UNIVERSITY OF RUHUNA

Faculty of Engineering

End-Semester 3 Examination in Engineering: August 2015

Module Number: CE3301   **Module Name: Building Planning and Cost Estimating**

[Three Hours]

[Answer **all questions**]

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

Q1. One of your neighbours, Mr. PRS Zoyza is planning to construct a two-storey house on a land he owns. Land area is 18 perch with the frontage of 20 m and is facing a 4.5 m wide local road within the Colombo city area. He has two daughters and a son and all are school children whose ages are 13, 15 and 17 years. Mr. Zoyza has one vehicle and a driver. Mr. Zoyza's plan is to keep the driver stay with him in their new house. His wife is un-employed and used to do gardening during her leisure time. Mr. Zoyza requested you to assist him to prepare a draft house plan. Further he is not aware of building regulations and its usage. As a part of this work carry out following.

a) What are the basic features that you need to discuss with Mr. Zoyza?

[2.0 Marks]

b) Mr. Zoyza's intention is to use the available land as much as possible for his house construction. How do you advise to him regarding the restriction of using the whole land for construction?

[2.0 Marks]

c) List down the activity spaces based on the above description.

[1.0 Mark]

d) Prepare the bubble diagram for the activity spaces listed in part (c).

[1.0 Mark]

e) Prepare a neat sketch of the proposed ground floor.

[4.0 Marks]

Q2. Explain the following related to the regulations specified by the City of Colombo Development Plan. Give the relevant regulation number(s) for each answer.

a) Particulars to be submitted to get an approval for construction of a building.

[2.0 Marks]

b) Particulars to be on a floor plan.

[2.0 Marks]

c) Clearance from electric lines.

[2.0 Marks]

d) Open spaces to be provided for a two-storey domestic house.

[2.0 Marks]

e) Preliminary Planning Clearance.

[2.0 Marks]

Q3.
a) Explain the following terms used in a Bill Of Quantities.
  i Description
  ii Quantity
  iii Unit
  iv Rate

[2.0 Marks]

b) What is the difference between open tendering and selective tendering?

[2.0 Marks]

c) Carry out following calculations based on the information provided in Figures Q3 (a) to Q3 (d). Any assumptions you made should be clearly stated.
  i Centerline dimensions.
  ii Take-off quantities of site clearing
  iii Take-off quantities of excavation for foundation
  iv Take-off quantities of plinth plaster
  v Take-off quantities of DPC

[11.0 Marks]

Q4. The owner of a house situated near an earth slope sought advice from a geotechnical engineer regarding the safety of the house. The engineer advised him to construct a retaining wall and fill the area as shown in Figure Q4 to safeguard the foundation of the house from soil erosion. Excavated soil can be used for earth filling and if that quantity is not sufficient soil has to be purchased. Length of the proposed retaining wall is 8 m. For convenience consider 1.75 m as the average depth of excavation. You are required to prepare a BOQ for this retaining wall construction. Use the Data Sheet 1 in page 7.

a) Calculate the quantities of
  i Excavation work in m^3
  ii Concrete work in m^3
  iii Rubble work in m^3
  iv Earth filling in m^3

[6.0 Marks]

b) Calculate the material requirements for
  i 1 m^3 of 1:3:6 (20) concrete
  ii 1 m^3 of rubble work

[3.0 Marks]

c) Calculate the rates for
  i 1 m^3 of excavation
  ii 1 m^3 of concrete work
  iii 1 m^3 of rubble work
  iv 1 m^3 of earth filling

[4.0 Marks]

d) Calculate the total cost for the retaining wall construction assuming a 25 % profit margin.

[2.0 Marks]

Q5.

a) Explain the importance of price adjustments in civil engineering contracts.

[1.0 Mark]

b) What is meant by non-adjustable elements in a BOQ in the context of price adjustments?

[1.0 Mark]

c) What are the three main categories of elements which can be considered as non-adjustable elements giving an example for each category?

[3.0 Marks]

d) Data sheet 2 in page 9 shows a part of a BOQ. General contract data and the money for work done for a period of two months from the start of the project are shown in Table Q5. During this two months' time period activities under categories A and B were completed. Other than the activities listed in the BOQ there were some extra works that the contractor had to complete. Contractor may submit a claim to the client for the work done during first two months. Calculate the price adjustment for this claim.
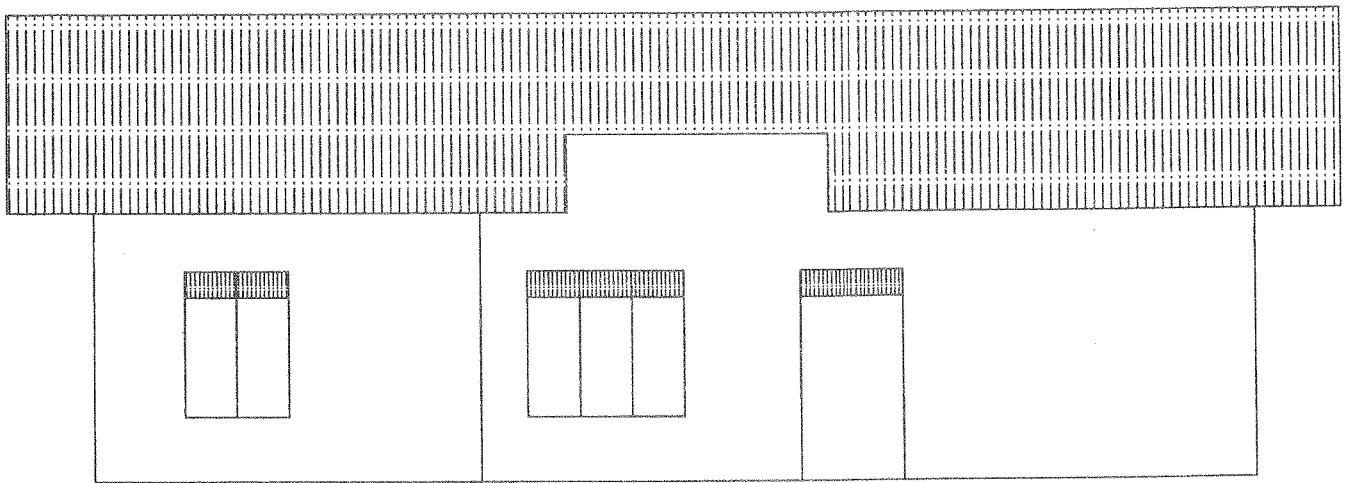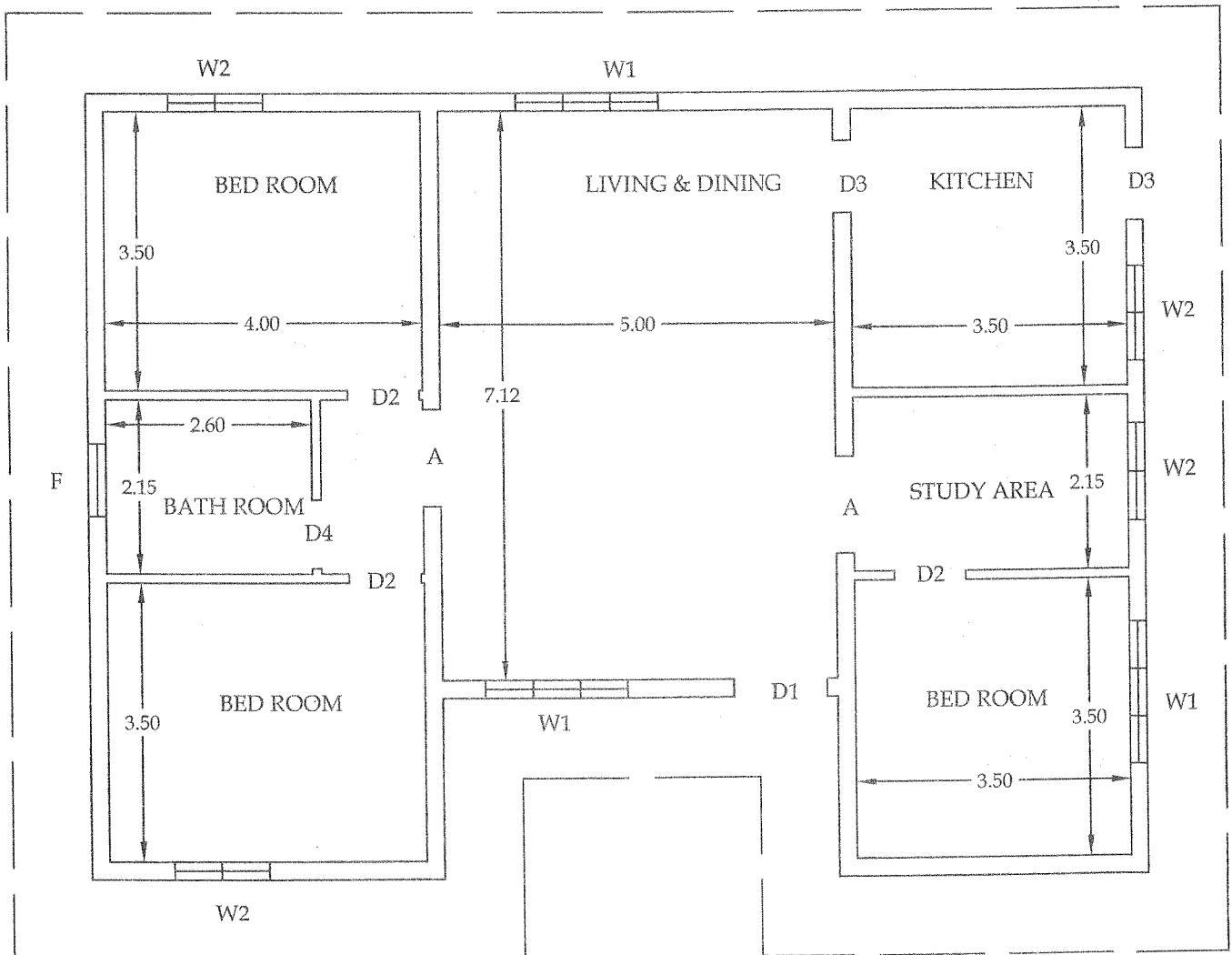
[5.0 Marks]

Figure Q3(a):Front Elevation

All Dimensions are in meters
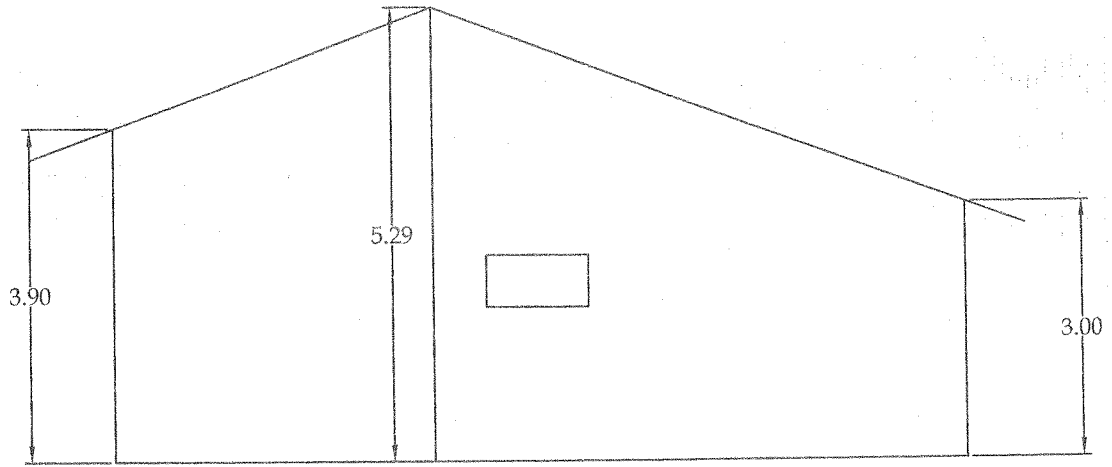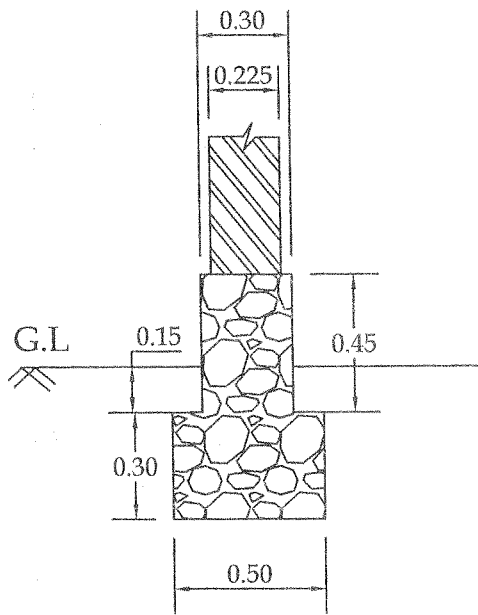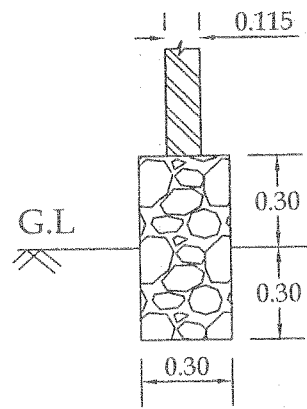Not to scale

Figure Q3 (b): Floor Plan

Figure Q3 (c): Side Elevation

225mm Wall foundation

115mm Wall foundation

Figure Q3 (d): Foundation Details

All Dimentions are in meters

House
Boundary

0.50   3.00   1.00

Proposed fill level

0.75

Existing earth fill

RRM in 1:8 cement sand mortar

2.10

1.10

0.80

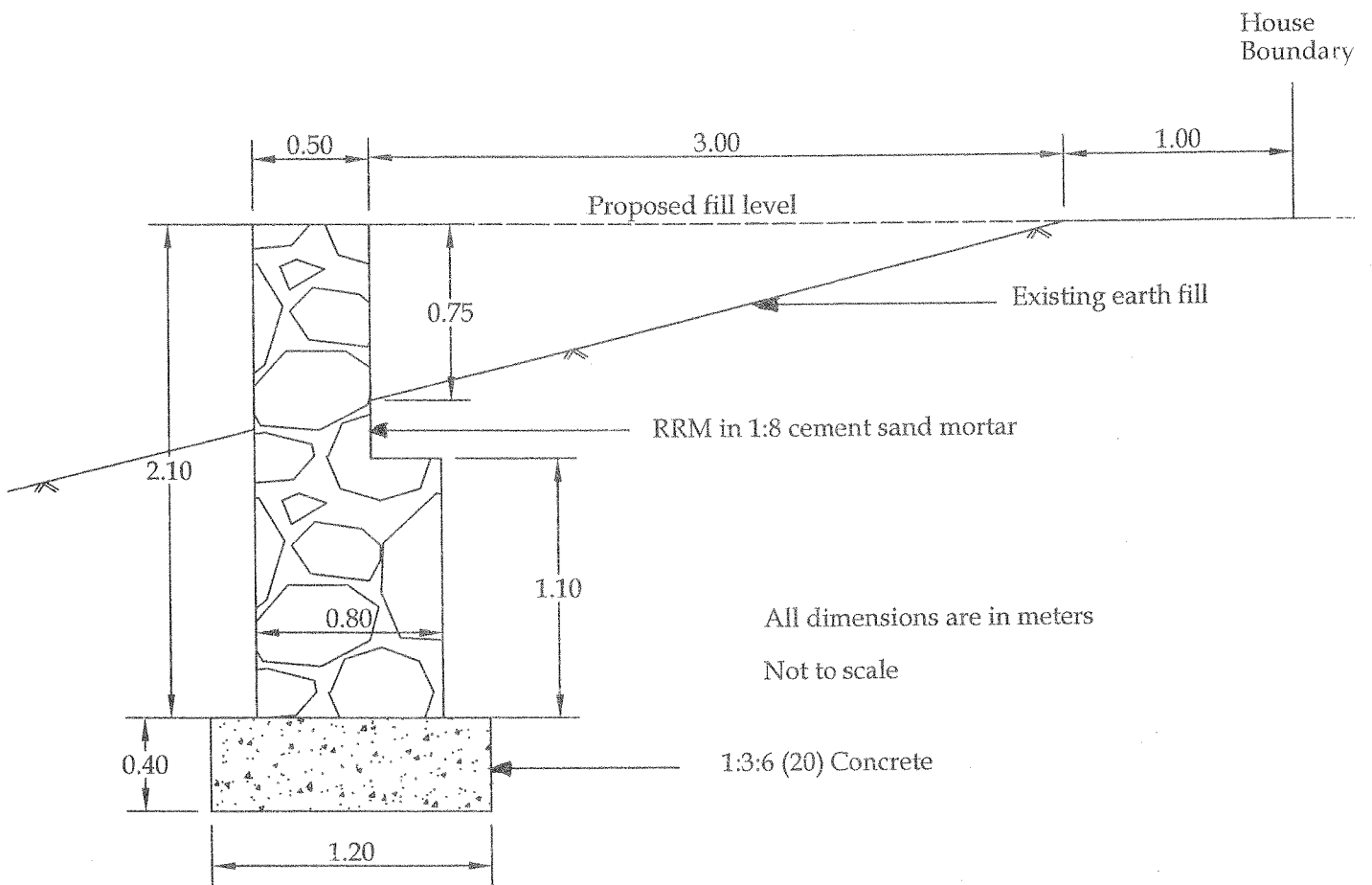All dimensions are in meters

Not to scale

1:3:6 (20) Concrete

0.40

1.20

Figure Q4: Foundation Details for the Proposed Retaining Wall

DATA

Cement Specific gravity =3.15
Bulk density in bag form =1442 kg/m^3
Weight of a bag of cement =50 kg

Sand Specific gravity =2.66
Bulk density =1600 kg/m^3

Metal Specific gravity =2.8
Bulk density =1440 kg/m^3

Water Density =1000 kg/m^3
W/C ratio (concrete) =0.55
W/C ratio (mortar) =0.6

Rubble Porosity =0.35

Waste 10% for all the material unless otherwise specified.

Labour requirement for 1:3:6(20) concrete per 1m^3

Mason =0.5 days
Unskilled labour =2 days

Labour requirement for excavation work per 1 m^3
Unskilled labour = 1 day

Labour requirement for Random Rubble masonry per 1 m^3

Mason = 0.5 days
Unskilled labour =1 day

Labour requirement for earth filling per 1 m^3
Unskilled labour =0.25 days

Cost data (transport included)
20mm metal 1m^3 = Rs. 2500.00
Cement bag (50 kg) = Rs. 870.00
Sand 1m^3 = Rs. 4200.00
Rubble 1 m3 =Rs. 3100.00
Soil 1 m^3 = Rs. 450.00
Water Free
Mason 8 hour day =Rs 1200.00
Unskilled labour 8 hour day =Rs 950.00

Table Q5: Data for Price Adjustment

Contract Data	
Total Contract Sum	Rs. 9,425,650.00
Date of Closing Bids	01- March- 2015
Date of commencement of work	02-May-2015
Claim No. 1	
Date of submission	01-July-2014
Value of certified work done (Cumulative)	Rs.1,070,685.00
Value of Extra work for claim 1	Rs. 75,000.00
Total Cost of materials at site up to this claim	Rs. 85,000.00

Assume that Indices for Average industrial building are as follows

January, 2015:-   375.9
February, 2015:-   376.5
March, 2015:-   379.3
April, 2015:-   387.1
May, 2015:-   391.3
June, 2015:-   402.0
July, 2015:-   410.5

ICTAD Price Fluctuation Formulas

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

$$F = 0.869(V - V_{na}) * \frac{I_{tc}-I_{tb}}{I_{tb}} \quad \text{for contracts not exceeding Rs. 10 million}$$

All the parameters are with their usual notations.

Item	Description	Qty	Unit	Rate	Amount
	Construction of shopping complex for ABC (Pvt) Company				
	BILL OF QUANTITIES				
	A-Preliminaries				
A1	Providing an advance payment		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
	Total carried to summary (page ....)				**200,000.00**
	B-Excavation and Earth Work				
B1	Site clearing and preparation of the site including removal of top soil up to a depth of 150mm for the entire site area	300	m^2	450	135,000.00
B2	Excavate trenches to receive foundations commencing at foundation level, maximum depth not exceed 1.5m.	235	m^3	1,500.00	352,500.00
B3	Filling to excavations with materials arising from the excavations deposited and compacted in 150mm thick layers.	90	m^3	827	74,430.00
B4	Removal of surplus excavated materials as directed by the Engineer		Item	Pro. Sum	130,000.00
B5	Approved hard earth filling under floors.	65	m^3	827	53,755.00
	Total carried to summary (page ....)				**745,685.00**
	C-Concrete Work				
C1	Reinforced concrete 1:2:4 (38mm) in column foundations.	68	m^3	15,000.00	1,020,000.00
C2	Reinforced concrete 1:2:4 (38mm) in slabs	120	m^3	15,000.00	1,800,000.00
C3	Reinforced concrete in columns	14	m^3	15,000.00	210,000.00
C4	Reinforced concrete in beams	30	m^3	15,000.00	450,000.00
C5	Reinforcement	6500	kg	200	1,300,000.00
	Total carried to summary (page ....)				**4,780,000.00**