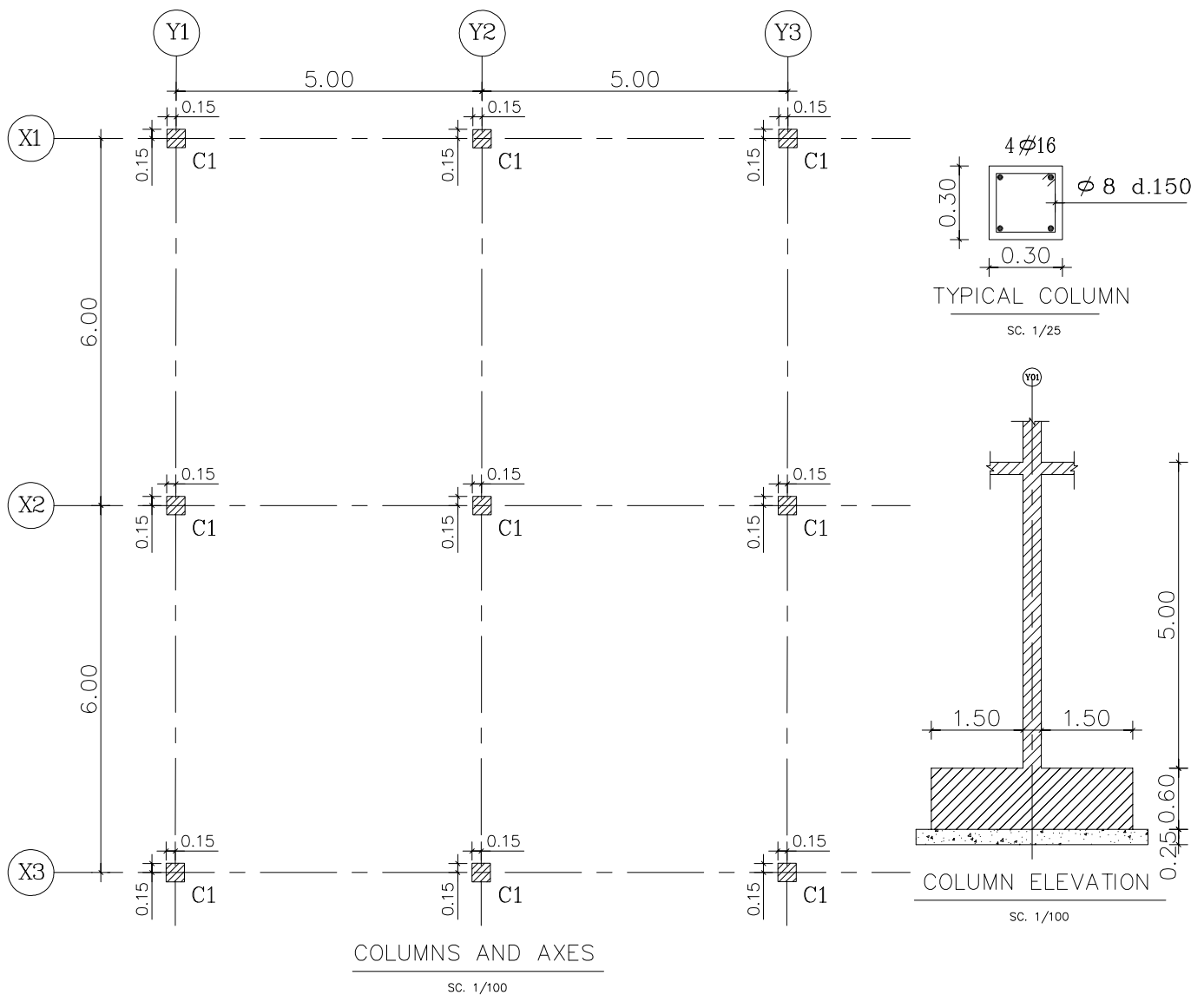| BENHA UNIVERSITY	COMPUTER APPLICATIONS ii
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Structural Drawings	Page 0

What is the types of structural drawings?

- <u>Design Drawings</u>: Contain detailed dimensioning information that establishes: Sizes, Relationships, and Location of all structural elements of the project.

- <u>Shop Drawings</u>: are actually an extension and further development of design drawings and Prepared by the contractor. Shop drawings do not change the intent of the design drawings and are provided for all structural elements such as: Columns, beam, footings, slabs and walls and etc.......

- <u>As-Built Drawings</u>: Usually these are "actual drawings" to which the owner may refer for maintenance and repairs. The shop drawings show "proposed" dimensions and reinforcement details for all structural elements. The (as built drawings) show "actual" dimensions and reinforcement of all elements after casting in the site.
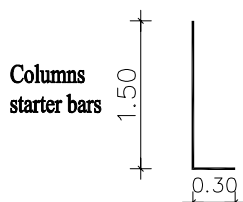
The Structural Drawings in the course are :-

1- Columns and Axes layout.
2- Foundations layout.
3- Flat slab.
4- Reinforced concrete Beams Details.

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| Assignment (1) | Columns and Axes Layout | Page 1 |

For the following figure:

1- Draw the columns and axes layout using the AutoCAD program.

2- Calculate the necessary reinforcement quantities for casting columns from the foundation level up to the Ground floor level.

3- Draw a section elevation for the typical column indicating bar marks and lengths for all bars.

4- Draw the bar bending schedule (BBS) using the AutoCAD program.

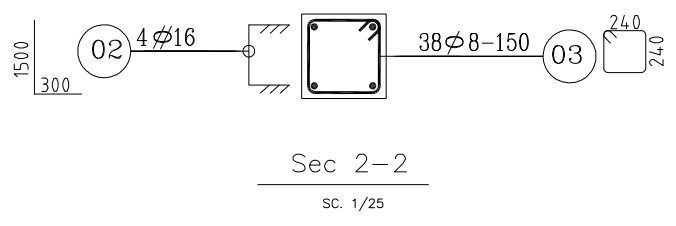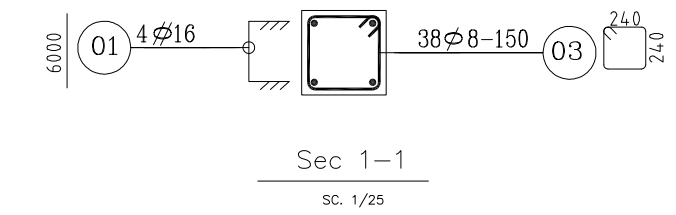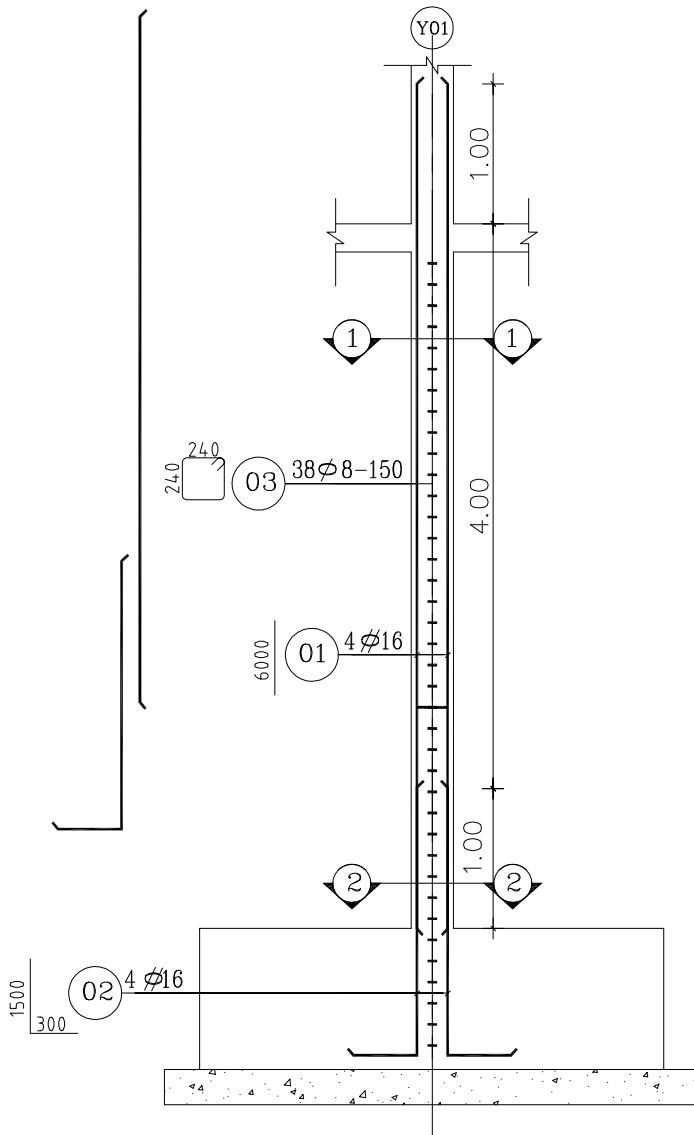TYPICAL COLUMN
SC. 1/25

COLUMN ELEVATION
SC. 1/100

COLUMNS AND AXES
SC. 1/100

Notes:-

Columns starter bars

Rebars Weight	
Diameter	Unit Wt (kg/m)
⌀ 8	0.394
⌀ 10	0.617
⌀ 12	0.888
⌀ 14	1.208

Diameter	Unit Wt (kg/m)
⌀ 16	1.578
⌀ 18	1.998
⌀ 20	2.466
⌀ 22	2.984
⌀ 25	3.853

* Concrete grade
For Plain Concrete Fcu=20 N/mm^2
For Reinforcing Concrete Fcu=30 N/mm^2

LOCATION	CLEAR COVER
FOUNDATION	75 mm
BEAMS AND COLUMNS	30 mm
SLABS	25 mm

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| Assignment (1) | Columns and Axes Layout | Page 2 |

Sec 1-1
SC. 1/25

01 4 ϕ16   38ϕ8-150 03

Sec 2-2
SC. 1/25

02 4 ϕ16   38ϕ8-150 03

03 38ϕ8-150

01 4 ϕ16

02 4 ϕ16

Y01

1.00

4.00

1.00

COLUMN ELEVATION

SC. 1/100

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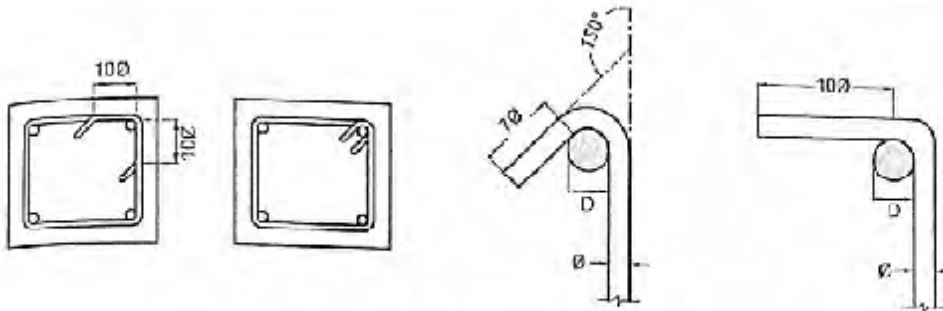Assignment (1)   Columns and Axes Layout   Page 3
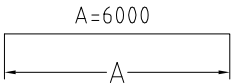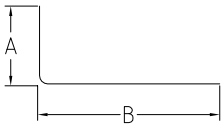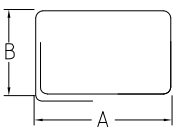
Bar Bending Schedule

SC. 1/100

Bar mark	Type and size mm	No. of memb.	No. of bars in each memb.	Total No.	Length mm	Shape & Dimension	Total Weight (Kg) (Kg)
01	⌀16	9	4	36	6000	A=6000	340.85
02	⌀16	9	4	36	1800	A=300 B=1500	102.26
03	⌀8	9	38	342	1120	A=240 B=240 St = 160	140.20

Total Weight	
Diameter	Weight (kg)
⌀8	140.20
⌀16	443.11

شكل (٢٤-٤) طرق تثبيت الكانات في الكمرات

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Example (1)	Columns and Axes Layout	Page 4

For the following figure:

1- Draw the columns and axes layout using the AutoCAD program.

2- Calculate the necessary reinforcement quantities for casting columns from the foundation level up to the Ground floor level, the Ground floor height is 5.0m.

3- Calculate the necessary reinforcement quantities for casting columns from the Ground level up to to the First floor level, the typical floor height is 3.0m.

COLUMN C1
SC. 1/25

COLUMN C2
SC. 1/25

COLUMN C3
SC. 1/25

COLUMNS AND AXES
SC. 1/100

Notes:-

Columns starter bars
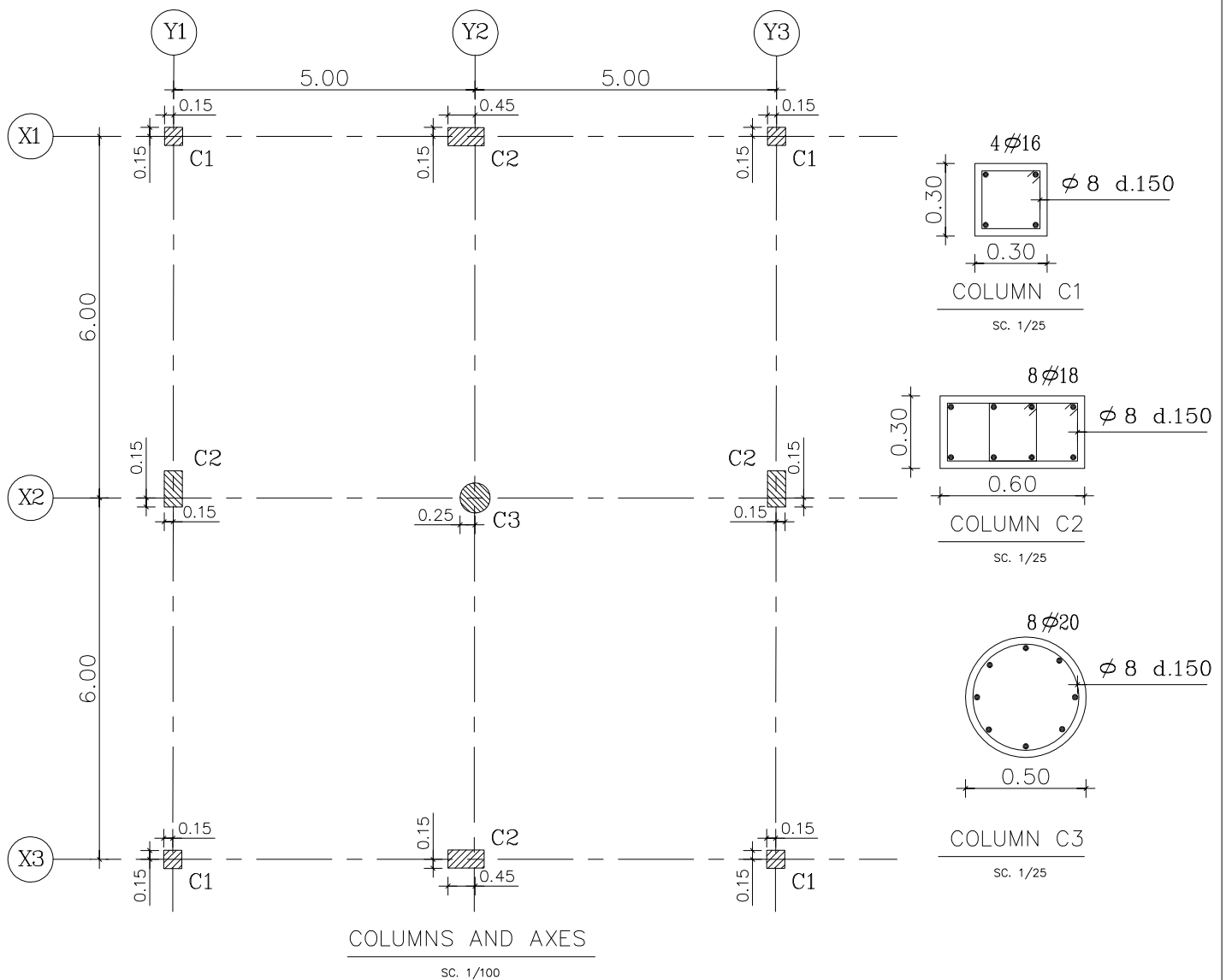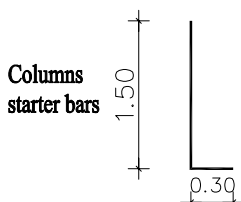
Rebars Weight	
Diameter	Unit Wt (kg/m)
ϕ 8	0.394
ϕ 10	0.617
ϕ 12	0.888
ϕ 14	1.208

Diameter	Unit Wt (kg/m)
ϕ 16	1.578
ϕ 18	1.998
ϕ 20	2.466
ϕ 22	2.984
ϕ 25	3.853

* Concrete grade
For Plain Concrete Fcu=20 N/mm^2
For Reinforcing Concrete Fcu=30 N/mm^2
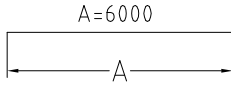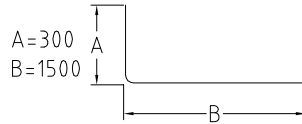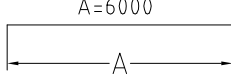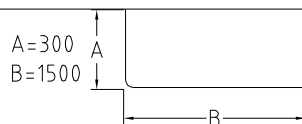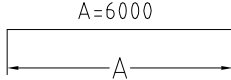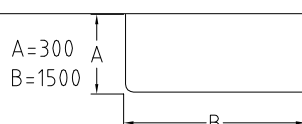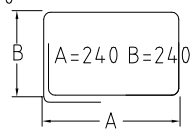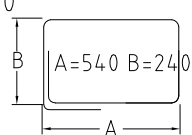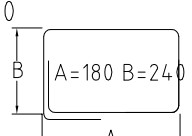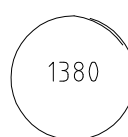
LOCATION	CLEAR COVER
FOUNDATION	75 mm
BEAMS AND COLUMNS	30 mm
SLABS	25 mm

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| Example (1) | Columns and Axes Layout | Page 5 |

2- Calculate the necessary reinforcement quantities for casting columns from the foundation level up to the Ground floor level, the Ground floor height is 5.0m.
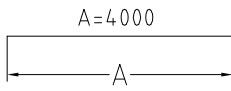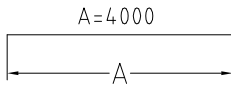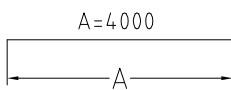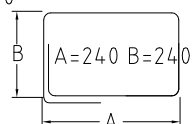
Bar Bending Schedule

Bar mark	Type and size mm	No. of memb.	No. of bars in each memb.	Total No.	Length mm	memb.	Shape & Dimension	Total Weight (Kg) (Kg)
01	∅16	4	4	16	6000	C1	A=6000	151.50
02	∅16	4	4	16	1800	C1	A=300 B=1500	45.50
03	∅18	4	4	16	6000	C2	A=6000	191.80
04	∅18	4	4	16	1800	C2	A=300 B=1500	57.60
05	∅20	1	4	4	6000	C3	A=6000	59.20
06	∅20	1	4	4	1800	C3	A=300 B=1500	17.80
07	∅8	4	38	152	1120	C1	St = 160 A=240 B=240	....
08	∅8	4	38	152	1720	C2	St = 160 A=540 B=240	....
09	∅8	4	38	152	1000	C2	St = 160 A=180 B=240	....
10	∅8	1	38	38	1540	C3	St = 160 1380	....

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| Example (1) | Columns and Axes Layout | Page 6 |

3- Calculate the necessary reinforcement quantities for casting columns from the Ground level up to to the First floor level, the typical floor height is 3.0m.

Bar Bending Schedule

Bar mark	Type and size	No. of memb.	No. of bars in each memb.	Total No.	Length	memb.	Shape & Dimension	Total Weight (Kg)
	mm				mm			(Kg)
11	ϕ 16	4	4	16	4000	C1	A=4000	....
12	ϕ 18	4	4	16	4000	C2	A=4000	....
13	ϕ 20	1	4	4	4000	C3	A=4000	....
14	ϕ 8	4	20	108	1120	C1	St = 160, A=240 B=240	....
15	ϕ 8	4	20	108	1720	C2	St = 160, A=540 B=240	....
16	ϕ 8	4	20	108	1000	C2	St = 160, A=180 B=240	....
17	ϕ 8	1	20	20	1540	C3	St = 160, 1380	....

Total Weight			
Diameter	Weight (kg)	Diameter	Weight (kg)
ϕ 8	....	ϕ 18	....
ϕ 16	....	ϕ 20	....