Bangladesh University of Engineering and Technology

Course No: CE 206
Course Title: Engineering Computation Sessional

Project Name: Cost Estimation of Superstructure of A Rectangular One Storied Masonry Building

Submitted To:

Subashish Kundu Sunny
Lecturer, Dept. of Civil Engineering, BUET
Dr. Shohel Rana
Associate Professor
Dept. of Civil Engineering, BUET

Submitted By:

Md. Abdul Motin Khosru (**1904136**)
Md. Noyan Mony (**1904142**)
Rajesh Sharma Arghya (**1904148**)
Sabuj Biswas (**1904154**)
Sohely Anjum (**1904160**)
Md. Abdul Aziz (**1904163**)

Group No: 6

Forwarding Letter

August 30, 2022

Dr. Shohel Rana
Associate Professor.

Subashish Kundu Sunny
Lecturer.

Department of Civil Engineering
Bangladesh University of Engineering and Technology, Dhaka.

Dear Sir,
It is our great pleasure to present you the report on our Matlab project entitled as **"Cost Estimation of superstructure of a rectangular One storied masonry building".** We would like to express our heartiest gratitude to you for giving us the opportunity.

While preparing the project and report, we had the opportunity to research about the estimation of superstructure of different types of masonry building. This report is composed with necessary information and data with relevant illustrations, we think you will find the report much informative and purposeful. We would like to apologize for any unwilling mistakes in the report. We hope you will consider those.

In the end we like to thank you for providing us such an opportunity to prepare this project. We hope this report will represent a perfect overview about our project.

Sincerely yours,

Md. Abdul Motin Khosru (1904136)

Md. Noyan Mony (1904142)

Rajesh Sharma Arghya (1904148)

Sabuj Biswas (1904154)

Sohely Anjum (1904160)

Md. Abdul Aziz (1904163)

Group No-06

Introduction

This project deals with the idea of cost estimation of a simple masonry building above superstructure. As the calculation of estimation can be quite tedious, erroneous and difficult for a person, MATLAB comes in handy if MATLAB code can be developed for various structures in a way so that a user, not necessarily an engineer, gets an idea about how much money or material is needed. This circumstance works as the main stimulation for this project. To give a brief idea, first, all components composing a masonry building consisting of two rooms and one verandah from plinth level to all the way up to the roof are estimated with MATLAB codes and hence cost of the estimated materials are calculated according to the rates per unit (BDT) specified by 'PWD SCHEDULE OF RATES 2018 FOR CIVIL WORKS'.

Objectives

This project is an application of basic MATLAB knowledge to estimate of cost of one storied masonry building consists of two room & one verandah. Different features of MATLAB are used to execute this project. Estimation helps to get an idea about how much the construction project will cost before starting to perform it practically. This project will enable us to estimate the total cost of materials and help to understand the feasibility of the construction project. Cost Estimation using Matlab should ensure the following objectives.

- Computation of all Material Quantities to build a building
- Unit Weights of Different Structural Materials
- To find individual Material cost
- Determine the total cost of materials for the construction of the building
- To take all including input by users so different types of building cost are easy to execute
- To calculate material cost more effectively
- To ensure more precise, accurate estimation

Methodology

The main objective of this project is to estimate the amount and materials required for superstructure of a rectangular one storied building. To solve the problem, at first the number of rooms has been fixed. This project analyzed various composition of 02 room and 01 verandah. As there is 03 unit, and rectangular in shape, there can be 3!=6 number of combination. At first, 06 combinations were detected as drawn in the figure below. Each combination is marked as individual case.

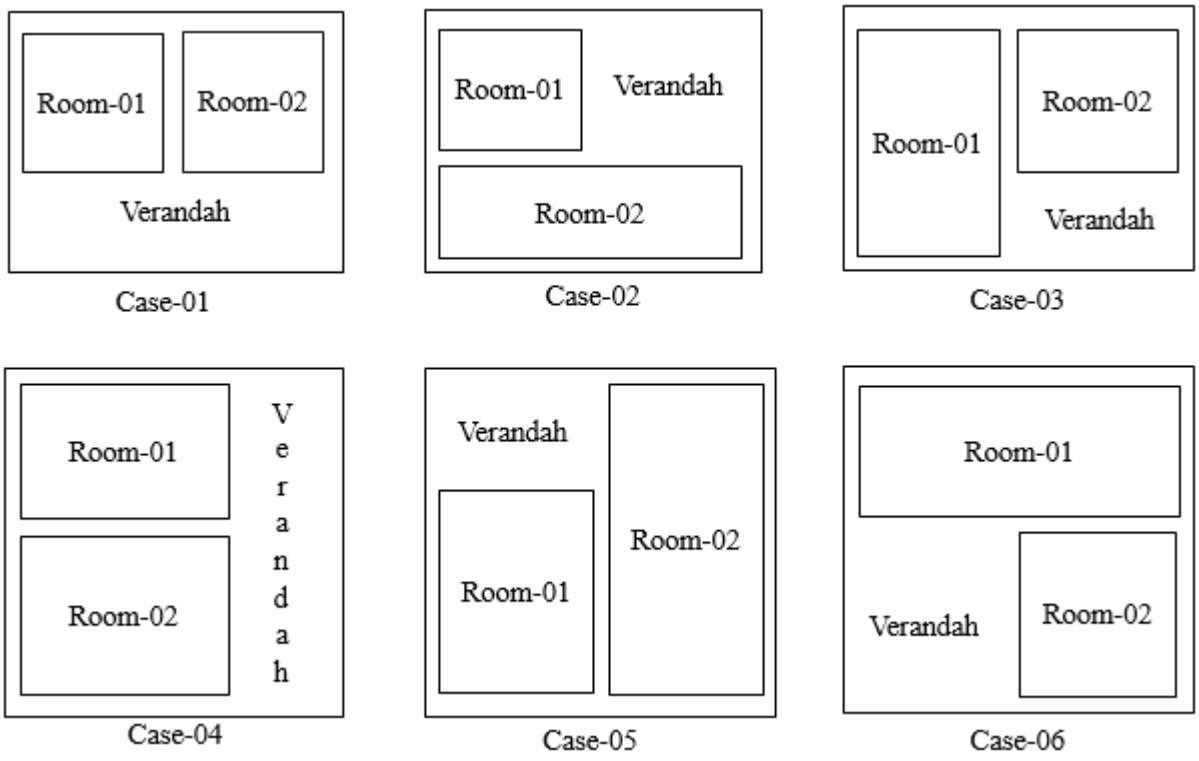

Figure-1: Possible Combinations

After more analysis, a pattern can be found in this cases such as either dimension of one room is large or the verandah is large. They can be large in horizontal or vertical direction. For the sake of discussion, horizontal direction is considered as x axis and vertical direction is considered as y axis.

Pattern among the cases:

	Verandah Large	**Room Large**	
		Room-01	**Room-02**
In x direction	Case-01	Case-06	Case-02
In y direction	Case-04	Case-03	Case-05

This code is applicable for this 06 type of possible pattern only. Furthermore analysis shows that if case-04, case-05 and case-06 is rotated, they became same as case-01, case-02 and case-03. That means if dimensions of those cases is altered (i.e. altering the x and y dimension), then solving three case is enough. Again, if case-03 is rotated and room dimensions are interchanged, it became same as case-02. That means solving only for first two cases can help in the solving of other cases. This process is shown as figure below:

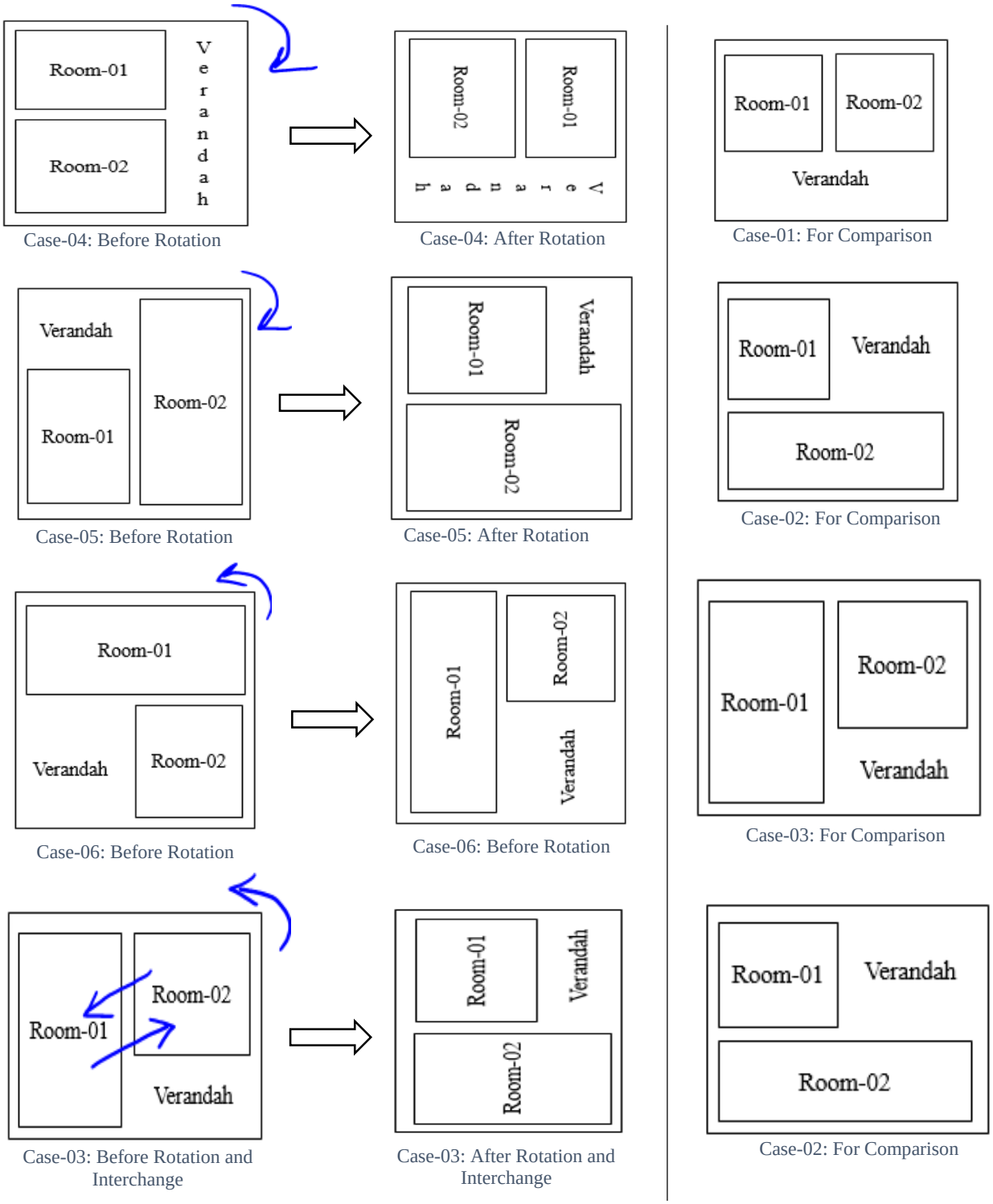

Figure-2: Co-relation Among the Conditions

Simply this code works only for those 06 cases. If the input taken from the user matches with the conditions, we can estimate cost and amount of materials, otherwise, there comes limitations of this code. It can simply be represented as the following flowchart:

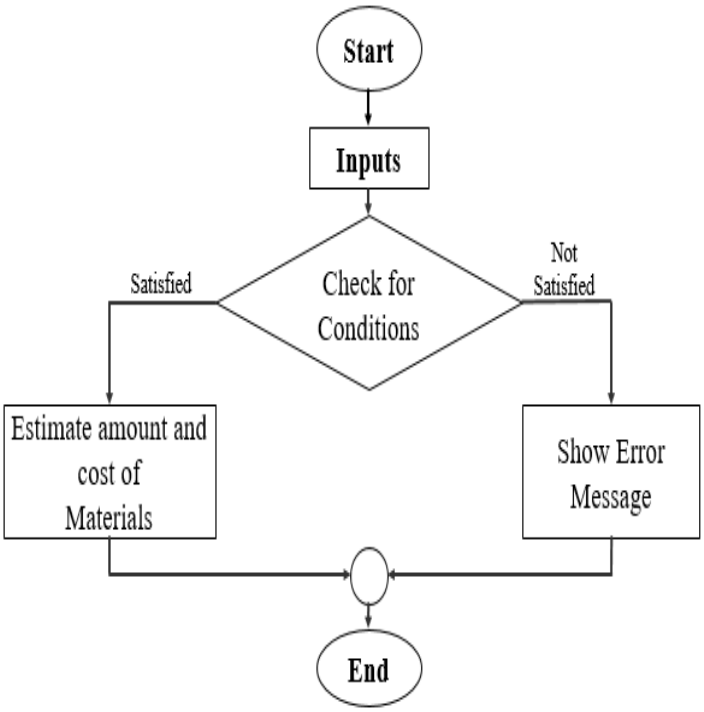

Figure-3: Simple Flow Diagram

Brief Code Analysis:

Taking a plan as an example will help us to understand better. A sample plan for case-01 is given below:

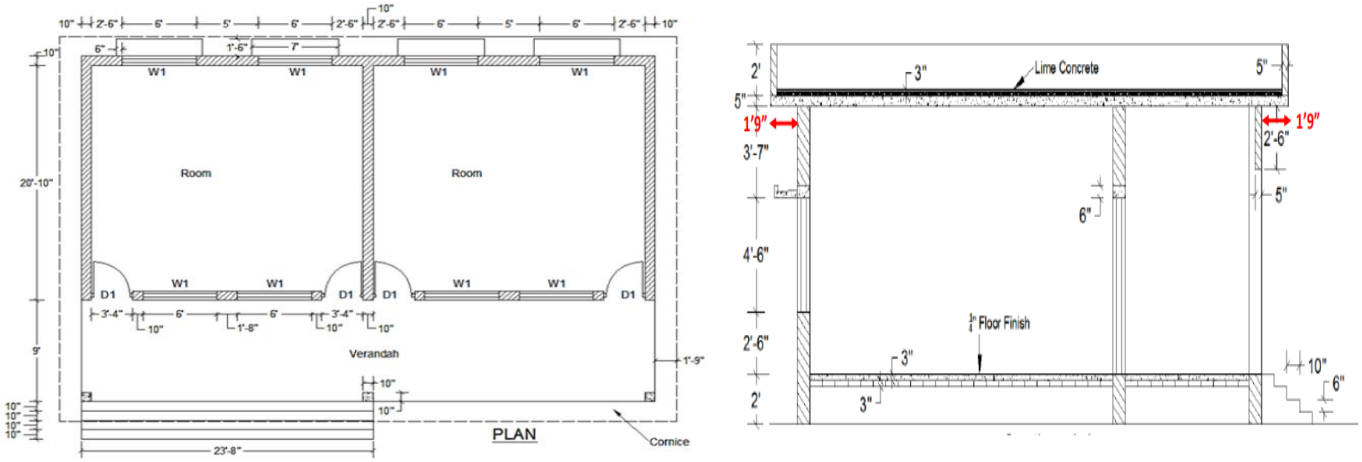

Figure-4: Sample Plan and Section View (For case-01)

Before starting the analysis, it is necessary to mention the inputs. The inputs taken from user is:

1. Dimension of the Plan (inner edge to inner edge)
2. Dimension of Room-01?
3. Dimension of Room-02?
4. Dimension of Veranda? (Outer Edge to Outer Edge)

5. Height of Section?
6. Dimension of Column? (in [x y] direction)
7. Number of Column in Verandah?
8. Dimension of door [x z]
9. Number of door
10. Dimension of window [x z]
11. Number of window
12. No of Stairs
13. Length of Stairs
14. Dimension of cornice in [x y] direction
15. Thickness of Cornice
16. Height and Thickness of Parapet Wall (in [h t] format)
17. No of Common Door?
18. Total Dropwall Length (in [x y] direction)
19. Height and Thickness of Dropwall? (in [h t] format)
20. No of Common Window between rooms and verandah
21. Number of Outside Window

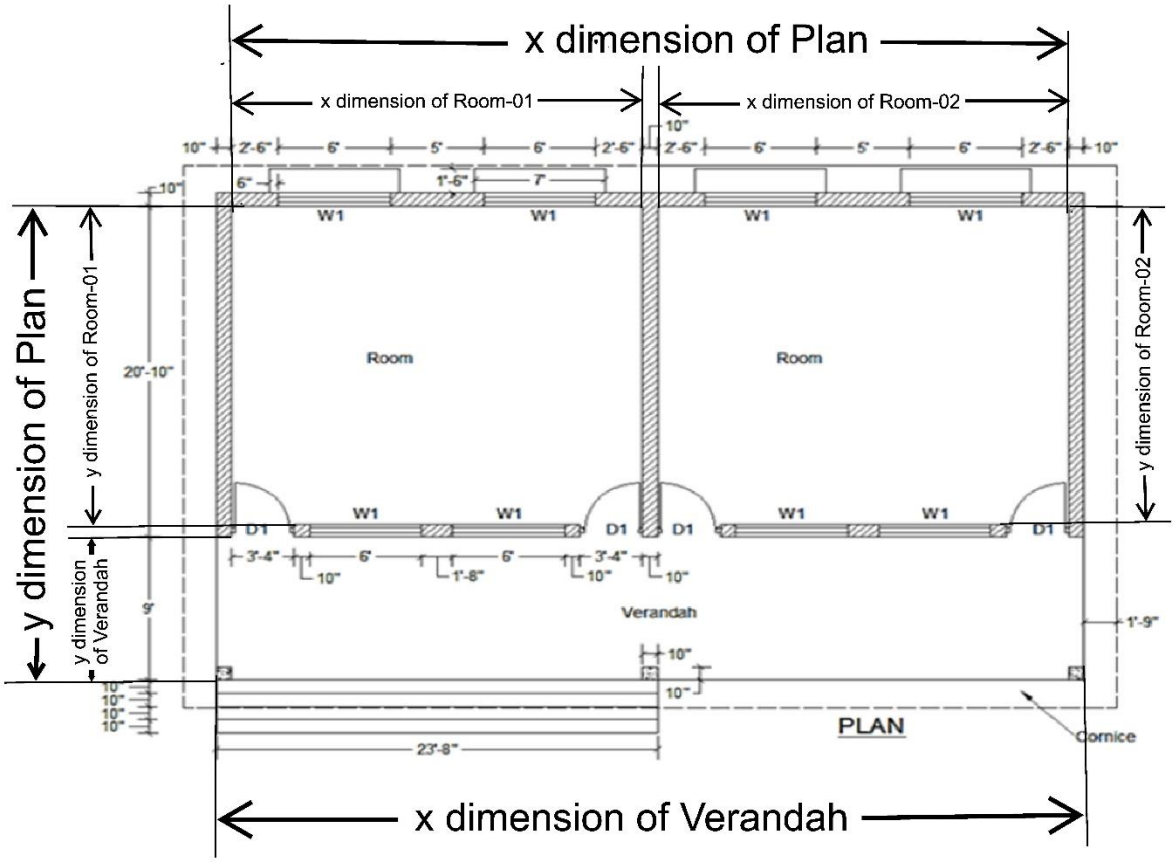

Figure-5: Taking Inputs (Matching with case-01)

Matlab will take input step by step. It will detect cases according to first 04 inputs (Taking the values is shown in figure-05). To detect case-01, the code is:

```
if
((r1(1)+r2(1)+tw==p(1))&&(r1(2)+v(2)+tw==p(2))&&(r1(1)+r2(1)+3*tw==v(1)&&r1(2)==r2(2)
))
```

Here r1(1) indicates the first element of r1 vector, which is the x dimension of room-01. Again r1(2) is the y dimension of room-01. In a similar manner, p(1), r2(1), v(1) indicates x dimension of total plan, room-02 and verandah respectively. Same goes for y direction too. From the figure, we can verify the code for this condition. Throughout the code, this convention is followed and estimated amount of materials and cost is determined. case-02 was also satisfied in this way.

For case-03, swapping the x and y dimension of plan, room and verandah, and the interchanging the dimensions of room-01 and room-02; it became a condition of case-02 (For better understanding see figure-02). To swap the values, following code was written:

```
elseif ((r1(2)==p(2))&&(r1(1)+2*tw+r2(1)==p(1))&&(r2(2)+v(2)==r1(2))) %%case-03
    temp= p(2); p(2)=p(1); p(1)=temp; %%swap the x and y dimension of plan
    temp= r1(2); r1(2)=r1(1); r1(1)=temp; %%swap the x and y dimension of room-01
    temp= r2(2); r2(2)=r2(1); r2(1)=temp; %%swap the x and y dimension of room-02
    temp= v(2); v(2)=v(1); v(1)=temp; %%swap the x and y dimension of verandah
    temp=r1; r1=r2; r2=temp; %%Replace the values of room-01 and room-02

    %Now its a condition of case 02
```

Rest of the code is same as the code of case-02. In the similar manner, case-04, case-05 and case-06 was solved.

Output

In this MATLAB project we get The Output in tabular form (14x5table). In the table there is 14 item cost with their item name, quantity, rate, Item wise cost and Total cost. Here is the Screenshot of row title of the table:

Item No	Quantity	Per Unit Cost(BDT)	Cost of Individual Item(BDT)

And here is the screenshot of the column title:

BFS
CC
FloorFinish
Brickwork
RCCInColumn
RCCInLintel
RCCinRoof
LimeConcreteInRoof
BricksInParapet
BrickworkInStairs
InsidePlastering
OutsidePlastering
Skirting
RCCinDropwall

Here is the example of total project output:

```
A =

  14×4 table
```

	Item No	Quantity	Per Unit Cost(BDT)	Cost of Individual Item(BDT)
BFS	1.00	1246.14	39.02	48624.34
CC	2.00	311.53	198.22	61752.41
FloorFinish	3.00	29.87	13.00	388.31
Brickwork	4.00	1027.85	184.06	189185.56
RCCInColumn	5.00	22.05	218.04	4807.48
RCCInLintel	6.00	63.75	212.38	13539.23
RCCinRoof	7.00	711.81	226.53	161245.31
LimeConcreteInRoof	8.00	409.72	372.79	152740.30
BricksInParapet	9.00	138.89	184.06	25564.09
BrickworkInStairs	10.00	98.61	184.06	18150.36
InsidePlastering	11.00	66.98	573.41	38408.68
OutsidePlastering	12.00	84.66	573.41	48545.74
Skirting	13.00	10.30	164.49	1694.88
RCCinDropwall	14.00	62.85	212.38	13347.49

```
Estimated Total Cost is 777994 Tk
Thanks for staying with us
```

For example, in the code of BFS (in case-01):

```
%BFS
BFS=r1(1)*r1(2)+r2(1)*r2(2)+(v(1)-2*tw)*(v(2)-tw);
```

Here area of BFS is determined after calculating the input values. Per unit cost is also taken from user, as market price varies with time. In example table, its Item no is 1, quantity is 1246.14 unit, per unit Cost (BDT) is 39.02 (input extracted from excel) and total BFS cost/cost of Individual Item (BDT) is 48624.34.

In the bottom of the table there is Total Estimated cost which is sum of total 14 item cost in TK.

Limitation: Though this code works perfectly, it has its limitations. For simplicity, 1) sunshades are not measured as the cornice works as sunshades, 2) Lintel is considered continuous along the perimeter of the walls of the super-structure

Conclusion

With the help of MATLAB, the user can simply put the dimensions of components of a building from plinth level to the roof according to his requirements and get a rough idea about cost within a very short amount of time. This code is developed for two rooms and a verandah system where all the orientations that can possibly be available for a square type plan are considered. This code will not be valid if the condition changes but codes can be developed by the same methodology. Hence, this project can be a very useful tool for mankind.