



# UNIVERSITY OF RUHUNA

## Faculty of Engineering

End-Semester 3 Examination in Engineering: August 2018

Module Number: CE3301

Module Name: Building Planning and Cost Estimating

[Three Hours]

[Answer all questions]

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[You may refer separately provided City of Colombo Development Plan when answering for Q1 and Q2]

Q1.

- a) Figure Q1 is the plan of a proposed land sub-division prepared to get approval based on the City of Colombo Development Plan. You are required to check the following aspects related to the given plan to consider for the approval. Your answer should consist with the appropriate regulations to each of the requirement.
- i Frontage and depth of lands
  - ii Minimum Land area
  - iii Access roads' lengths and widths
  - iv Turning circle and other requirements

[8.0 Marks]

- b) Other than the plan in Figure Q1, what are the other necessary documents to get the approval from the relevant local authority?

[2.0 Marks]

Q2.

- a) Explain the following in relation with the building regulations provided in the City of Colombo Development Plan.
- i Usable land area for residential building construction
  - ii Clearance from electric lines
  - iii Minimum area of rooms in residential building

[6.0 Marks]

- b) What are the occasions where a qualified person engaged in supervising building construction should submit progress reports to the relevant local authority?

[2.0 Marks]

- c) What is meant by Certificate of conformity for occupation?

[2.0 Marks]

Q3.

- a) Explain the occasions where open tendering and selective tendering can be used to select a contractor for a civil engineering project.

[2.0 Marks]

- b) What are the factors that should be considered during tender evaluation stage for selecting a suitable contractor for a construction project?

[2.0 Marks]

- c) Calculate following requirements based on the information provided in Figures 3(a) and 3(b).
- i Calculate centerline dimensions
  - ii Take-off quantities of excavation work in foundation
  - iii Take-off quantities of plinth plaster
  - iv Take-off quantities of DPC

[11.0 Marks]

Q4.

- a) Explain the information necessary for deriving unit rates to use in a Bill of Quantities.

[2.0 Marks]

- b) Give two examples for each of followings.

- i General Overheads
- ii Job (Site) overheads

[2.0 Marks]

- c) Calculate the unit rates for the following work norms. You may use the price data given in the Table Q4.

- i Excavation in trenches for walls/column pits in ordinary soil from 0' 0" to 5' 0" deep  
Per cube  
2 ¼ days U/Sk labours

- ii Back filling to trenches with imported material  
Per cube  
1.0 cube earth delivered at site  
Allow 15% compaction  
Filling and Compaction  
1 ¼ days U/Sk labours

- iii Random Rubble masonry in cement mortar 1:8 in foundation  
Per cube  
Materials  
1.30 cubes rubble  
5.00 cwt cement (50 kg bags)  
0.3 cubes sand  
Water (100 gals)

- Labour  
4 day skilled labours  
6 days U/Sk labours

[6.0 Marks]

- d) Proposed retaining wall detail to protect a sloping land is shown in Figure Q4. Soil arise from excavation is not suitable for earth filling and hence soil are to be imported. Length of the proposed retaining wall is 9 m. For convenience consider 1.35 m as the average depth of excavation. You are required to find the total cost for this proposed retaining wall. Determine following data to identify the total cost for the retaining wall.

- i Excavation work in m<sup>3</sup>
- ii Rubble work in m<sup>3</sup>
- iii Earth filling in m<sup>3</sup>
- iv Calculate the total cost of the retaining wall. You may use the answers from above part (c).

[5 Marks]

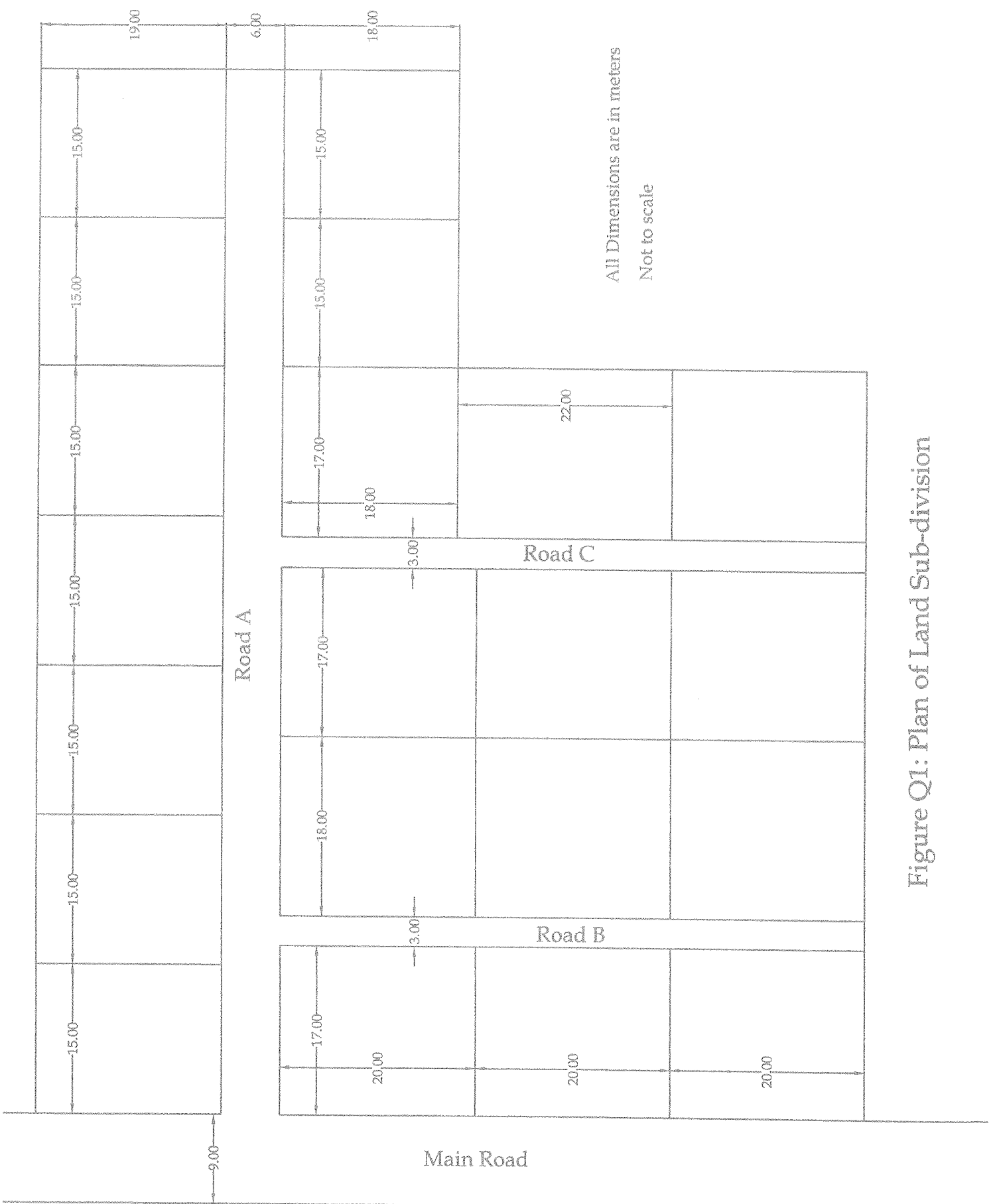
Q5.

- a) Write a short description on each of following topics related to price adjustments for civil engineering contracts.
  - i Non-adjustable elements
  - ii Input percentages
  - iii Indices

[3.0 Marks]

- b) Data sheet 1 in pages 8 and 9 shows a part of a BOQ prepared for a proposed shopping complex for ABC (Pvt) Company. The total contract sum of the project is Rs. 138,520,650.00. Bid submission for this project was ended on 15<sup>th</sup> February, 2017. Project was started on 15<sup>th</sup> May, 2017. Contractor put his first claim for the activities given in the BOQ under categories A and B on 15<sup>th</sup> June, 2017. By this date, contractor's material storage is having materials worth of Rs. 125,000.00. Contractor put the second claim on 10<sup>th</sup> August, 2017 for the activities in categories C and D. By this date, store keeper's records contain material storage of Rs 180,000.00 Calculate the price adjustment for the second claim. Input percentages and price indices for the price adjustment are shown in Table Q5.

[7.0 Marks]



All Dimensions are in meters  
Not to scale

Figure Q1: Plan of Land Sub-division

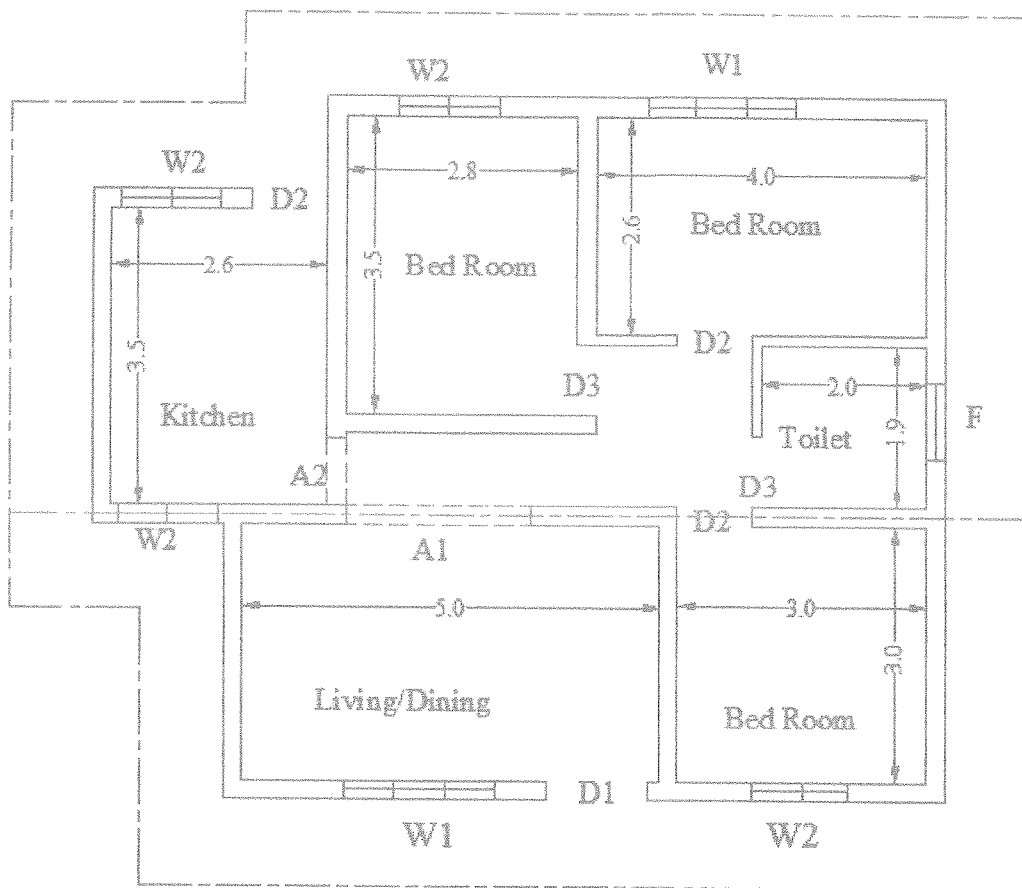
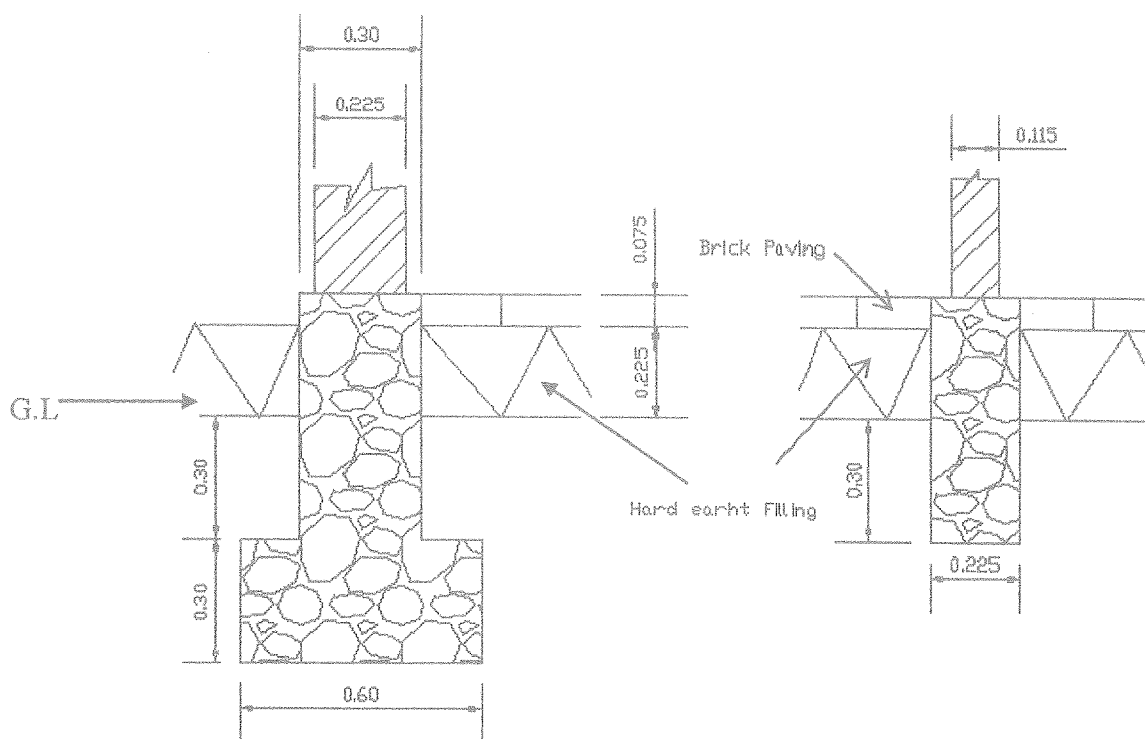


Figure Q3 (a): Floor Plan

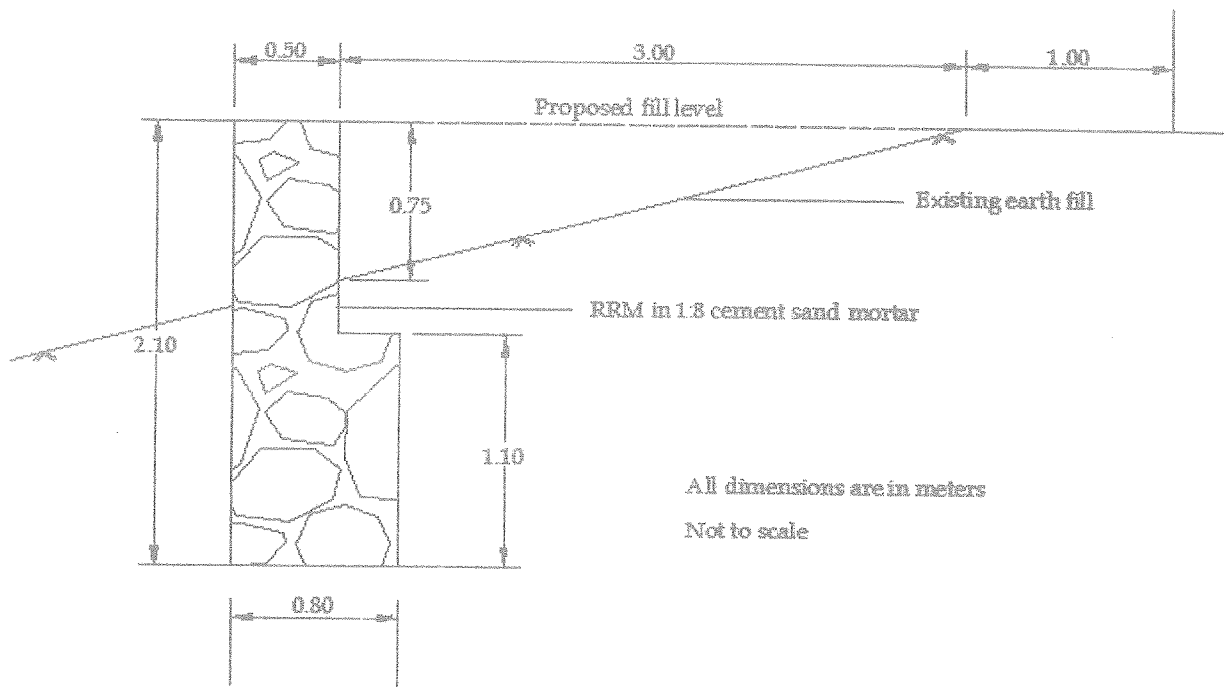


All dimensions are in meters  
Not to scale

Figure Q3 (b): Foundation Details

**Table Q4: Cost Data for Unit Rate Analysis (transport included)**

Resource	Price (Rs.)
Imported soil 1 cube	3500.00
Cement bag (50 kg)	920.00
Sand 1 cube	9500.00
Rubble 1 cube	5000.00
Water	Free of charge
Mason 8 hour day	1200.00
Unskilled labour 8 hour day	1000.00



**Figure Q4: Foundation details for Proposed Retaining wall**

Table Q5: Input Percentages and Price Indices

Input	Input %	Price indices in 2017							
		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug
Cement	12.82	525.3	525.3	515.5	490.8	490.8	490.8	490.8	491.2
Rubble	3.76	639.6	639.6	639.6	639.6	647.6	647.6	647.6	647.6
Metal	1.79	361.9	361.9	361.9	361.9	363.3	363.3	363.3	365.0
Sand	6.20	2371.7	2470.2	2478.1	2478.1	2537.2	2537.2	2537.2	2537.2
Brick	9.56	416.2	421.2	421.2	421.2	421.2	421.2	428.0	430.0
R/f steel	4.26	558.0	558.0	558.0	558.0	558.0	558.0	558.0	558.0
Asbestos roof	4.98	460.3	461.5	461.5	460.3	462.8	462.8	463.0	465.0
PVC pipe	2.00	778.0	778.0	778.0	778.0	778.0	778.0	778.0	778.0
Wall paint	3.34	661.5	661.5	661.5	661.5	665.5	665.5	660.0	662.0
Floor tile	2.05	231.7	231.7	233.2	233.2	233.2	235.4	235.4	235.4
Wall tile	1.35	944.8	944.8	945.1	945.1	945.1	947.2	947.2	946.1
Electrical fittings	3.43	212.3	212.3	214.4	214.4	214.4	214.4	214.4	215.0
Skilled Labour	18.57	445.9	462.9	481.7	481.7	481.7	486.4	486.4	488.1
Unskilled labour	15.88	494.6	513.9	542.8	542.8	542.8	550.0	550.0	551.2

ICTAD Price Fluctuation Formulas

$$F = \frac{0.966(V-V_{na})}{100} * \sum \frac{P_x(I_{xc}-I_{xb})}{I_{xb}} \quad \text{for contracts exceeding Rs. 10 million}$$

All the parameters are with their usual notations.

**Data Sheet 1**  
**Construction of shopping complex for ABC (Pvt) Company**  
**BILL OF QUANTITIES**

Item	Description	Qty	Unit	Rate	Amount
	<b><u>A-Preliminaries</u></b>				
A1	Providing accommodation for workers		Item	Pro. Sum	100,000.00
A2	Construction and maintenance of site office for contractor		Item	Pro. Sum	35,000.00
A3	Construction and maintenance of site office for Engineer		Item	Pro. Sum	35,000.00
A4	Allow sanitary facilitate for workers and staff		Item	Pro. Sum	30,000.00
A5	Provide construction management services	12	months	25,000.00	300,000.00
A6	Allow for temporary electricity facility to site		Item	35,000.00	35,000.00
	Total carried to summary				535,000.00
	<b><u>B-Excavation and Earth Work</u></b>				
B1	Site clearing and preparation of the site including removal of top soil up to a depth of 150mm for the entire site area	1990	m <sup>2</sup>	100.00	199,000.00
B2	Excavate trenches to receive foundations commencing at foundation level, maximum depth not exceed 1.5m.	601	m <sup>3</sup>	1,500.00	901,500.00
B3	Filling to excavations with materials arising from the excavations deposited and compacted in 150mm thick layers.	908	m <sup>3</sup>	827.00	750,916.00
B4	Removal of surplus excavated materials as directed.	526	m <sup>3</sup>	250.00	131,500.00
B5	Approved hard earth filling under floors well rammed and consolidated in layers not exceeding 150mm.	172	m <sup>3</sup>	827.00	142,244.00
	Total carried to summary				2,125,160.00
	<b><u>C-Concrete Work</u></b>				
C1	Reinforced concrete 1:2:4 (20mm) in raft foundations poured into trenches against faces of excavation.	574	m <sup>3</sup>	15,606.00	8,957,844.00
C2	Reinforced concrete 1:2:4 (20mm) in slabs	2199	m <sup>3</sup>	15,606.00	34,317,594.00
C3	Reinforced concrete 1:2:4 (20mm) in columns.	32	m <sup>3</sup>	16,670.00	533,440.00
C4	Reinforced concrete 1:2:4 (20mm) in beams	144	m <sup>3</sup>	16,670.00	2,400,480.00
C5	High yield steel reinforcement	12500	kg	200.00	2,500,000.00
	Total carried to summary				43,275,438.00



<u>D-Masonry Work</u>					
D1	Random rubble masonry in foundation in cement and sand mortar 1:8 mix up to D.P.C.level.	6	m <sup>3</sup>	3,980.00	23,880.00
D2	230mm brick walls in 1:5 cement sand mortar, flush pointed on both side.	451	m <sup>2</sup>	2,100.00	947,100.00
D3	115mm brick walls in 1:5 cement sand mortar, flush pointed on both side.	178	m <sup>2</sup>	1,100.00	195,800.00
D4	100mm block work in 1:5 cement sand mortar flush pointed on both sides	13	m <sup>2</sup>	1,398.00	18,174.00
D5	Cement and sand 1:3 mix in 15mm thick Damp Proof Course laid over foundation walls including applying two coats of hot bitumen and fine sand	2.4	m <sup>2</sup>	2,300.00	5,520.00
	Total carried to summary				<b>1,190,474.00</b>
<u>E-Finishes</u>					
E1	15mm thick 1:1:5 cement lime sand external plaster	485	m <sup>2</sup>	500.00	242,500.00
E2	15mm thick 2:5 lime sand plaster in two coats finished smooth with lime putty to internal walls	415	m <sup>2</sup>	500.00	207,500.00
E3	Supply and application of two coats of emulsion paint for slab soffit	750	m <sup>2</sup>	750.00	562,500.00
E4	Painting for external walls	485	m <sup>2</sup>	500.00	242,500.00
E5	Painting for internal walls	415	m <sup>2</sup>	500.00	207,500.00
	Total carried to summary				<b>1,462,500.00</b>
<u>F-Roof work</u>					
F1	Zink Aluminium Sheet	349	m <sup>2</sup>	2,145.00	748,605.00
F2	Roof Truss	1966	m	1,424.00	2,799,584.00
F3	GI pipes	497	m	1,424.00	707,728.00
F6	Zink Aluminium valance board	8.8	m <sup>2</sup>	1,400.00	12,320.00
	Total carried to summary				<b>4,268,237.00</b>