

SECTION I

Q1. ANSWER

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Estimate: It is a probable cost of quantities and various expenditures to be incurred during the execution of construction project. /3marks

Q2. ANSWER

The three types of data for preparing an estimate are:

- a) Drawing /1 mark
- b) Specification /1 mark
- c) Rates of the current year /1 mark

Q3. the three items of work which requires cost estimation are:

a) Earth work <sup>1 mark</sup> is a preliminary work for filling and cutting a soil this item is measured in  $m^3$  /0.5 mark

b) Foundation: It is a part of building which supports the superstructure of the building.

a) Superstructure <sup>1 mark</sup> is a part of building which is above the foundation and it is measured in concrete work in  $m^3$  in  $m^3$  /0.5

e) Flooring  $\rightarrow m^2$

f) Plastering  $\rightarrow m^2$  any three are enough

Q4. DATA GIVEN

Length = 4m

Height = 3m

Thickness = 20cm = 0.2m

Rate of brickwork = 7000 Ru /  $m^3$

Plastering = 1800 Ru /  $m^2$

## Solution

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\* The volume of brickwork =  $4m \times 3m \times 0.20$   
 $= 2.4 m^3$

If thickness 20cm  $V = 4m \times 3m \times 20cm = 240m^3$

\* Area to plaster =  $4m \times 3m = 12 m^2$   
 For 2 sides =  $12 \times 2 = 24 m^2$

\* The cost of brickwork =  $2.4 m^3 \times 70000 = 168000 \text{ Frw}$   
 For thickness of 20cm =  $240 m^3 \times 70000 = 16800000 \text{ Frw}$

\* The cost of plastering =  $12 m^2 \times 1800 \text{ Frw} = 21600 \text{ Frw}$   
 for 2 sides =  $24 m^2 \times 1800 \text{ Frw} = 43200 \text{ Frw}$

\* Total cost =  $168000 \text{ Frw} + 21600 = 189600 \text{ Frw}$   
 or for 2 sides:  $168000 \text{ Frw} + 43200 = 211200 \text{ Frw}$

3. The schedule of reinforcement bars is a list of reinforcement bar in a tabular form giving the particulars of bars, the key elements are the size and length of bars may be known and may be arranged and bent up during the construction.

Key element:   
 examples: 10mm 1.5m 10mm 1.5m

Particular of Item indication of bar	Shape or bending of bar	Length for each m	No. of bars	Total weight/m length	Total weight (kg)

any three are enough

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where  $d_1, d_2$  = depth of bank cut at 2 ends

Mid ordinate or Average depth =  $\frac{d_1 + d_2}{2}$

Area of mid section ( $A_m$ ) =  $b d_m + n d_m^2$

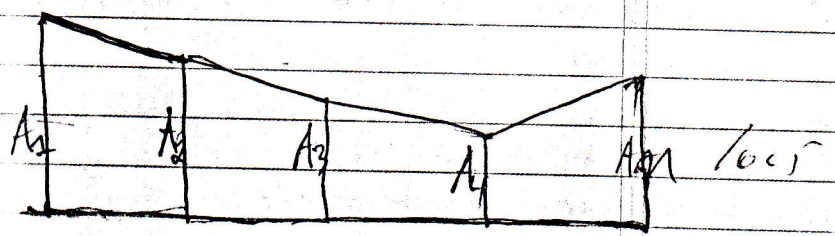
$V = A_m \times L = (b d_m + n d_m^2) \times L$  /1

2. Trapezoidal formula method /0.5  
& for 2 sections

In this method also called mean sectional area method

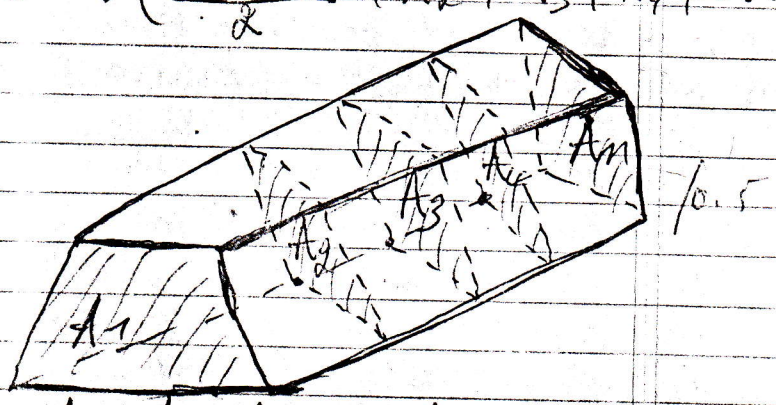
$A_m = \frac{A_1 + A_2}{2} \Rightarrow V = A_m \times L$  /1 marks

where  $A_1, A_2$  are two 2 area at 2 ends



$V = \frac{d}{2} L [A_1 + A_n + 2(A_2 + A_3 + A_4 + \dots + A_{n-1})]$

$V = d \left( \frac{A_1 + A_n}{2} + A_2 + A_3 + A_4 + \dots + A_{n-1} \right) L$  /1



$A_1, A_2, A_3, A_4 \dots A_n$  are cross-sections

$A_1$ : first cross-sectional area

$A_n$ : last cross-sectional area

$A_2, A_3, A_4 \dots A_{n-1}$ : mid cross-sectional area

(iii) Prismoidal method 0.5

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where,  $d_1, d_2$  = depth of bank cut at 2 ends

Mid ordinate or Average depth =  $\frac{d_1 + d_2}{2}$

Area of mid section ( $A_m$ ) =  $b d_m + n d_m^2$

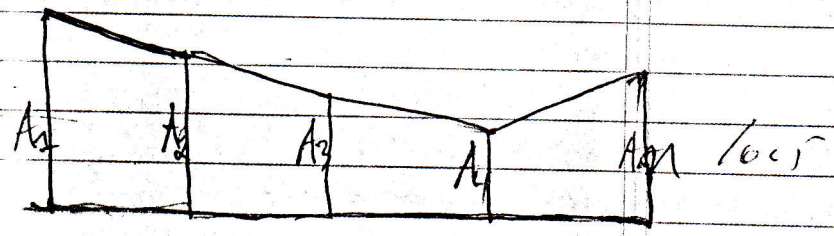
$V = A_m \times L = (b d_m + n d_m^2) \times L$  1/1

2. Trapezoidal formula method 1005  
& for 2 sections

In this method also called mean sectional area method

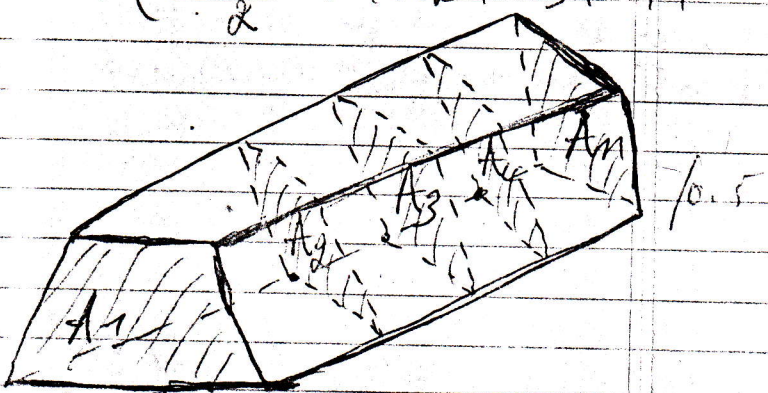
$A_m = \frac{A_1 + A_2}{2} \Rightarrow V = A_m \times L$  1/2 marks

where  $A_1, A_2$  are two 2 area at 2 ends



$V = \frac{d}{2} L [A_1 + A_n + 2(A_2 + A_3 + A_4 + \dots + A_{n-1})]$

$V = d \left( \frac{A_1 + A_n}{2} + A_2 + A_3 + A_4 + \dots + A_{n-1} \right) L$  1/1



$A_1, A_2, A_3, A_4 \dots A_n$  are cross-sections

$A_1$ : first cross-sectional area

$A_n$ : last cross-sectional area

$A_2, A_3, A_4 \dots A_{n-1}$ : mid cross-sectional area

(iii) Prismoidal method 005

$$V = \frac{d}{3} [A_1 + A_n + 2(\text{odd areas}) + 4(\text{even area})]$$

$$V = \frac{d}{3} [A_1 + A_n + 2(A_3 + A_5 + \dots + A_{n-2}) + 4(A_2 + A_4 + \dots + A_{n-1})]$$

Q8. <sup>10.5</sup> Cost: is the original amount of money required for construction of a project completely or purchasing goods and services

<sup>10.5</sup> Value: is the present amount of money for existing property it may be higher or lower than the cost

Five purposes of valuation are

- (i) Selling property when it is required to sell a property. 1/1
- (ii) Taxation to assess the tax of a property it is required 1/1
- (iii) Rent fixation 1/1
- (iv) Security of loan or mortgage 1/1
- (v) Compulsory acquisition when a property is acquired by law compensation is paid to the owner. 1/1
- (vi) Valuation for insurance speculation, --- any five are enough 1/2 mark for each

Q9. The two types of construction contracts by method of pricing are:

- Lump sum contract 1/2
- Bill of quantity contract 1/2
- Item rate contract
- Percentage base contract
- Labour rate contract
- Lough basis contract.

Q10. The four forms of cost type construction contract are:

- contract of construction
- contract of study

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- Contract of supervision
- Contract of fabrication
- Contract of supply of material
- Cost plus fixed fee contract
- Cost plus percentage fee contract
- Cost plus fluctuation fee contract
- Cost reimbursement contract

Any three are enough. Mark for each

Q11. The three documents which are enclosed in the construction contract are:

- (i) Working drawing
- (ii) Specification
- (iii) Bill of quantity
- (iv) Tender notice
- (v) Letter for acceptance
- (vi) Schedules of issue of materials
- (vii) General condition of contract
- (viii) Special condition of contract

Any three are enough. Mark for each

Q12. The construction of a new road  
- The repair of a road

The difference between the two activities in costing estimation and costing can be listed in the following table

1. Construction of new road	Repair of existing road
- Deep study - Money for construction	No study Money for demolishing works
2. Construction of a roof - Money for construction	Changing existing roof Money for construction with additional cost for demolishing works

3. Construction of new wall

Money for bricks, stones, ..  
\$.

Repairing existing wall

Additional money for broken stone or bricks.

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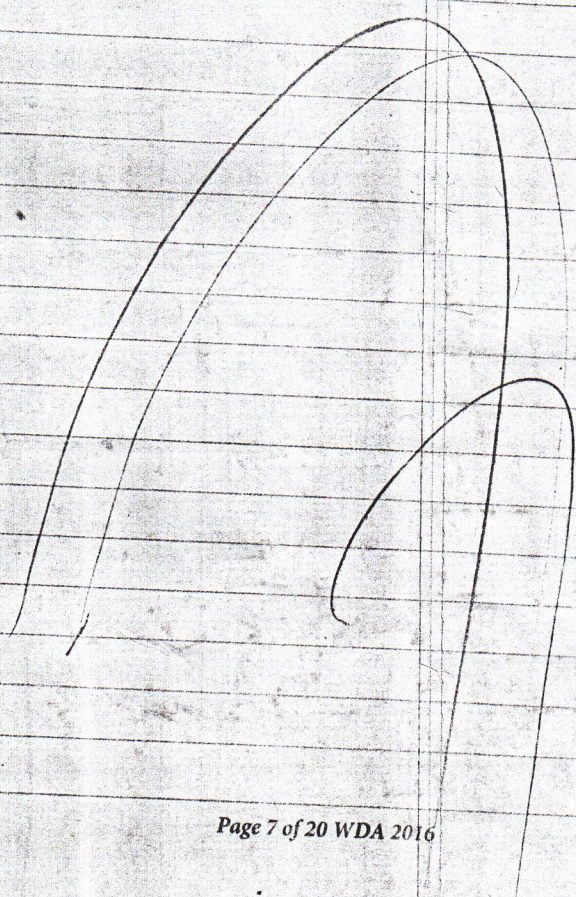
2 are enough 1.5 mark for each

Q.13. Difference between contract to tender.

\* **Contract**: is an agreement between the client and contractor / 1.5

\* **Tender** is a formal offer submitted by the bidder for execution of work or supply of materials / 1.5

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## SECTION II

Q.14. The ~~two~~ general factors which affect the tender price

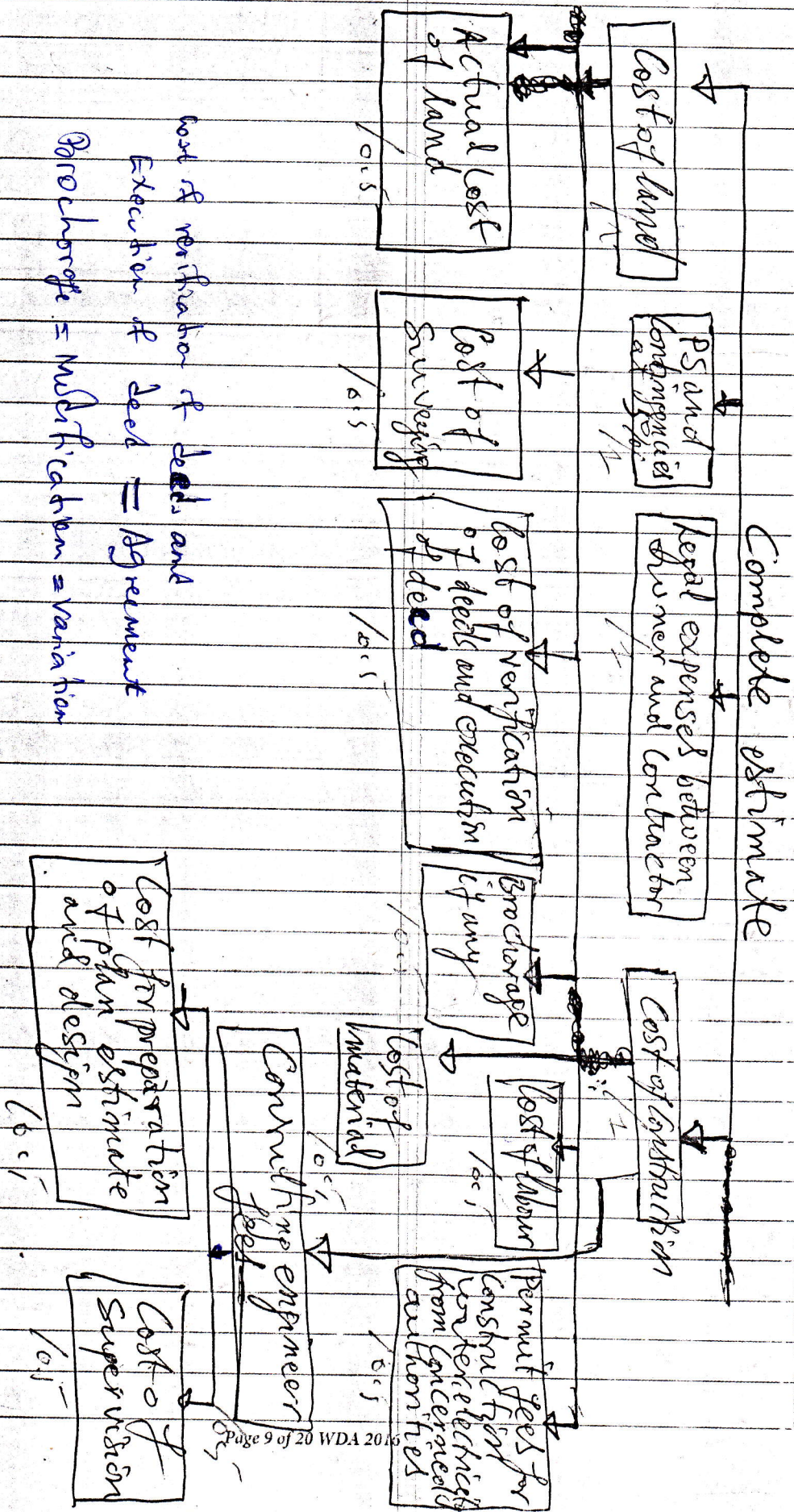
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- Detailed specifications showing all requirements of all different of work item of work
- Type of project
- Overheads and profits
- Direct cost
- Indirect cost
- Fluctuation of price on market
- Location of project
- Time consideration
- Availability of material
- Market condition
- Availability of labour
- Transportation
- Types of client
- Types of consultant
- Types of tendering
- Total height of building
- Reg. legislation

Ans. The two are enough  
5 marks for each



Q.25.



Cost of verification of deeds and Execution of deed = Agreement  
 Prochorage = Modification = Variation

20 marks

Q16 Complete the table below:

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S/N	Particular items	Unit of measurement
1	Earth work	Cu-m or $m^3$
2	Concrete	Cu-m or $m^3$
3	Damp proof course (D.P.C)	<del>Cu-m</del> Sqm or $m^2$
4	Brickwork	Cu-m or $m^3$
5	Stone work	Cu-m or $m^3$
6	Plastering	Sqm or $m^2$
7	Flooring	Sqm or $m^2$
8	Hand railing	L-m or R-m
9	Rain water pipe	L-m or R-m
10	Glass panels	Sqm or $m^2$

One mark for each

Q17. Ten different types of overhead cost:

- a) Establishment charges
- b) Travelling expenses
- c) Telephone
- d) Rent and taxes
- e) Supervision
- f) Handling of materials (loading & unloading)
- g) Amounts of labour
- h) Workman compensation (insurance)
- i) Interest on investment
- j) Repair, carriage and depreciation of tools
- k) Postage and plant
- l) Transport
- m) Internet
- n) Fax, permanent staff.

Any ten are enough one mark for each

Q18.

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$$\text{Cost of building floor area} = 1600 \text{ m}^2 \times 240000 \text{ fmw/m}^2 \\ = 384000000 \text{ fmw}$$

$$\text{Cost of architectural work} = 384000000 \text{ fmw} \times \frac{1.5}{100} \\ = 5760000 \text{ fmw}$$

$$\text{Cost for electricity installation water supply and sanitary installation} = 384000000 \times \frac{16}{100} \\ = 61440000 \text{ fmw}$$

$$\text{Cost for other services} = 384000000 \times \frac{8}{100} = 30720000 \text{ fmw}$$

$$\text{Sub-Total} = 481920000 \text{ fmw}$$

Cost of contingencies and supervision charges

$$= 481920000 \times \frac{10}{100} = 48192000 \text{ fmw}$$

$$\text{Total} = 481920000 \text{ fmw} + 48192000 \text{ fmw} \\ = 530112000 \text{ fmw}$$

marks

Q.18. Center to center method

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S/N	Description of Items	No	L (m)	B (m)	H (m)	Quantities (m <sup>3</sup> )	explanatory note
1.	lime concrete in foundation	1	20.4 0.5	0.8 0.5	0.2 0.5	3.264 m <sup>3</sup> / 2 0.5	$L_1 = 5.6 * 2 = 11.2$ $L_2 = 4.6 * 2 = 9.2$ $T.L = 11.2 + 9.2 = 20.4m$
2.	Masonry first class brick work in lime mortar						
	1 <sup>st</sup> footing	1	20.4 0.5	0.8 0.5	0.2 0.5	2.448 m <sup>3</sup> / 2 0.5	
	2 <sup>nd</sup> footing	1	20.4	0.5	0.1	1.02 m <sup>3</sup> / 2	
	wall	1	20.4	0.4	2.2	17.952 m <sup>3</sup> / 2	
	<b>Total</b>					<b>21.42 m<sup>3</sup></b>	
3	Flooring over 7.5cm lime concrete	1	5.2	4.2	-	21.84 m <sup>2</sup> / 2	
	Flooring over wall	1	20.4	0.4	-	8.16 m <sup>2</sup> / 2	
	<b>Total</b>					<b>30 m<sup>2</sup></b>	
4	wall finishing (plastering)	1	22	-	2.1	46.2 m <sup>2</sup> / 2	

Format table / 1

*[Signature]*

# Long wall and short wall method

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S/N	Particular Item	N <sup>o</sup>	L	B	H	Quantities	Explanatory notes
1.	Foundation - lime concrete						
	- long wall	2	6.8	0.8	0.2	2.176 m <sup>3</sup>	L = 6 + 0.8 = 6.8 m
	- short wall	2	3.4	0.8	0.2	1.088 m <sup>3</sup>	L = 4.2 - 0.8 = 3.4 m
						3.264 m <sup>3</sup>	
2.	Masonry 1st class brickworks in lime mortar						
	1st footing						
	- long wall	2	6.6	0.6	0.2	1.584 m <sup>3</sup>	L = 6 + 0.6
	- short wall	2	3.6	0.6	0.2	0.864 m <sup>3</sup>	L = 4.2 - 0.6
	2nd footing						
	- long wall	2	6.5	0.5	0.2	0.65 m <sup>3</sup>	L = 6 + 0.5
	- short wall	2	3.7	0.5	0.2	0.37 m <sup>3</sup>	L = 4.2 - 0.5
	wall below G.L						
	- long wall	2	6.4	0.4	0.2	1.024 m <sup>3</sup>	L = 6 + 0.4
	- short wall	2	3.8	0.4	0.2	0.608 m <sup>3</sup>	L = 4.2 - 0.4
	wall above G.L						
	- long wall	2	6.4	0.4	2	10.24 m <sup>3</sup>	1/2
	- short wall	2	3.8	0.4	2	6.08 m <sup>3</sup>	1/2
	Total					21.42 m <sup>3</sup>	
3.	Wall finishing (Plastering)						
	Flooring over 7.5 cm lime mortar	1	5.2	4.2	-	21.84 m <sup>2</sup>	1/2
	Flooring over wall on top	1	20.4	0.4	-	8.16 m <sup>2</sup>	1/2
4.	wall finishing Plastering	1	2.2	-	2.1	46.2 m <sup>2</sup>	1/2

Format / 2

/ s. malik

Q20

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S/N	Particular Item	No	L	B	H	Quantities
1.	Earthwork in excavation	1	3.2	1.10	0.15	0.528 m <sup>3</sup>
2.	Concrete in foundation	1	3.2	1.10	0.10	0.352 m <sup>3</sup>
3.	Brickwork					
	1st step	1	3.0	1	0.23	0.69 m <sup>3</sup>
	2nd step	1	2.5	0.75	0.18	0.3375 m <sup>3</sup>
	3rd step	1	2.0	0.5	0.18	0.18 m <sup>3</sup>
	4th step	1	1.5	0.25	0.18	0.0675 m <sup>3</sup>
	Total					1.275 m <sup>3</sup>
4.	2.5 cm cr 1/2 m surface finish					
	1st step					
	Tread: FAS	1	4.0	0.25	-	1.125 m <sup>2</sup> / 0.5
	Rise: FAS	1	5	-	0.18	0.9 m <sup>2</sup> / 0.5
	2nd step					
	Tread: FAS	1	3.5	0.25	-	0.875 m <sup>2</sup> / 0.5
	Rise: FAS	1	4	-	0.18	0.720 m <sup>2</sup> / 0.5
	3rd step					
	Tread: FAS	1	2.5	0.25	-	0.625 m <sup>2</sup> / 0.5
	Rise: FAS	1	3	-	0.18	0.540 m <sup>2</sup> / 0.5
	4th step					
	Tread: FAS	1	1.5	0.25	-	0.375 m <sup>2</sup> / 0.5
	Rise: FAS	1	2	-	0.18	0.36 m <sup>2</sup> / 0.5
	Plinth	1	1.5	-	0.8	0.270 m <sup>2</sup> / 1
	Total					5.750 m <sup>2</sup>

S/N	Description of	No.	L	B	H	Q	Explanation
5	2.5m nosing						
	1 <sup>st</sup> step: FxS	1	5	-	-	5m / 1	
	2 <sup>nd</sup> step: FxS	1	4	-	-	4m / 1	
	3 <sup>rd</sup> step: FxS	1	3	-	-	3m / 1	
	4 <sup>th</sup> step: FxS	1	2	-	-	2m / 1	
	Total					14m	

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H. S. M. K.

Q. 1. Center to center method

$$\text{Center line length for long wall} = 4m + 6m + 0.3m + 0.15m + 0.15m = 10.6m$$

$$\text{Center line length for short wall} = 6m + 0.15m + 0.15m = 6.3m$$

$$\text{Total center length of wall} =$$

$$(10.6 \times 2) + (6.3 \times 2) = 20.1m$$

# Center to center method

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S/N	Particular Item	N <sup>o</sup>	L	B	H	Quantities	Explanatory notes
1	Earthwork in excavation	1	0.15 39	0.25 1.1	0.21 1	42.9 m <sup>3</sup>	L = 40.1 - 2 * 0.5 = 39
2	Rime concrete	1	39	1.1	0.3	12.87 m <sup>3</sup>	same as above
3	1st class brickwork in cement mortar in foundat <sup>n</sup> & plinth						L = 40.1 - 2 * 0.4 = 39.3
	1st footing	1	39.3	0.8	0.2	6.288 m <sup>3</sup>	L = 40.1 - 2 * 0.4 = 39.3 m
	2nd footing	1	39.4	0.7	0.1	2.758 m <sup>3</sup>	L = 40.1 - 2 * 0.35 = 39.4 m
	3rd footing	1	39.5	0.6	0.1	2.37 m <sup>3</sup>	L = 40.1 - 2 * 0.3 = 39.5 m
	4th footing	1	39.6	0.5	0.1	1.98 m <sup>3</sup>	L = 40.1 - 2 * 0.25 = 39.6 m
	Plinth wall above footing	1	39.7	0.4	0.8	12.704 m <sup>3</sup>	L = 40.1 - 2 * 0.2 = 39.7 m
4	Damp proof course	1	39.7	0.4	-	15.884 m <sup>2</sup>	Same as plinth wall
	Deduct sill	2	1.2	0.4	-	0.96 m <sup>2</sup>	
	Net total					14.92 m <sup>2</sup>	
5	1st class brick work in 1:6 cement mortar in superstructure	1	39.8	0.3	2.1	50.148 m <sup>3</sup>	L = 40.1 - 2 * 0.15 = 39.8 m
	<u>Deduct</u>						
	Door opening	2	1.2	0.3	2.1	1.512 m <sup>3</sup>	/0.1
	Window	4	1	0.3	1.5	1.8 m <sup>3</sup>	/0.1
	Shelves	2	1	0.2	1.5	0.6 m <sup>3</sup>	25 cm back of shelves
	Lintel over window	4	1.3	0.3	0.25	0.3588 m <sup>3</sup>	25 cm bearing
	Lintel over door	2	1.5	0.3	0.15	0.135 m <sup>3</sup>	25 cm bearing
	shelves	2	1.3	0.3			25 cm bearing
	Total deduction					4.5228 m <sup>3</sup>	



# DRAFT

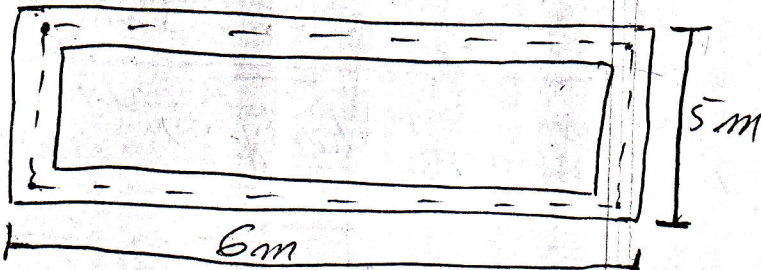
Net total =  $50.148 - 4.5228 = 45.625 m^3$   
 Format / 1

Req. other way for long and shorty wall

S/N	Description of item	No	L	B	H	Quantity	Explanatory notes
1	Foundation - lime concrete					$1.82 m^3$	/ 1
	- long wall	2	6	0.8	0.2	$1.344 m^3$	/ 1
	- short wall	2	4.2	0.8	0.2	$3.264 m^3$	
2	Brick work 1st class						
	- long wall:						
	1st footing	2	6	0.6	0.2	$1.44 m^3$	/ 10
	2nd footing	2	6	0.5	0.1	$0.6 m^3$	/ 10
	wall	2	6	0.4	2.2	$10.56 m^3$	/ 10
	- short wall:						
	1st footing	2	4.2	0.6	0.2	$1.008 m^3$	/ 10
	2nd footing	2	4.2	0.5	0.1	$0.42 m^3$	/ 10
wall	2	4.2	0.4	2.2	$7.392 m^3$	/ 10	
	Net total					$21.42 m^3$	
3	Flooring	1	6	5	-	$30 m^2$	/ 1
4	wall finish						
	- long wall	2	6	-	2	$24 m^2$	/ 1
	- short wall	2	5	-	2	$20 m^2$	/ 1
	Total					$44 m^2$	

/ remarks

As other method **DRAFT**



Long and short wall method (into-in and out to out)  
 center to center length of long wall =  $6 - \frac{0.4 \times 2}{2} = 5.6m$   
 center to center length of short wall =  $5 - \frac{0.4 \times 2}{2} = 4.6m$

S/N	Description of Item	No	L	B	H	Quantities	Explanatory
a.	Foundation - lime concrete						
	- Long wall	2	6.4	0.80	0.2	2.048 m <sup>3</sup> / 1	$L = 5.6 + \frac{0.8}{2} \times 2 = 6.4m$
	- Short wall	2	3.8	0.80	0.2	1.216 m <sup>3</sup> / 1	$L = 4.6 - \frac{0.8}{2} \times 2 = 3.8m$
	<b>Total</b>					<b>3.264 m<sup>3</sup></b>	
b.	Brickwork 1 <sup>st</sup> class in lime mortar						
	1 <sup>st</sup> footing						
	- Long wall	2	6.2	0.60	0.20	1.488 m <sup>3</sup> / 1	$L = 5.6 + 0.6$
	- Short wall	2	4.0	0.60	0.20	0.36 m <sup>3</sup> / 1	$L = 4.6 - 0.6$
	2 <sup>nd</sup> footing						
	- Long wall	2	6.1	0.50	0.10	0.610 m <sup>3</sup> / 1	
	- Short wall	2	4.1	0.50	0.10	0.410 m <sup>3</sup> / 1	
wall below G/L							
- Long wall	2	6.0	0.4	0.10	0.960 m <sup>3</sup> / 1	$L = 5.6 + 0.4$	
- Short wall	2	4.2	0.4	0.20	0.672 m <sup>3</sup> / 1	$L = 4.6 - 0.4$	
						<b>21.42 m<sup>3</sup></b>	
c.	Flooring 2.5cm cc over 7.5cm L.C	1	5.2	4.2	-	21.84 m <sup>2</sup> / 1	

# DRAFT

S/N	Description of Item	No	L	B	H	Quantities	Explanatory notes
	* 2.5cm CC over wall only						
	- Long wall	2	6	0.4	-	4.8 m <sup>2</sup> / 1	L = 5.6 + 0.4
	- Short wall	2	4.2	0.40	-	3.36 m <sup>2</sup> / 1	L = 4.6 - 0.4
						8.16 m <sup>2</sup>	
d	wall finish - outside 12mm Cement plastered in 1:6						
	- long wall	2	6	-	2 or 2.1	24 or 25.2 / 1	
	- short wall	2	5	-	2 or 2.1	20 or 21 / 1	
	Total					44 or 46.2	$\begin{array}{r} 40 \\ 1 \\ 0.3 \\ \hline 35.8 \end{array}$
							Remarks