



UNIVERSITY OF RUHUNA

Faculty of Engineering

End-Semester 4 Examination in Engineering: November 2022

Module Number: CE4301

Module Name: Building Planning and Cost Estimating

[Three Hours]

[Answer all questions. Each question carries 12 marks]

[You may refer separately provided City of Colombo Development Plan to answer Q1]

- Q1. a) Figure Q1 is the floor plan of a proposed house prepared to get approval based on the City of Colombo Development Plan. Specified building line is 6m away from the center of available roads. Low-tension electric line exists just above the boundary of the land adjacent to the road. You have been asked to check the following requirements related to the given plan to consider for the approval. Your answer should consist of the appropriate regulations relevant to each of the requirement.
- Compliance with the requirement of the building line
 - Distance from the electric line to the building
 - Minimum space requirements around the building
 - Minimum areas of habitable rooms and bath room
 - If one or more of the above requirements are not satisfied according to the City of Colombo Development Plan, give your suggestions to match with the regulations.
- [6.0 Marks]
- b) Explain the followings related to the regulations specified by the City of Colombo Development Plan. Write down the relevant regulation number for each answer where necessary.
- Qualified person
 - Duties of qualified person employed or engaged to prepare the plans or to supervise building work & other development activities
 - Occasions that are not necessary to sign by a qualified person for a building construction
- [6.0 Marks]
- Q2. a) **Estimating** is an important task that usually carried out at an early stage of a construction project. Explain briefly how estimating is helpful to make various decisions in a construction project.
- [4.0 Marks]
- b) **Open Tendering** can be identified as a process that contains several important steps. Briefly describe the tendering process applicable for a building construction project. Identify the documentation requirements during this process.
- [4.0 Marks]
- c) **Preliminaries** can be identified in almost every construction contract.
- Explain briefly why it is important to include Preliminaries as part of the contract?
 - Identify any four items typically included under the Preliminaries section.
- [2.0 Marks]
[2.0 Marks]

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- Q3. a) Carry out following based on the information provided in Figures Q3 (a), Q3 Q3(c). Any assumptions you made should be clearly mentioned.
- i Calculate the centerline dimensions for 225 mm and 115mm separately.
 - ii Take-off quantities of excavation work in foundation.
 - iii Take-off quantities of the rubble work in foundation for 225mm walls
- [9.0 Mark]
- b) "Standard phraseologies are available to derive the description of work items preparation of Bills of Quantities (BOQ)".
- i Discuss why it is important to adhere to standards?
 - ii Identify a commonly used publication available in Sri Lanka for the purpose
- [3.0 Mark]
- Q4. a) Unit rates are calculated based on published data by the Estimators in pricing Bills of Quantities (BOQ).
- i Identify the three main cost categories/types included in a unit rate.
 - ii Identify two publications where can you obtain basic rates for unit rate calculations.
 - iii Discuss how the material wastages, and profits can be taken into account in preparation of a BOQ.
- [3.0 Mark]
- b) Calculate the following using information provided in **Data Sheet 1** provided. State clearly assumptions made (if any).
- i Material requirement for 1 m³ of random rubble masonry if 1:8 cement sand mortar is used. Porosity of the random rubble work can be taken as 0.4.
 - ii Unit rate for the above random rubble masonry work.
- [9.0 Mark]
- Q5. a) Explain the general procedure of claiming the expenses for following in the context of Sri Lankan construction industry.
- i Extra works
 - ii Variations
 - iii Price changes due to fluctuations of construction inputs
- [3.0 Mark]
- b) Table Q5 (a) shows the interim claims schedule together with some contract data for four projects; A, B, C and D. Identify the applicable months for base indices of each project and applicable months for current indices of each claim. Present your answer as per the format given in Table Q5 (b).
- [4.0 Mark]
- c) The data given in the Table Q5 (c) includes the General Contract data and the details of interim claims No 1, and 2 for a project undertaken to construct a shopping complex. Table Q5 (d) gives composite indices for construction projects. Calculate the probable total cost that the contractor can claim with the claim No. 2.
- [5.0 Mark]

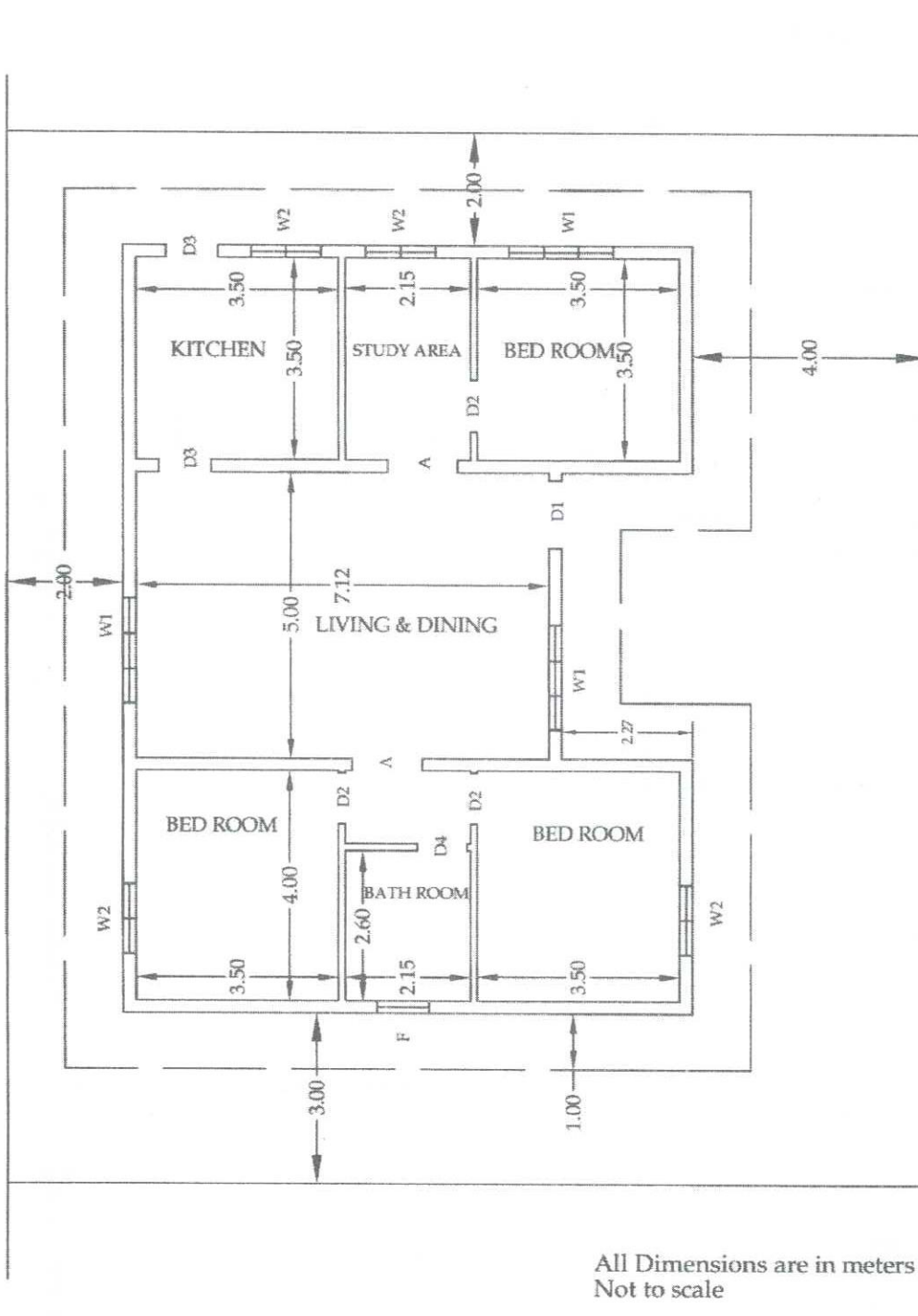
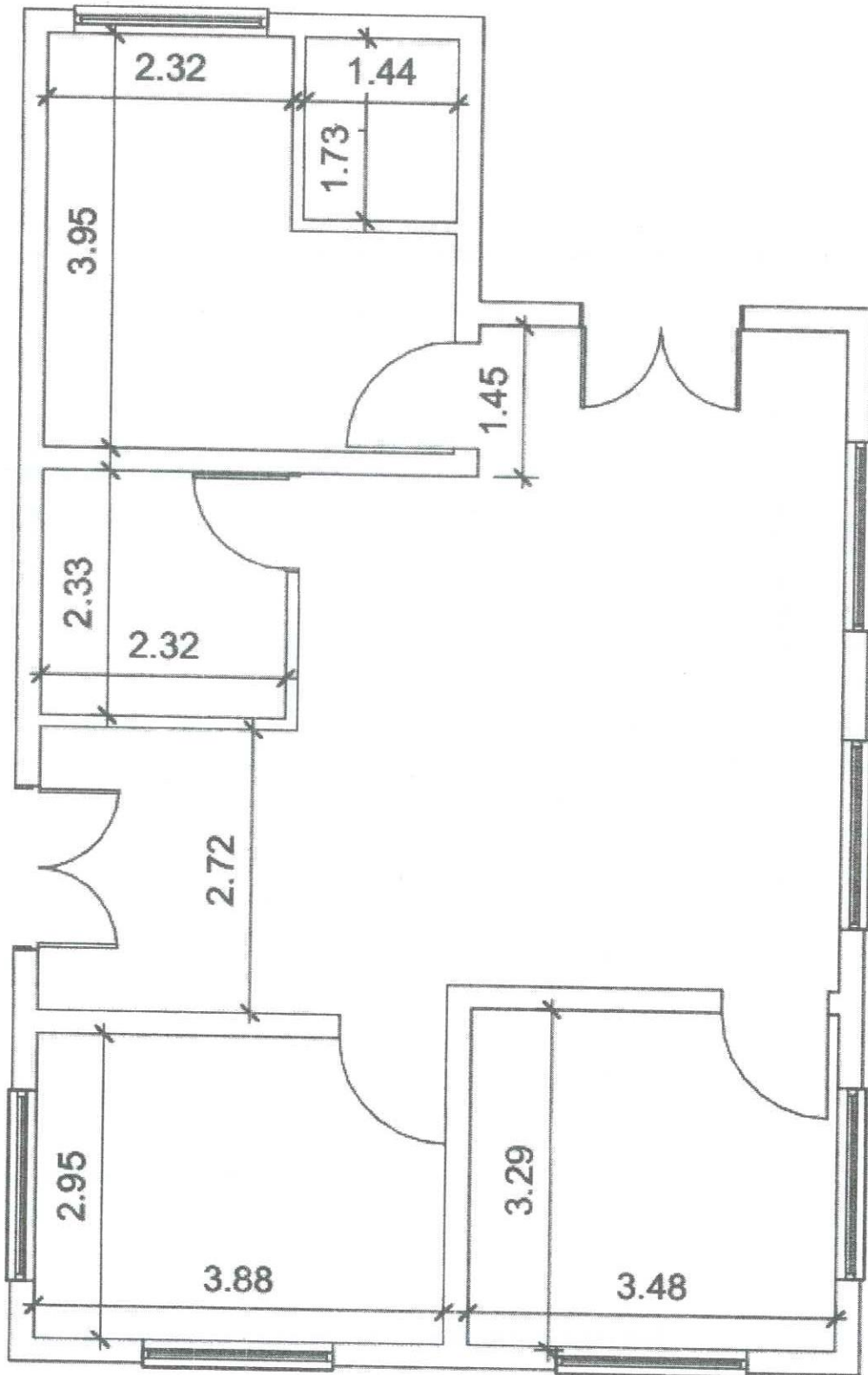


Figure Q1: Building Plan to check compliances



All dimensions are in meters.

Figure Q3(a): Ground Floor Plan

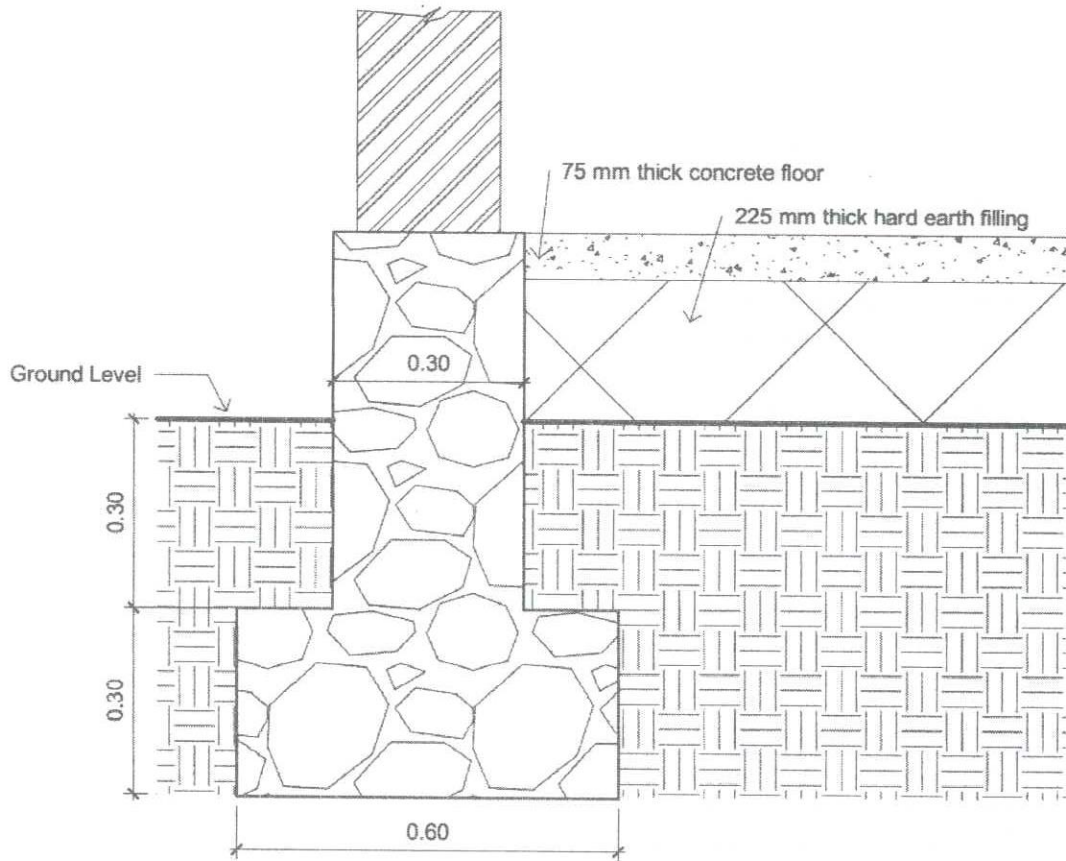


Figure Q3(b): Foundation Detail for 225mm wall

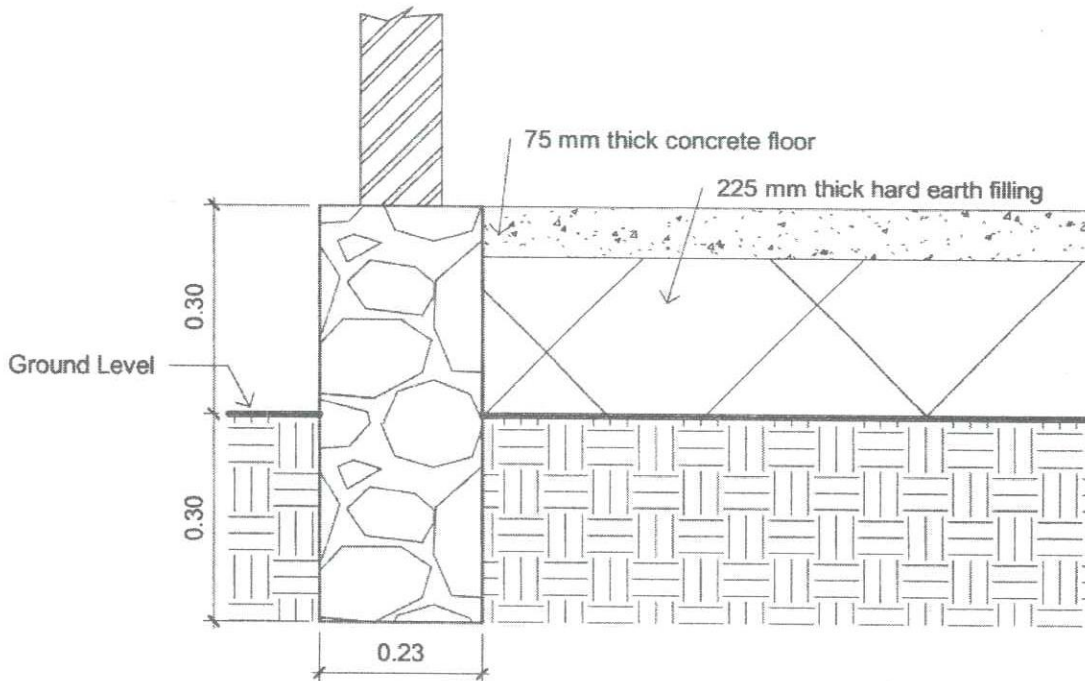


Figure Q3(c): Foundation Detail for 115mm wall

Data Sheet 1

Cement

Specific gravity = 3.15
Bulk density in bag form = 1442 kg/m³
Weight of a bag of cement = 50 kg

Sand

Specific gravity = 2.66
Bulk density = 1600 kg/m³

Metal

Specific gravity = 2.8
Bulk density = 1440 kg/m³

Water

Density = 1000 kg/m³
W/C ratio = 0.6

Wastage

Allow 10% wastage for all materials.

Labour requirement for Random Rubble Masonry (per cube)

4 days Skilled labours
6 days Unskilled labours

Cost data (transport included)

Cement bag (50 kg) = Rs.3000.00
Sand (1m³) = Rs.7050.00
Rubble (1 m³) = Rs.6500.00
Water - free
Mason (8-hour day) = Rs.3500.00
Unskilled labour (8-hour day) = Rs.2500.00

Table Q5 (a): Dates for Interim Claims

Project	Date of Bid Submission	Project Start Date	Date of Claim 1	Date of Claim 2	Date of Claim 3
A	04.12.2021	02.02.2022	05.04.2022	10.07.2022	09.09.2022
B	31.12.2021	15.03.2022	20.04.2022	10.07.2022	10.10.2022
C	08.02.2022	15.03.2022	31.05.2022	31.06.2022	31.09.2022
D	15.04.2022	01.05.2022	15.06.2022	15.08.2022	15.11.2022

Table Q5 (b): Applicable Months for Base and Current Indices

Project	Base month	Claim 1	Claim 2	Claim 3
A				
B				
C				
D				

Table Q5 (c): Data for Price Adjustment

Contract Data	
Total Contract Sum	Rs. 9,850,650.00
Date of Closing Bids	15- February- 2022
Date of commencement of work	01-March-2022
Claim No. 1	
Date of submission	01-May-2022
Cumulative value of certified work done	Rs.1,150,650.00
Value of Extra work for claim 1	Rs. 175,000.00
Cumulative value of Non-Adjustable work	Rs. 450,000.00
Total Cost of materials at site up to this claim	Rs. 125,000.00
Claim No. 2	
Date of submission	01-July-2022
Cumulative value of certified work done	Rs.4,250,800.00
Value of Extra work for claim 2	Rs. 150,000.00
Cumulative value of Non-Adjustable work	Rs. 850,000.00
Total Cost of materials at site up to this claim	Rs. 200,000.00

Table Q5 (d): Composite Indices for Various Types of Construction Works in 2022

Month	Modern Housing	Non-Residential Housing	Water Supply and Drainage
January	1086.0	1021.5	1109.4
February	1097.4	1030.0	1112.4
March	1179.7	1135.3	1236.0
April	1386.7	1455.2	1618.9
May	1517.4	1584.9	1929.2
June	1637.5	1685.5	2037.3
July	1754.9	1765.1	2046.4
August	1810.3	1728.6	2036.6

ICTAD Price Fluctuation Formulas

$$F = \frac{0.966(V - V_{na})}{1.00} * \sum \frac{P_x(I_{xc} - I_{xb})}{I_{xb}} \quad \text{for contracts exceeding Rs. 10 million}$$

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

All the parameters are with their usual notations.