4.20 - 0.30 = 3.90 m
	Deduct Door Sills	2	1.20 m	0.30 m	—	~~0.96 m~~ 0.72 m	—
					Total	8.25 cu.m	

First class brick work in cement mortar in super-structure	No.	Length	Breadth	Height	Quantity	
5.						
Long wall	2	6.60m	0.20m	3.50m	9.24m	Length = 6.40 + 0.20 = 6.60
Short wall	3	4.00m	0.20m	3.50m	8.40m	Length = 64.20 - 0.20 = 4.00
				Total	17.64m	
Deduct door openings	2	1.20m	0.10m	2.10m	1.01m	Length = 6
windows	4	1.00m	0.20m	1.50m	1.20m	
				Total	2.21m	
Lintel over doors	2	1.40m	0.20m	0.15m	0.07m / 0.08m	
Lintel over window	4	1.20m	0.20m	0.15m	0.14m	
				Total	0.22m	

Net total 2.43 cum
Net total 15.21 cum

Problem - 06
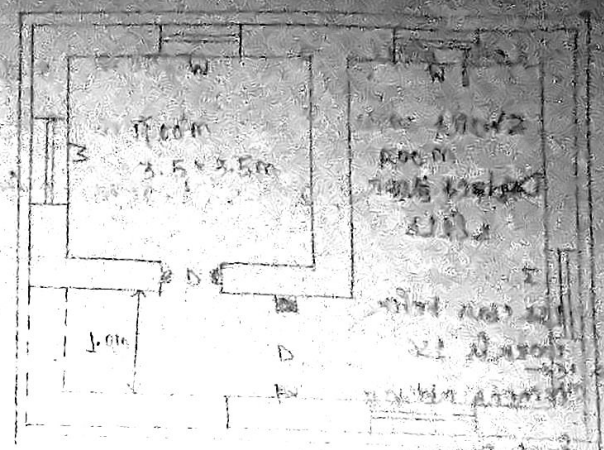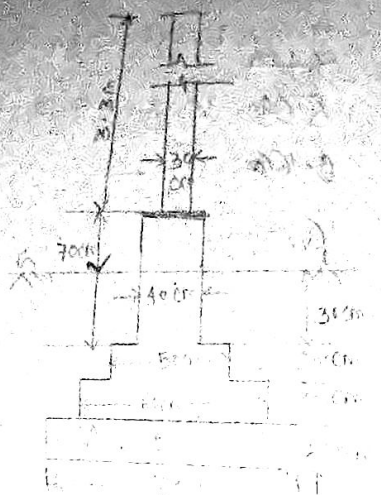
Estimate the quantity of following item of a two roomed building from to given plan & section.

1) Excavation of foundation.

2) Lime concrete in foundation.

3) 1st class brick work is 1:6 cement mortar in foundation & plinth.

4) 2.5 cm D.P.C.

5) 1st class brick work is 1:6 cement mortar in super structure.

Length of the long wall C/C

$$= 3.5 + 3.5 + 2 \times \frac{0.3}{2} + 0.3 = 7.60m$$

Length of the short wall C/C

$$= 4.80 + 2 \times \frac{0.3}{2}$$

$$= 5.10m.$$

ITEM NO.	Particular of Item	No.	Length	Breadth	Height or Depth	Quantity	Explanatory Notes
	Excavation of foundation						
1.	Long wall	3	8.40m	0.80m	0.70m	18.14 m³	Length = 7.60 + 0.80 = 8.40 m.
	Short wall	3	4.30m	0.80m	0.90m	9.29 m³	Length = 5.10 + 0.80 = 4.30 m
					Total	27.43 cu.m	
	Lime concrete						
2.	In foundation						
	Long wall	3	8.40m	0.80m	0.20m	4.03 m³	Length = 7.60 + 0.80 = 8.40 m
	Short wall	3	4.30m	0.80m	0.20m	2.06 m³	Length = 5.10 - 0.50 = 4.30 m
					Total	6.09 cu.m	
3.	1st class brick work is 1:6 cement mortar in foundation & plinth.						
	Long wall						
	1st footing	3	8.20m	0.60m	0.20m	2.95 m	Length = 7.60 + 0.60 = 8.20 m
	2nd footing	3	8.10m	0.50m	0.20m	2.43 m	Length = 7.60 + 0.50 = 8.10 m
	Plinth wall	3	8.00m	0.40m	1.00m	9.60m	Length = 7.60 + 0.40 = 8.00 m
	Short wall						
	1st footing	3	4.50m	0.60m	0.20m	1.62m	Length = 5.10 - 0.60 = 4.50 m
	2nd footing	3	4.60m	0.50m	0.20m	1.38 m	Length = 5.10 - 0.50 = 4.60 m
	plinth wall	3	4.70m	0.40m	1.00m	5.64 m	Length = 5.10 - 0.40 = 4.70 m
					Total	23.62 cu.m	
						23.62 cu.m	

2.56m
DPC

4.

Item	No.	Length	Breadth	Height	Quantity	Remarks
Long wall	3	8.00 m	0.40m	—	9.60m / 9.48m	Length = 7.60 + 0.40 = 8
Short wall	3	4.70 m	0.40m	—	5.64m	Length = 5.10 - 0.40 = 4.7
Deduct door sills	2	1.20 m	0.40m	—	0.96 m	—
				Total	16.28 qm / 16.200 m²	

1st class brick
work in 1:6

5. cement mortar
in super structure

Item	No.	Length	Breadth	Height	Quantity	Remarks
Long wall	3	7.90m	0.30m	3.30 m	23.46 m	Length = 7.60 + 0.30 = 7.9
Short wall	3	4.80 m	0.30m	3.30 m	14.26 m	Length = 5.10 - 0.30 = 4.80
				Total	37.72 qm	
Deduct door openings	2	1.20 m	0.30 m	2.10 m	1.51 m	
window	5	1.00 m	0.30 m	1.50 m	2.25 m	
Lintel over door	2	1.50 m	0.30 m	0.15 m	0.13 m	
Lintel over window	5	1.30 m	0.30 m	0.15 m	0.29 m	
				Total	4.18 m	
			Net	Total	33.54 qm	

Method - II :-

Centre line method :-

$$AB + BC + CD + DA = 5.3 + 4.3 + 5.3 + 4.3$$
$$= 19.2m.$$
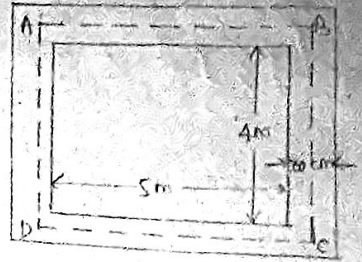
→ This method known as centre line method. Sum total length of centre line of walls long and short has to be found out.

→ Find the total length of centre lines of walls of same type long and short wall having same type of foundation and footing.

→ Then fined the quantity by multiplying the total centred length by the respective breadth & height.

→ These method is quick but requires special attention and consider at the ~~function~~ junction meeting points of partition wall or cross wall.

→ For rectangular, circular, polygonal, hexagonal, octagonal.

→ Building have no item cross wall.

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→ For building having cross wall or partition wall for every junction of partition wall special consideration shall be made to find the correct quantity.
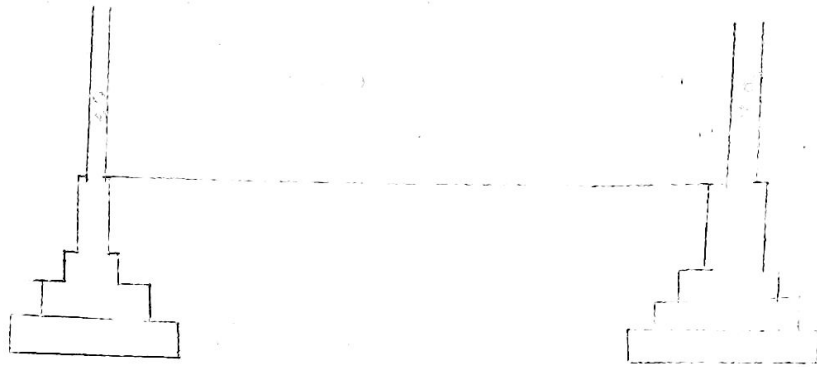
→ For each junction half breadth of the respective item or footing is to be deducted from the total centre length

→ In centre line method the length is given by sumension of all centre lines of the plans.

Long wall ~~out~~ C/C $= 5 + \frac{0.3}{2} + \frac{0.3}{2} = 5.3m$.

Short wall C/C $= 4 + \frac{0.3}{2} + \frac{0.3}{2} = 4.3m$.

CD + ~~AB~~ AB + BC + AD $= 5.3 + 5.3 + 4.3 + 4.3 = 19.2$

Sl.	Description of item	No.	Length	Breadth	Height or depth	Quantity	Explanatory note
1.	Earth work in excavation in foundation	1	19.2	0.9	0.9	15.55 m³	
2.	concrete in foundation	1	19.2	0.9	0.3	5.18 m³	
3.	~~Isa~~ Brick work in foundation and plinth.						
	1st footing	1	19.2	0.6	0.3	3.45 m³	
	2nd footing	1	19.2	0.5	0.3	2.88 m³	
	Plinth	1	19.2	0.4	0.6	4.60 m³	
4.	Brick work in super structure	1	19.2 ~~19.2~~	0.3	3.5	20.16 m³	

Sl

1

2

3

4
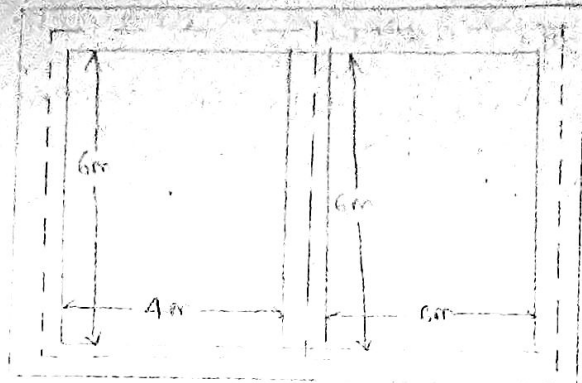
Quantity of earth work in excavation $L = \left(40.1 - 2 \times \frac{1.1}{2}\right)$
$= 39.8\,m$

Bredth : 1.1m

$H = 1m$

Quantity $= 39 \times 1.1 \times 1 = 42.9\,m.$

$AB + CD + AD + BC + EF = 10.6 + 10.6 + 3 \times \frac{6.3}{2} = 40.1$

Sl.	Description of Item	No.	length (m)	bredth (m)	Height or depth (m)	Quantity	Explanatory notes
1.	Earth work in excavation in foundation.	1	39	1.1	1	42.9 m³	$40.1 - 2 \times \frac{1.1}{2} = 39\,m$
2.	Lime concrete in foundation	1	39	1.1	0.3	12.87 m³	
3.	Brickwork in footing & Plinth						
	1st footing	1	39.3	0.8	0.2	6.29 m³	$40.1 - 2 \times \frac{0.8}{2} = 39.3\,m$
	2nd footing	1	39.4	0.7	0.1	2.76 m³	$40.1 - 2 \times \frac{0.7}{2} = 39.4\,m$
	3rd footing	1	39.5	0.6	0.1	2.37 m³	$40.1 - 2 \times \frac{0.6}{2} = 39.5\,m.$
	4th footing	1	39.6	0.5	0.1	1.98 m³	$40 \times 1 - 2 \times \frac{0.5}{2} = 39.6\,m.$
	Plinth	1	39.7	0.4	0.8	12.70 m³	$40 \times 1 - 2 \times \frac{0.4}{2} = 39.7\,m.$
					Total	26.1 m³	
4.	D.P.C 2.4 cm over Plinth	1	39.7	0.4	0 —	15.88 m²	Length same as Plinth
	Deduction Deduct doors	2	1.2	0.4	0.96 —	0.96	$40.1 - 2 \times \frac{0.3}{2} = 39.8\,m.$
5.	Brick work in super structure	1	39.8	0.3	4.2	14.92 m²	
	Deduct doors.	2	1.2	0.3	2.1	50.15 m³	
	window	4	1	0.3	1.5	1.51 m³	
	shelves	2	1	0.2	1.5	1.80 m³	
						0.6 m³	

Problem 1:-

Calculate the dry materials required for 550m
550m² of 25mm thick D.P.C in cement concrete
$\left(1 : 1\frac{1}{2} : 3\right)$.

Solution :-

$1m^3$ — cement

$1.5 m^3$ — sand

$3 m^3$ — aggregate

$25mm = \dfrac{25}{1000} = 0.025m$

$550 m^2 \times 0.025m = 13.75 m^3$.

$13.75 m^3$ wet mixture.

$1 m^3$ wet mixture ⟶ $1.54 m^3$ dry mixture

$13.75 \times 1.54 = 21.17 m^3$.

| Density of cement $= 1440 \, kg/m^3$ |

$1 + 1.5 + 3 = 5.5$ parts.

Cement = 1 part = $\dfrac{21.17}{5.5} = 3.85 m^3$

Sand = $3.85 \times 1.5 = 5.77 m^3$.

Aggregate = $3.85 \times 3 = 11.55 m^3$.

| Density of cement $= 1440 \, kg/m^3$ |

$\rho \times V = m$

$1440 \times 3.85 = 5544 \, kg$

$\therefore 5544 \, kg$ of cement.

1 bag = 50 kg cement.

$$\frac{5544}{50} = 110.88 \text{ bags}$$

$$\simeq 111 \text{ bags of cement}.$$

Problem:-

Find the dry material required for $10 m^3$ cement concrete (1:2:4).

Solution:-

$1 m^3$ = cement

$2 m^3$ = sand

$4 m^3$ = Aggregate

wet volume = $10 m^3$

Dry volume $10 \times 1.54 = 15.4 m^3$.

Total $1+2+4 = 7$ parts.

cement = 1 part = $\dfrac{15.4}{7} = 2.2 m^3$.

Sand = 2 parts = $\cancel{15.4}\ 2.2 \times 2 = 4.4 m^3$.

Aggregate = 4 parts = $2.2 \times 4 = 8.8 m^3$.

Density of cement = 1440 kg/m^3.

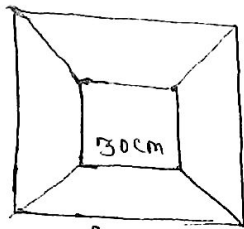$1440 \times 2.2 = 3168$ kg

. 1 bag = 50 kg.
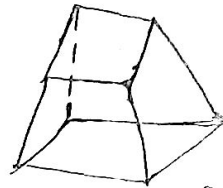
$$\frac{3168}{50} = 603.36$$

$$= 64 \text{ bags}.$$

Problem:

Find the quantity of cement concrete 1:4:8 requir for a trapezoidal square footing of size 2m a bottom and 30cm at top with 38 cm depth.
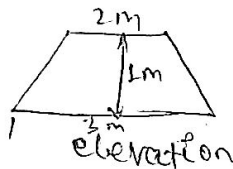
Solution:-

Plan

Isometric

elevation

$$\text{Area of trapezium} = \frac{1}{2}(\text{sum of parallel sides}) \times \text{height}$$

$$= \frac{1}{2} \times (2+3) \times 1$$

$$= 2.5 \ m^2$$

$$\text{Volume of trapezium} = \frac{1}{2} \times (\text{sum of parallel area}) \times \text{height}$$

$$= \frac{1}{2}(0.3 \times 0.3 + 2 \times 2) \times 0.38$$

$$= 0.78 \ m^3.$$

Dry volume = 0.78×1.54

$$= 1.2 \ m^3.$$

Total Parts = $1+4+8 = 13$ parts.

Cement = 1 part $= \frac{1.20 - 78}{13} \cancel{}$ $= 0.09 \ m^3$

Sand = 4 parts = $0.09 \times 4 = 0.36 \ m^3$

Aggregate = 8 parts = $0.09 \times 8 = 0.72 \ m^3$

Density of cement = 1440 kg/m³.

$$1440 \times 0.09 = 864 \div 129.6$$

$$\frac{864}{50} = \frac{129.6}{50} = 2.59$$

$$= 3 \text{ bags}.$$

Analysis of rate :-

→ The determination of rate per unit of a perticular item of work from the cost of quantities of material, the cost of labourers and other miscellaneous small expenses require for its completion is called analysis of head.

→ Usually 10% for the contractor is also included in the analysis of rate.

→ Rates of material are usually taken as the rates delivered at the site of work and includes the first cost (cost of origin, transportation cost), taxes etc.

→ The rates of material and labour vary from place to place and therefore, the rates of different items of work vary from place to place.

→ The rate of perticular item of work depend on the following.

a) specification of works and material, quality of material, proportion of morctar method of construction operation

b) Quantities of materials and their rates, number of different types of labourers and their rates.

c) Location of the site of work and its dista.. from the source of materials and the transp.. availability of water.

d) Profits and miscellaneous and over head expense.. of contractor.

Over head cost :-

It consists of office expenses, rents, taxes, supervision and other cost which are indirect expenses and not productive expenses on the Job.

The miscellaneous expenses on over heads may be under the following heads :-

A) General overheads :-

(i) Establishment (office staff)

(ii) Stationary, posters etc.

(iii) Travelling expenses

(iv) Telephone

v) Rent and charges taxes.

B) Job overheads :-

(i) Supervision (salary of Engineers, workers etc)

(ii) Handling of materials

(iii) Repairs

(iv) Amenities of labour

v) workmen's compensation and Insurance

→ The analysis of rates is usually worked out for the unit of payment of perticular item of work under the and two head

      a) Materials

      b) Labour

and the added cost together give the cost of item.

→ A provision for of water charges at 1.5% of is made.

Task or out-turn work :-

The capacity of doing work by an artidian or skilled labourer in the form of quantities of work per day is known as task work or out-turn work.

Rates of material and labour

Materials	Rate at site
1) Brick - 1ˢᵗ class	Rs 8000 %₀ → per thousand number
2) Brick 2nd class	RS. 7000 %₀
3) Brick 3ᵈ ballast (40mm) juge	Rs. 1000/m³
4) Brick ballast (20mm) gauge	Rs. 1100/m³
5) Stone ballast (40mm)	Rs. 2400/m³
6) Stone ballast (20mm) gauge	Rs. 2400/m³
7) cement (	Rs. 330/bag (Rs. 9700/m³
8) steel	Rs. 4200/quintal(q)
9) white or stone lime (unslaked)	Rs. 1000/quintal (q)

10) White or stone lime   — Rs. 1000/m^3
           (slaked)

11) Surkhi   — Rs. 800/m^3

12) Fine sands   — Rs. 1500/m^3 $\boxed{D - 27 - 02 - 19}$

13) coarse sand   — Rs. 1800/m^3

14) Teak wood   — Rs. 50,000/m^3

15) shisham wood   — 35,000/m^3

16) salwood   — 50,000/m^3

Labour	expense
1) Head masson	425/day
2) Mason	400/day
3) Mazdoor	250/day
4) Boy or coolie	230/day
5) Bishti (water carriers)	230/day
6) Carpenter	400/day
7) Black smith	375/day
8) Painter	375/day

9) __Sundries :__

small items not necenary mentioned in the list

$$Density = \frac{m}{v}$$

$$\Rightarrow \quad 1440 = \frac{50}{v}$$

$$\Rightarrow \quad 1440\,v = 50$$

$$\Rightarrow \quad v = \frac{50}{1440}$$

$$\Rightarrow \quad v = 0.035\ m^3$$

1 bag of cement has volume = 0.035 m³.

$$\frac{1}{0.035} \ bag \ = \ 1\ m^3$$

$$= 28.57 \simeq 29\ bags$$

cost of cement = 29 × 330 = 9570

30 × 330 ≈ 9900

≈ 9700 ✓

Problem:-

Lime concrete in foundation with 40mm gauge brick ballast unit 1 m³.

Take 10 m³

a) with white lime & surkhi (1 : 2 : 6).

Particulars		Quantities	Rate	Cost
Materials				
white lime	—	1.71 m³	₹. 1000/m³	₹ 1710
surkhi		3.42 m³	800/m³	₹ 2736
Brick ballast (40mm)		10.26 m³	1000/m³	₹ 10260
				₹ 14,706
				≃ ₹ 14,800
labour				
1) Head mason		1/2	425/day	212.5
2) mason		.1	400/day	400
3) mazdoor		10	250/day	2500
4) Boy or coolie		10	230/day	2300
5) Bishti		2	230/day	460
5) Sundries		lump sump	250	250

6122.5
₹ 6130

Total cost of material + labour | $14800 + 6130$
| $= 20930/-$

Contractor $= 10\% = 2093/-$

water $= 1.5\% = 314/-$

_____

Grand total $= 23,337/-$

$10 m^3 = 23,337$

$1 m^3 = \dfrac{23,337}{10}$

$= 2333.7$

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Problem 2.

Lime concrete in ~~conster~~ foundation with 40 mm stone ballast, white lime and sand $(1:2:4)$ unit $1 m^3$ for $10 m^3$

| particular | quantity | Rate | cost |

wet volume $= 10 m^3$

~~Dry~~ Dry volume $= 10 \times 1.54 = 15.4 m^3$.

$1 + 2 + 4 = 7$ parts.

lime $= \dfrac{15.4}{7} = 2.2 m^3$.

sand $= 2.2 \times 2 = 4.4 m^3$.

Aggregate $= 2.2 \times 4 = 8.8 m^3 \cdots =$ stone ballast

Particular material	Quantity	Rate	Cost
white lime	2.2 m³	1000/m³ 2400/m³	R 2200
fine sand	4.4 m³	1500/m³	Rs. 6600
Stone ballast (40mm gauge)	8.8 m³	2400/m³	R 21120
			Rs. 29920
			≈ Rs. 30,000

Labour

1)	Head mason	1/2	425/day	Rs. 212.5
2)	Mason	1	400/day	Rs. 400
3)	Mazdoor	10	250/day	Rs. 2500
4)	Boy or coolie	10	230/day	Rs. 2300
5)	Bisthi	2	230/day	Rs. 460
6)	Sundries	lump sump	300	Rs. 300
				Rs. 6172.5
				≈ Rs. 6180

Total cost of material + labour = 29920 + 6180
                                = 36100

Contractor = 10% = 3610
water = 1.5% = 541.5
             ≈ 542

Grand total = 40,252

10 m³ = 40,252
1 m³ = 4025.2

Problem:

Cement concrete 1:5:10 in foundation on floor of brick ballast with 40 mm gauge unit 1 m³ for 10m³

Solution:-

wet volume = 10m³

Dry volume = 10 × 1.54 = 15.4 m³.

1 + 5 + 10 = 16 parts.

$$cement = \frac{15.4}{16} = 0.96 \ m^3$$

sand = 0.96 × 5 = 4.8 m³.

Brick ballast = 0.96 × 10 = ~~9.6 m³~~ 9.6 m³.

Particulars

Material	Quantity	Rate	Cost
Cement	0.96 m³	~~550/m³~~ 9700/p	Rs. ~~5168~~ 9312
fine sand	4.8 m³	1500/m³	Rs. 7200
Brick ballast (40mm)	9.6 m³	1000/m³	Rs. 9600
			Rs. ~~17116.6~~ 26112
			~Rs. ~~17120~~ 26120

Labour			
Head mason	1/2	425/day	212.5
mason	1	400/day	400
Mazdoor	10	250/day	2500
Boy or coolie	10	230/day	2300
Bhisti	2	230/day	460
sundries Lump sum	~~250~~ 250	250	250
			@Rs. 6122.5
			~Rs 6130.

Total cost of material + labour = 26120 + 6130 = 32250

contractor = 10% = $32250 \times \frac{10}{100}$ = Rs. 3225

water = 1.5% = $32250 \times \frac{1.5}{100}$ = 483.75
≈ 485

Grand total = Rs 35960

$$10 \, m^3 = Rs. 35960$$
$$\Rightarrow 1 \, m^3 = \frac{35960}{10}$$
$$= Rs 3596$$

&

Super structure:

Brick

moratar :- (cement, fine aggregate)

nominal Brick size = 19 cm × 9 cm × 9 cm

Modular brick size = 20 cm × 10 cm × 10 cm = 0.2 × 0.1 × 0.1

$$= 2 × 10^{-3} \, m^3$$

volume of 1 brick = 2000 cm³

$$= 2000 × (0.01)^3$$

$$\boxed{\text{for } 1 \, m^3 = \frac{1}{2×10^{-3}} = 500 \text{ bricks}}$$

Calculation of material of mortar :-

Approximate method to determine the quantity of materials of mortar for 10 m³ brick work.

Divide 3 by the sum of numerals of the proportion of material which gives the quantity of cement in m³.

$$\underline{1:6}$$

Total part = 1 + 6 = 7

cement

$$cement = \frac{3}{7} = 0.43 \, m^3$$

fine aggregate = 6 × 0.43 = 2.58 m³

$$1 \, m^3 \rightarrow 0.3 \, m^3$$
$$10 \, m^3 \rightarrow 30 \, m^3.$$

Problem:-

1st class brick work in super structure with 20×10×10 20cm × 10cm × 10cm brick with 1:6 cement sand mortar. unit 1m³. Take 10m³

Solution

Particulars	Quantity	Rate	Cost
Materials			
1) Brick 1st class	5000 no.	8000%. Rs. 8 per brick	Rs. 40,000
2) fine sand	2.58 m³	m. 1500	Rs. 3870
3) cement	0.43 m³	@ Rs. 9700/m³	Rs. 4171
			Rs. 48,041 ≈ Rs. 48,050
Labour			
1) Head mason	1/2	425/day	Rs. 212.5
2) Mason	10	400/day	Rs. 4000
3) Mazdoor	7	250/day	Rs. 1750
4) Boy or coolie	10	230/day	Rs. 2300
5) Bhisti Bhishi	4	230/day	Rs. 920
6) Sundries	lump sump	300	Rs. 300
7) scaffolding	lump sump	350	Rs. 350
			Rs. 9832.5 ≈ Rs. 9840

Total material + labour
$$= 48,050 + 9840 = Rs. 57890$$

contractor = 10% = Rs. 5789

water = 1.5 = Rs. 868.35 ≈ Rs. 870

Total = Rs. 64549.

$$10\,m^3 = \text{A} \cdot 64549$$

$$1\,m^3 = \frac{64549}{10}$$

$$\therefore 1\,m^3 = \text{A} \cdot 6454 \cdot 9$$

Problem :-

1st class brick work 20cm × 10cm × 10cm in superstructure 1:3 cement coarse sand mortar unit 1m³ for 10 m³.

solution :-

Parts = 1 + 3 = 4

$$cement = \frac{3}{4} = 0.75\,m^3$$

sand = 0.75 × 3 = 2.25 m³

Particulars	Quantity	Rate	Cost
materials :-			
1) 1st class brick	5000 no.	8000 %. or As per brick	Rs. 40,000
2) coarse sand	2.25 m³	1800 / m³	Rs. 4050
3) cement	0.75 m³	Rs. 9700 / m³	Rs. 7275
			Rs. 51325
Labour			
1) Head mason	1/2	425/day	Rs. 212.5
2) Mason	10	400/day	Rs. 4000
3) Mazdoor	7	250/day	Rs. 1750
4) Boy or coolie	10	230/day	Rs. 2300
5) Bisthi	4	230/day	Rs. 920
6) sundries	lump sump	300	Rs. 300
7) scaffolding	lump sump	350	Rs. 350
			Rs. 9832.5
			≈ Rs. 9840

Total = 51325 + 9840 = 61165

Contractor = 10% = 61,165 × $\frac{10}{100}$ = A.6116.5

water $= 1.54 = 61,165 \times \dfrac{1.5}{100}$

$$= Rs. 917.47$$

∴ Grand total $= Rs. 68198.97$

$$10\ m^3 = Rs. 68198.97$$

$$1\ m^3 = \dfrac{68198.97}{10}$$

$$= Rs. 6819.9$$

Problem:

1st class brick work in foundation and plinth with 20cm × 10cm × 10cm (nominal size) bricks with cement sand mortar 1:6 unit 1 m³ for 10 m³.

Solution:-

$$cement = \dfrac{3}{7} = 0.43\ m^3$$

$$sand = 0.43 \times 6 = 2.58\ m^3.$$

Particulars	Quantity	Rate	Cost
Materials			
1st class brick	5000 nos.	8000/..	Rs. 40,000
fine sand	2.58 m³	1500/m³	Rs. 3870
cement	0.43 m³	@ 9700/m³	Rs. 4171
			Rs. 48,041
			≃ Rs. 48,050
Labour			
Head mason	1/2	425/day	212.5
mason	7	400/day	Rs. 2800
Mazdoor	7	250/day	Rs. 1750
Boy or coolie	7	230/day	Rs. 1610
Bishti	2	230/day	Rs. 460
Sun dries	lump sump	250	Rs. 250
			Rs. 7082.5
			≃ Rs. 7090

Total materials + labour = 48,050 + 7090 = Rs. 55140

Contractor = 10% = $55140 \times \frac{10}{100}$ = Rs. 5514.

water = 1.5% = $55140 \times \frac{1.5}{100}$ = Rs. 827.1

Grand total = Rs. 61481.1

$$10 \, m^3 = Rs. \, 61481.1$$

$$1 \, m^3 = \frac{61481.1}{10} = Rs. \, 6148.11$$

Problem :- D-02-03-19

1st class brick work in arches 1:3 mortar cement, coarse sand, mortar unit 1 m^3. Take 10 m^3.

Solution :-

$$cement = \frac{3}{4} = 0.75 \, m^3$$

$$coarse \ sand = 0.75 \times 3 = 2.25 \, m^3.$$

Particulars	Quantity	Rate	cost
materials			
1st class brick	5000 nos.	8000%.	Rs. 40,000
coarse sand	2.25 m^3	1800/m^3	Rs. 4050
cement	0.75m^3	9700/m^3	Rs. 7275
			Rs. 51325
Labour			
1) Head mason	1/2	425/day	Rs. 212.5
2) mason	15	400/day	Rs. 6000
3) Mozdoor	10	250/day	Rs. 2500
4) Boy or collie	10	230/day	Rs. 2300
5) Bisthi	2	230/day	Rs. 460
6) Sun dries	lump sump	300	Rs. 300
7) scaffolding	lump sump	500	Rs. 500
8) centering and shuttering (form work)	lump sump	1000	Rs. 1000
			Rs. 13272.5
			Rs. 13,300

Total = 51325 + 13300 = Rs. 64,625

Contractor = 10% = $64,625 \times \dfrac{10}{100}$ = Rs. 6462.5

water = 1.5% = $64,625 \times \dfrac{1.5}{100}$ = Rs. 969.37

Grand total = ≈ 72056.87

$10 m^3$ = Rs. 72056.87

$1 m^3$ = $\dfrac{72056.87}{10}$ = Rs. 7205.687

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$D_1 = 1.2m \times 2.1m$

$D_2 = 1m \times 2m$

$D_3 = 0.75m \times 1.8m$
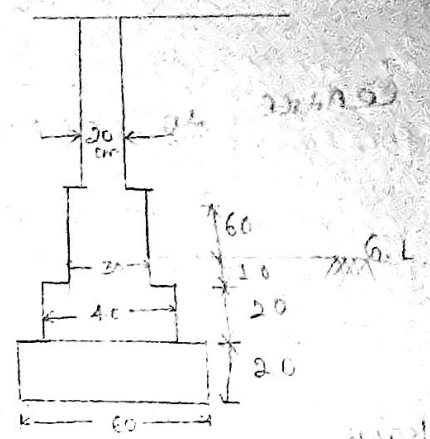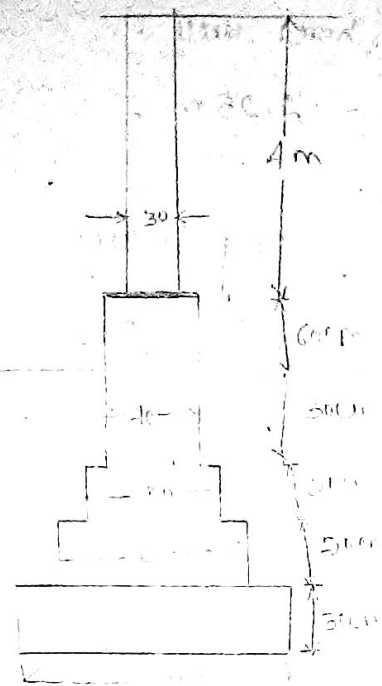
Drawing and left hand side bed room (combined):-

centre to centre distance of long walls

$= 0.15 + 6 + 0.3 + 0.4 + 0.15 = 10.6m$

centre to centre distance of short wall

$= 0.15 + 5 + 0.15 = 5.3m$

Bed rooms right side (Combined):-

centre to centre distance of long walls

$= 0.15 + 5 + 0.3 + 4 + 0.015 = 9.6m$

centre to centre distance of short walls

$= 0.15 + 4.5 + 0.15 = 4.8m$

Front verandah :-

centre to centre distance of short wall .

$$= 0.10 + 2 + 0.15 = 2.25 \, m.$$

centre to centre distance of long wall

$$= 0.15 + 5 + 0.3 + 4 + 0.3 - \frac{0.2}{2} = 9.65 \, m$$

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Back verandah including bathroom :-

centre to centre distance of long wall

$$= 0.15 + 5 + 0.3 + 4 + 0.3 - \frac{0.2}{2}$$

$$= 9.65 \, m.$$

Store

centre to centre distance of short wall

$$= 0.15 + 2.5 + 0.10 = 2.75 \, m$$

Item No.	Particulars of Item	No.	Length	Breadth	Height	Quantity	Explanatory notes
1.	Earth work in excavation in foundation (Drawing & bed room)						
	1. Long wall	2	11.5 m	0.9 m	2.0 m	20.7 m³	$10.6 + 0.9 = 11.5$ m
	2. Short wall	3	4.4 m	0.9 m	1	11.88 m³	$5.3 - 0.7 = 4.4$ m
	Bed room (combined)						
	1. Long wall	2	9.6 m	0.9 m	1 m	17.28 m³	$9.6 m - \frac{0.9}{2} + \frac{0.9}{2}$ $\neq 9.6$ m
	2. Short wall	2	3.9 m	0.9 m	1 m	7.02 m³	$4.8 - 0.9 = 3.9$ m
	Back Front verandah Excluding bath room						
	1. Long wall	1	9.5 m	0.6 m	0.5 m	2.85 m³	$9.65 - \frac{0.9}{2} + \frac{0.6}{2}$ $= 9.5$ m
	2. Short wall	1	1.5 m	0.6 m	0.5 m	0.45 m³	$\frac{9.65}{2.95} - \frac{0.9}{2} - \frac{0.6}{2}$ $= 1.5$ m
	Back verandah Including bath room						
	1. Long wall	1	9.5 m	0.6 m	0.5 m	2.85 m³	
	2. Short wall	2	2 m	0.6 m	0.5 m	1.2 m³	$2.75 - \frac{0.9}{2} - \frac{0.6}{2}$ $= 2$ m
						Total 64.23 m³	
2.	Lime concrete in foundation (Drawing & bed room)						
	1. Long wall	2	11.5 m	0.9 m	0.3 m	6.21 m³	
	2. Short wall	3	4.4 m	0.9 m	0.3	3.56 m³	
	Bed room (combined)						
	1. Long wall	2	9.6 m	0.9 m	0.3 m	5.18 m³	
	2. Short wall	2	3.9 m	0.9 m	0.3 m	2.11 m³	

front verandah

	No.	Length	Breadth	Depth	Quantity	Calculation
1. Long wall	1	9.7 m	0.6 m	0.2 m	1.16 m³	$9.65 - \frac{0.5}{2} + \frac{0.6}{2} = 9.?$ (substracting because here brick work is done)
2. Short wall	1	1.7 m	0.6 m	0.2 m	0.20 m³	$2.25 - \frac{0.6}{2} - \frac{0.5}{2} = 1.?$
Back verandah						
1. Long wall	1	9.7 m	0.6 m	0.2 m	1.16 m³	$9.65 + \frac{0.6}{2} - \frac{0.5}{2} = 9.7?$
2. Short wall	2	2.2 m	0.6 m	0.2 m	0.53 m³	$2.75 - \frac{0.6}{2} - \frac{0.5}{2} = 2.2?$

Total 20.11 m³

D-14-03-19

~~Brick work~~
1st class brick work
3. In foundation & plinth
(Drawing & bed room)

	No.	Length	Breadth	Depth	Quantity	Calculation
1. Long wall	2					
1st footing	2	11.2 m	0.6 m	0.2 m	2.69 m³	$10.6 + \frac{0.6}{2} + \frac{0.6}{2} = 11.2$ m
2nd footing	2	11.1 m	0.5 m	0.2 m	2.22 m³	$10.6 + \frac{0.5}{2} + \frac{0.5}{2} = 11.1$ m
plinth	2	11 m	0.4	0.9 m	7.92 m³	$10.6 + \frac{0.4}{2} + \frac{0.4}{2} = 11$ m
2. Short wall						
1st footing	3	4.7 m	0.6 m	0.2 m	1.69 m³	$5.3 - \frac{0.6}{2} - \frac{0.6}{2} = 4.7$ m
2nd footing	3	4.8 m	0.5 m	0.2 m	1.44 m³	$5.3 - \frac{0.5}{2} - \frac{0.5}{2} = 4.8$ m
plinth	3	4.9 m	0.4 m	0.9 m	5.29 m³	$5.3 - \frac{0.4}{2} - \frac{0.4}{2} = 4.9$ m
Bed room right side (combined)						we already calculated previously when calculating drawing & bed room
1. Long wall						
1st footing	2	9.6 m	0.6 m	0.2	2.30 m³	$9.6 - \frac{0.6}{2} + \frac{0.6}{2} = 9.6?$
2nd footing	2	9.6 m	0.5 m	0.2	1.92 m³	$9.6 - \frac{0.5}{2} + \frac{0.5}{2} = 9.6?$

Plinth (crossed out word above)

	No.	Length	Breadth	Height	Quantity	Remarks
Plinth	2	9.6m	0.4m	0.9m	6.92 m³	$9.6 - \frac{0.4}{2} + \frac{0.4}{2} = 9.6m$

2. short wall

	No.	Length	Breadth	Height	Quantity	Remarks
1st footing	2	4.2m (4.88 crossed out)	0.6 m	0.2m	1.01 m³	$4.88 - \frac{0.6}{2} + \frac{0.6}{2} = 4.88 \quad (4.2m)$
2nd footing	2	4.3m	0.5 m	0.2m	0.86 m³	$4.8 - \frac{0.5}{2} - \frac{0.5}{2} = 4.3m$
Plinth	2	4.4m	0.4m	0.9m	3.17 m³	

Here we exclude half width as this width is plinth level of main wall foundation.

Front verandah

1. Long wall

	No.	Length	Breadth	Height	Quantity	Remarks
1st footing	1	9.65m	0.4m	0.2 m	0.77 m³	$9.65 - \frac{0.4}{2} + \frac{0.4}{2} = 9.65m$
Plinth	1	9.6 m	0.3m	0.7m	2.02 m³	$9.65 - \frac{0.4}{2} + \frac{0.3}{2} = 9.6m$

2. short wall

	No.	Length	Breadth	Height	Quantity	Remarks
1st footing	1	1.85m	0.4	0.2 m	0.15 m³	$2.25 - \frac{0.4}{2} - \frac{0.4}{2} = 1.85m$
Plinth footing	1	1.9m	0.3	0.7 m	0.4 m³	$2.25 - \frac{0.4}{2} - \frac{0.3}{2} = 1.9m$

Back verandah

1. Long wall

	No.	Length	Breadth	Height	Quantity	Remarks
1st footing	1	9.65m	0.4m	0.2m	0.77 m³	$9.65 - \frac{0.4}{2} + \frac{0.4}{2} = 9.6m$
Plinth	1	9.6 m	0.3m	0.7m	2.02 m³	$9.65 - \frac{0.4}{2} + \frac{0.3}{2} = 9.6m$

2. short wall

	No.	Length	Breadth	Height	Quantity	Remarks
1st footing	2	2.35 m	0.4m	0.2m	0.38 m³	$2.75 - \frac{0.4}{2} - \frac{0.4}{2} = 2.35m$
Plinth	2	2.4m	0.3	0.7m	1.01 m³	$2.75 - \frac{0.3}{2} - \frac{0.4}{2} = 2.4m$

Net Total   44.94 m³

Brick work on
Super Structure
(Drawing & bed room)

5. 1. Long wall | 2 | 10.9 m | 0.3 m | 0.4 m | 26.616 m³ | $10.6 + \frac{0.3}{2} + \frac{0.3}{2} =$

2. Short wall | 3 | 5 m m | 0.3 m | 4 m | 18 m³ | $5.3 - \frac{0.3}{2} - \frac{0.3}{2} =$

Bed room
(combined)

1. Long wall | 2 | 9.6 m | 0.3 m | 4 m | 23.04 m³ | $9.6 + \frac{0.3}{2} - \frac{0.3}{2} = 9.$

2. Short wall | 2 | 4.5 m | 0.3 m | 4 m | 10.8 m³ | $4.8 - \frac{0.3}{2} - \frac{0.3}{2} = 4.5$

Front verandah

1. Long wall | 1 | 9.6 m | 0.2 m | 3.05 m | 5.86 m³ | $9.65 + \frac{0.3}{2} + \frac{0.2}{2} = 9$

2. Short wall | 1 | 2 m | 0.2 m | 3.05 m | 1.22 m³ | $\overset{2.25}{9.65} - \frac{0.3}{2} - \frac{0.2}{2} = 2 m$

Back verandah

1. Long wall | 1

4. 2.5 cm D.P.C
(Drawing & bed room)

① Long wall | 2 | 0.11 m | 0.4 m | — | 8.8 m² | $10.6 + \frac{0.4}{2} + \frac{0.4}{2} = 11 m$

Short wall | 3 | 4.9 m | 0.4 m | — | 5.88 m² | $5.3 - \frac{0.4}{2} - \frac{0.4}{2} = 4.9 m$

Description	No.	Length	Breadth	Height	Quantity	Calculation
Both bed room Combined Long wall	2	9.6 m	0.4 m	—	7.68 m²	$9.6 + \frac{0.4}{2} - \frac{0.4}{2} = 9.6 \text{ m}$
Short wall	2	4.8 m	0.4 m	—	3.84 m²	$4.8 + \frac{0.4}{2} - \frac{0.4}{2} = 4.8 \text{ m}$
Front verandah Long wall	d	9.6 m	0.3 m	—	2.88 m²	$9.65 - \frac{0.4}{2} + \frac{0.3}{2} = 9.6 \text{ m}$
Short wall. Bath room 9ntermediate wall & rear wall	2	2.4 m	0.3 m	—	1.44 m²	$2.75 - \frac{0.4}{2} - \frac{0.3}{2} = 2.4 \text{ m}$
Rear wall	1	2.5 m	0.3 m	—	0.75 m²	$2.2 + \frac{0.3}{2} + \frac{0.3}{2} = 2.5 \text{ m}$
Pillar	4	0.5 m	0.3 m	—	0.6 m²	6.4×0.2 $(0.4 + 0.05 + 0.05)$ $(0.2 + 0.05 + 0.05)$ $= 0.5 \times 0.3$ $= 0.15$

Total 28.67 m²

	No.	Length	Breadth	Height	Quantity
D_1	6	1.2 m / 0.4 m	0.4 m	—	2.88 m²
D_2	2	1 m	0.4 m	—	0.8 m²
D_3	1	0.75 m	0.3 m	—	0.225 m²

Total 3.905 m²

Net total 24.76 m²

Works of ASSISTANT ENGINEER :-

1) Engineer in chief

2) Chief Engineer

3) Superintending engineer

4) Executive Engineer

5) Assistant Engineer

6) Junior Engineer

Works & responsibilities of Executive assistant Engineer

→ The Assistant Engineer is responsible to the executive Engineer (Divisional officer (DO)) for management and ~~exe~~ execution of work in the sub-division.

→ He is also the assistant of divisional officer.

→ He arranges and checks the actual execution of work in the sub-division according to the estimates, drawing and specification.

→ To check the property in his charge Including buildings of pump houses and keep them in proper state by timely action

and wise utilisation of Government funds.

→ To maintain all initial accounts for expenditure in his charge and submit it to ~~divional~~ divisional officer.

→ To take measurement of work and to check the works of Junior Engineer.

→ The assistant Engineer is responsible to check muster-roll (labour attendance at site) carefully in respect of labour and work.

→ To give instruction to his sub-ordinates so that they can work ~~accord~~ according to the plan.

→ To report immediately to executive engineer in case of any serious accidents or unusual occurrences.

→ To keep an eye to the expenditure and report it to the divisional officer (D.O).

→ To take care of Government cash lying in the Government chest.

Works of Junior Engineer :-

The smallest unit in a department is called a section, in which the charge of section officer or Junior Engineer, whose duties and responsibilities are :-

→ Junior Engineer is responsible to prepare petty requisition, plans and estimates for special repairs and addition and change of works under his section.

→ To give marks for work to be done in his section and to carry out survey and levelling works when required.

→ He deals directly with the contractors regarding the official works.

→ He checks all the works of in the sites done by his sub-ordinates.

→ He arranges labour at economical rates within the sanctioned rates when a work is required to be done departmentally.

→ To maintain accounts of all the stocks and (T&P) (Tools and Plant) in his charge, their receiv receipts and issues to maintain register of material at site.

→ He assists the work of assistant executive Engineer.

→ To put up measurement books regularly to his sub-divisional officer (S.D.O).

→ To keep a control over expenditure in the site.

→ To report the progress of work to the S.D.O at atleast twice in a month.

→ To report to the S.D.O immediately if any serious accidents or unusual occurances occures in the site.

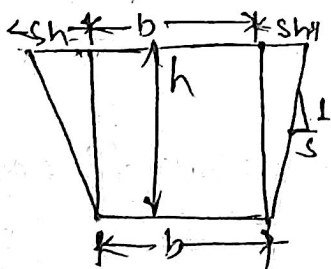→ To supervise the actual execution of works in the site according to the plan, estimates.

Lead and Lift :-

Earth work :-

→ Cross-section of earthwork of road in filling or in cutting is usually in the form of trapezium.

→ The quantities of earthwork may be calculated by

$$\boxed{Quantity = sectional\ area \times length}$$

$1 \rightarrow h$

$S = Sh$

$\frac{1}{2} \{$ sum of parallel sides $\} \times$ height

$= \frac{1}{2} \times (b + b + 2sh) \times h$

$= \frac{1}{2} \times 2b + 2sh^2 \times h$

$$\frac{1}{2} \times (2bh + 2sh^2)$$

$$= \frac{1}{2} \times 2 (bh + sh^2)$$

$$= bh + sh^2$$
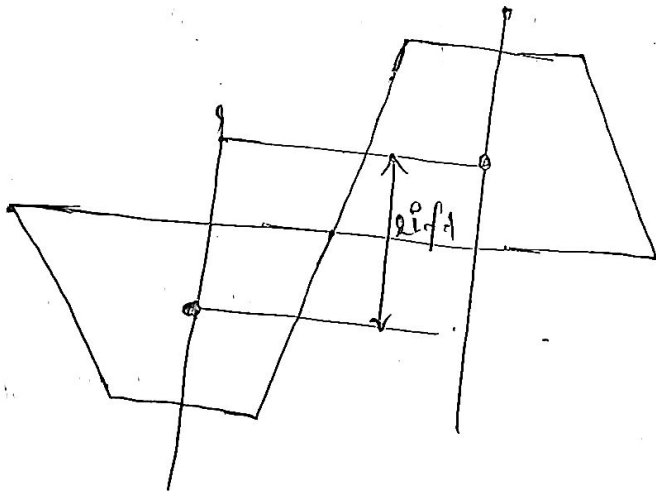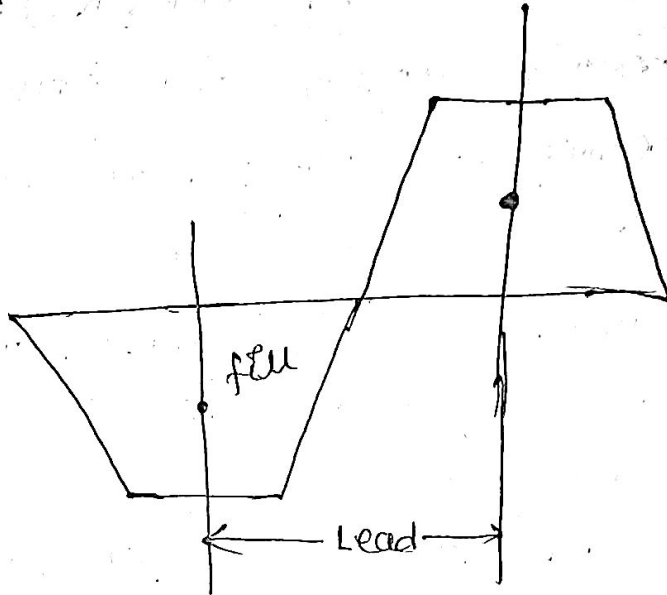
fill

Lead

lift

Lead :-

→ The lead shall be measured some the from the centre of area of excavation to the centre of areas of filling.

→ It is measured in horizontal direction.

$$\frac{1}{2} \times (2bh + 2sh^2)$$

Lift :-

→ Lift shall be measured from the centre of excavation to the centre of felling.

→ It is measured in vertical direction.

The measurement shall be taken separately for 30m ~~lead~~ (100ft) lead or distance and every 1.5m (5ft) lift or height.

Normally earth work is estimated for 30m lead and 1.5m lift. The distance of 30m and height of ~~5m~~ 1.5 m is known as <u>normal lead and normal lift</u>.

~~Works of contractor :-~~

$\boxed{D - 11 - 04 - 19}$

Q Name different Government & public sector organisation employing civil diploma holders in odisha state.

<u>Ans</u>- Government Organisation employing civil diploma holders.

→ O.P.S.C (odisha public service commission).

→ S.S.C (staff selection commission) (central Govt.)

→ O.S.S.S.C (odisha state staff selection commission).

→ Housing Board Department

→ R.R.B (Railway Requipment Board) (central Govt.)

→ P.W.D (public works Department), Irrigation Department, R.&.D (Roads and development), R&B (Road and Building)

→ Pbbl

Public sector organisation :-

→ Indian oil, Hindustan Petrolium, Bharat Petroli
  Essar, Reliance.

→ Jindal

→ Tata

→ ~~OPTCL~~

→ P. P. L (Paradeep. phosphate limited).

Works of Divisional Accountant :-

→ He is the financial adviser of executive Engineer of a particular division.

→ He is the ~~station~~ liaison ~~which~~ with the accountant general office (zonal head).

→ He is responsible to pre audit of monthly account submitted by the S.D.O office.

→ He is responsible to prepare budget and appropriate proposals to help the executive Engineer and submit the same to the higher officer.

→ He shall be responsible to bring the divisional officer (D.O) notice to the sub-ordinates regarding the accounts.

Plinth area :-

→ It is the built up area covered of a building measured at floor level of any storey.

→ Plinth area is calculated by taking the external dimension of the building at the floor level.

→ Courtyard, open areas, balconies and cantilever projection are not included in plinth area.

Carpet area :-

→ carpet area of the building is the useful area or livable area.

→ This is the total area — varendah corridors staircase, lifts, entrance hall etc and other sanitary accomodation.

Floor area :-

→ Floor area of a building is the total area of floor between walls and consists of floores of all rooms, corrideres, staircase room, kitchen, entrance hall, bathroom etc. Door sills and openings are not included in floor area.

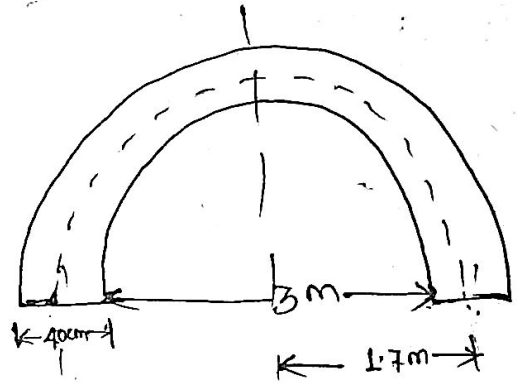→ Floor area is equal to plinth area — area occupied by walls

Q- A semi circular arch has span of 3m, thickness of arch is 30cm and width 40 cm. Calculate the quantity of arch masonry.

solution:-

span (L) = 3m

thickness = 30cm = 0.3m

width = 40 cm = 0.4m

Area of

perimeter of the circle $= \dfrac{2 \pi r}{2}$

$= 2 \times \pi \times 1.7$

$= 5.34$

$$A = \left[\dfrac{\pi (1.9)^2}{2} - \dfrac{\pi (1.5)^2}{2} \right]$$

$= 2.136 \, m^2.$