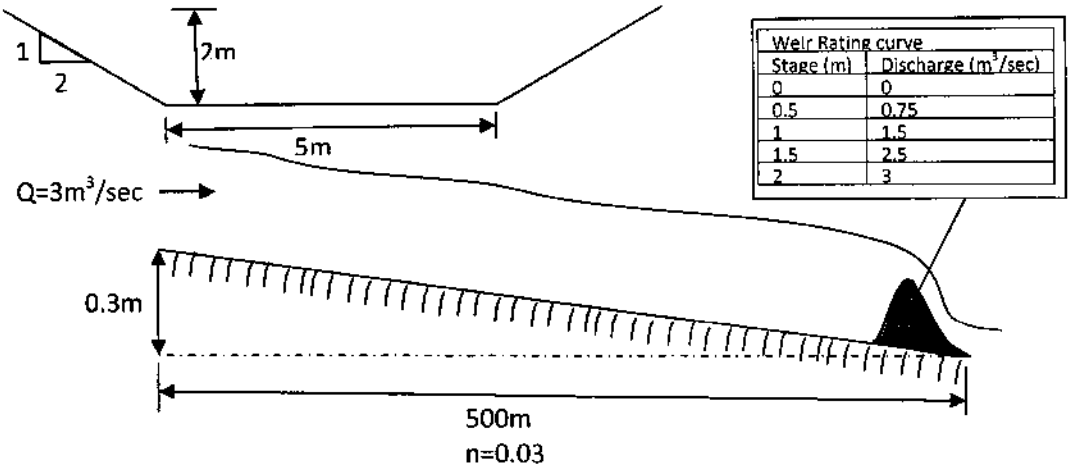
University Of Technology	
Building and Construction Eng. Dept.	
Final Exam 2012/2013	
Subject: Computer Applications	Class: 4th
Branch: Water and Dams Eng.	Time: Three Hour
Examiner: Dr. Mahmoud Saleh, and Sajed Mahdi	Date :

Patr 1- Note: Answer only **three** questions.

Q1: A: What are the assumptions that implicit in the analytical expressions used in the current version of HEC-RAS software?

B: Briefly define the Hydraulic Models, Physical Models and Mathematical Models.

Q2: Explain, with necessary sketch, the main stapes for preparing and running a hydraulic model to simulate the flow in a trapezoidal channel of a cross section, longitudinal profile, flow data and boundary condition as shown below.



Weir Rating curve	
Stage (m)	Discharge (m³/sec)
0	0
0.5	0.75
1	1.5
1.5	2.5
2	3

Q3: Write the geometric data of the hydraulic structure shown in figure (1) in the menus (A) and (B). The distance between upstream cross-section and deck is 25m, Deck width in direction of flow 10m, gate length 2m, gate width 3m, weir coefficient is 2.18, U.S and D.S embankment side slope is 0.5 and the weir is broad crested weir.

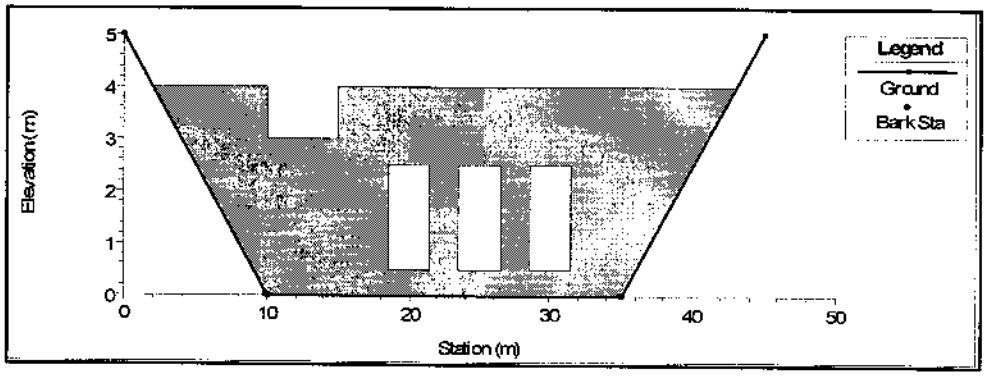


Figure (1): The Hydraulic structure.

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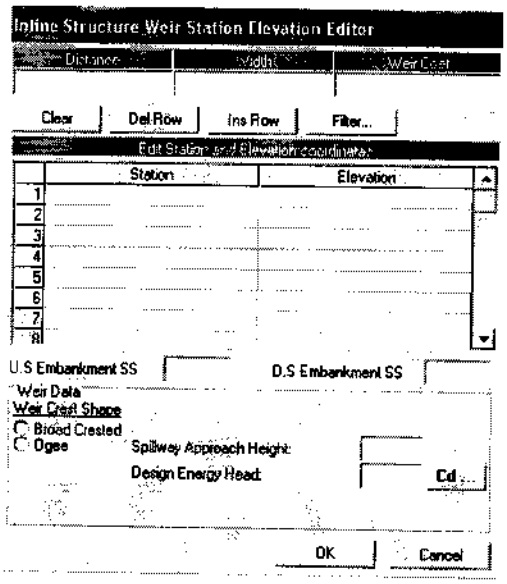
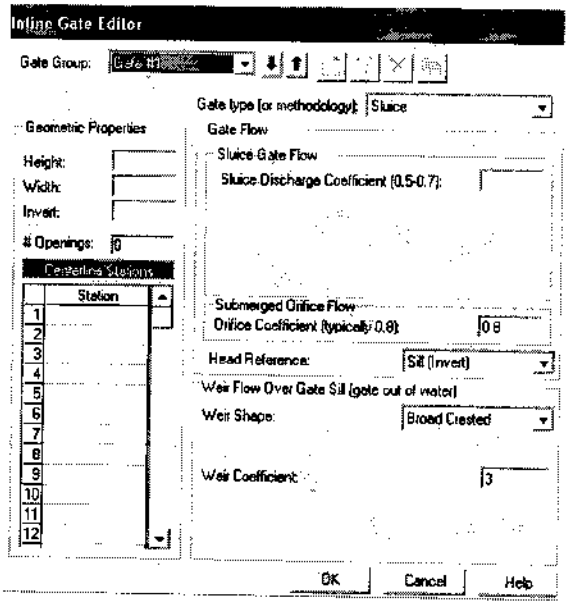
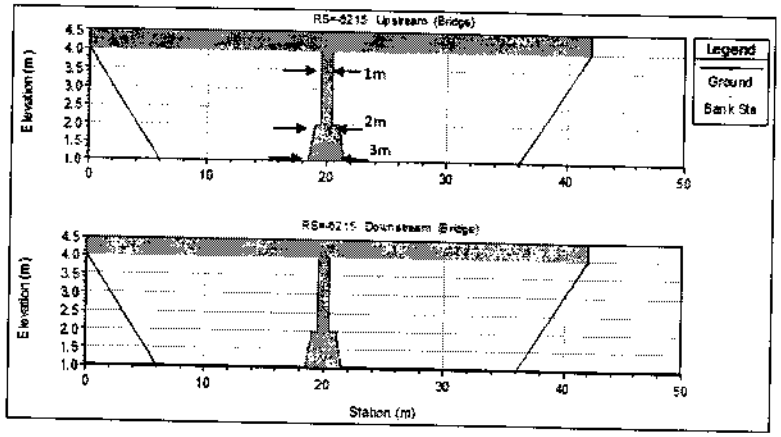


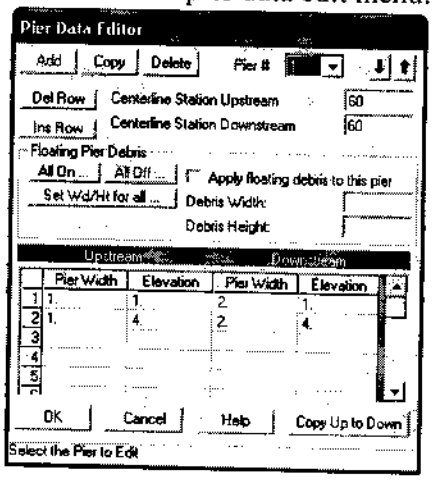
Menu A



Menu B

Q4: A: For the bridge shown below, correct the error in the pier data entered in pier data edit menu.





Q4: B: Explain with schematic diagram the main steps for viewing the, mean velocity profile along the modeled channel and the rating curve of a specific cross section of a modeled channel.

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Patr 2 - Note: Answer only **two** questions.

Q1: A: Using AutoCAD software, write drawing commands for fig (A)

B: Using AutoCAD software, write Modify commands, to change fig (A) to fig. (B), use the minimum steps.

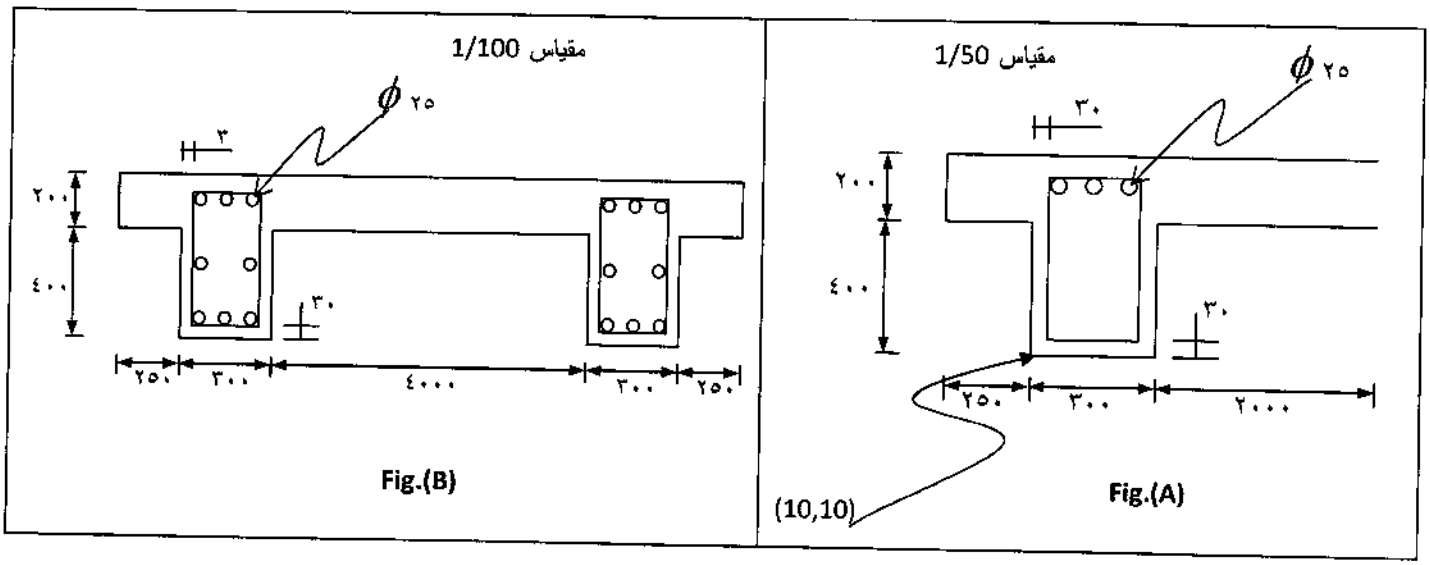
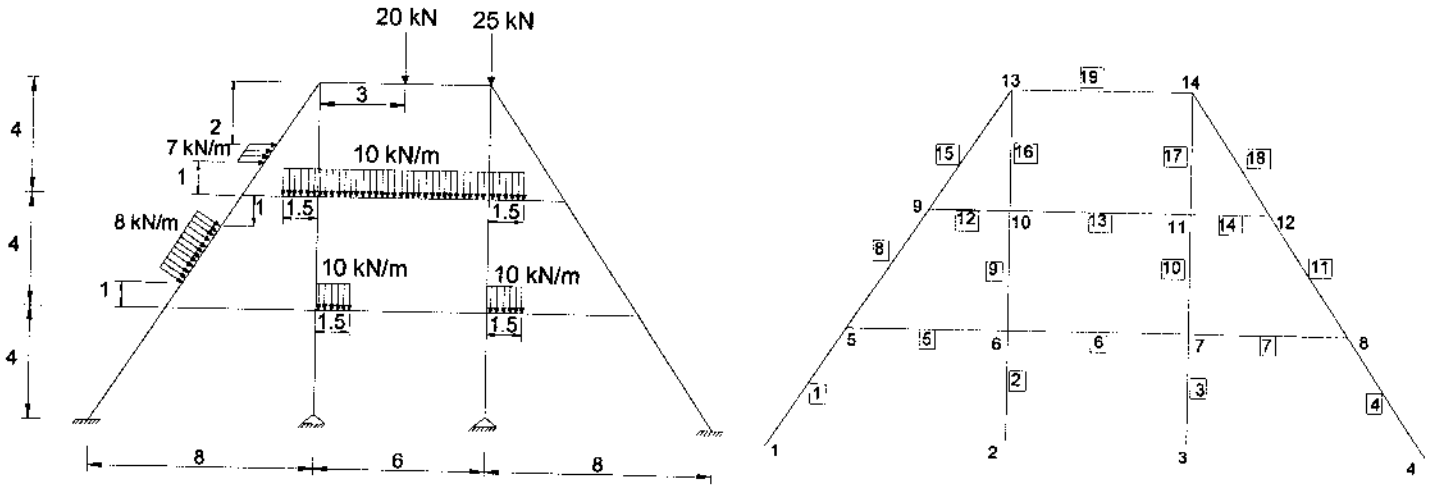


Fig.(B) Fig.(A)

Q2: Use (STAAD–pro.) Program, Write the command (Load), (Support) and (Design) for the Figure below



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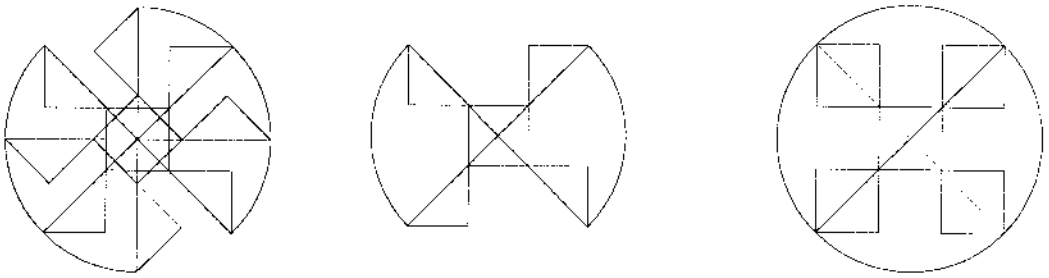
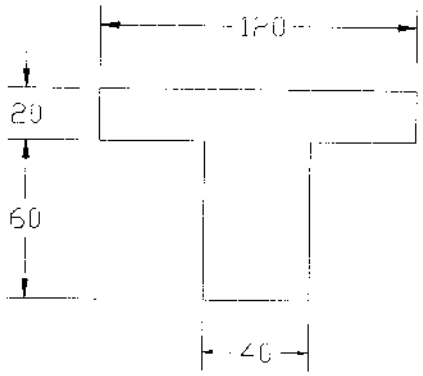
Q3: A: Using AutoCAD software, write Modify commands, to change fig (A) to fig. (B), to fig. (C), use the minimum steps.

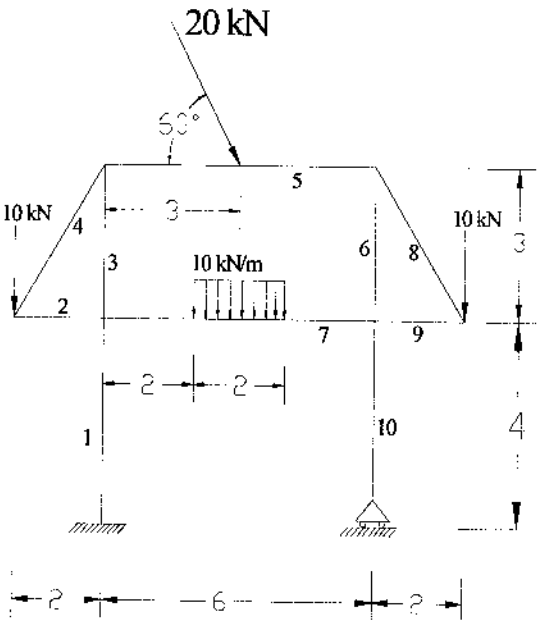


C B A

Q3:B: Use (STAAD–pro.) Program, Write the command Analysis and (Design) the Figure below, and Note that the columns are square (40 cm x 40 cm), and beams shown in fig.(D).



D



Good Luck

Part-1-

Solutions

Q1: A: The following assumptions are implicit in the analytical expressions used in the current version of the program:

i- Flow is steady

ii- Flow is gradually varied (except at hydraulic structures such as: Bridge, Culverts, and Weir.

iii- Flow is one dimensional.

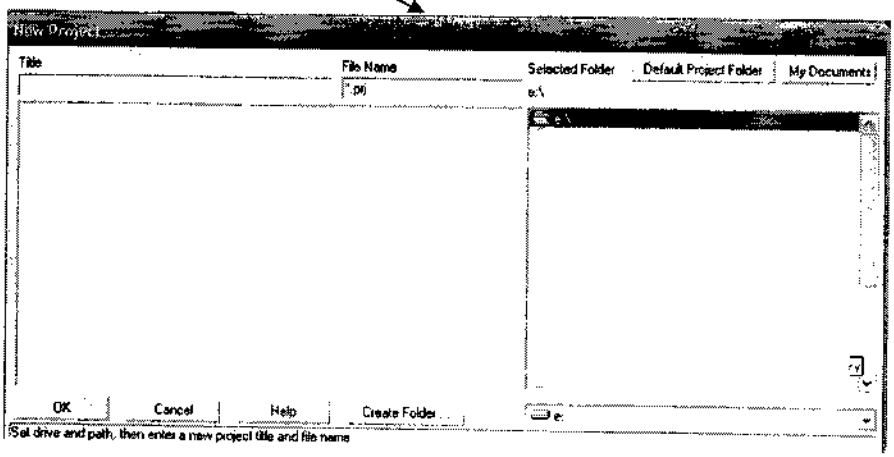
iv- River channels have small slopes, say less than 1:10

B: Hydraulic model is a hydraulic system by whose operation the characteristics of other similar systems can be predicted.

- Physical models: Dimensional analysis forms the basis for the design and operation of physical scale models which are used to predict the behaviour of their full-sized counterparts called prototypes for examples the models that used to design aircraft, ships, submarines, pumps, turbines, harbours, breakwaters, rivers, estuary, spillway and .... Etc.
- Mathematical models: One or more theoretical relationships which can be coupled with similar empirical equation to simulate a physical phenomenon or to estimate one or more of the variables that effected on this phenomenon. Such modelling techniques have progress rapidly due to the advent of high speed digital computers, for example flow situations such as pipe network analysis, pressure transient in pipelines, steady and unsteady flow in rivers.

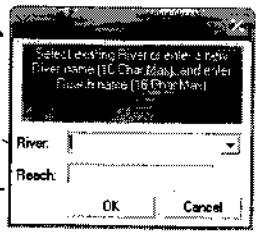
Q2:

1- Starting a new project: File ⟶ New project



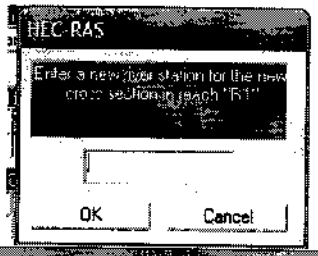
2- Entering Geometric Data : Edit → Geometric data → 

add new river reach → Draw the river reach ( → Draw → )

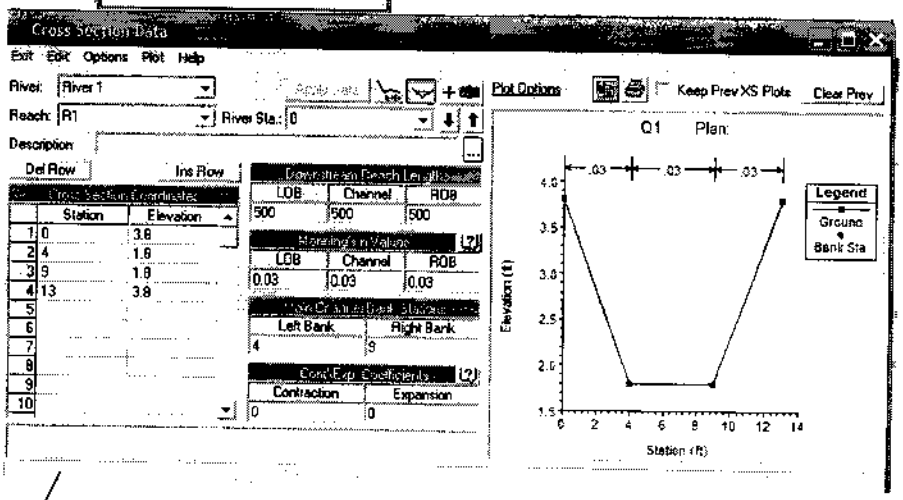


Option ← Edit cross section data

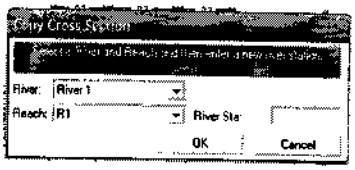
Add new cross



→ Enter cross section data

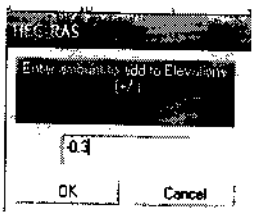


Option ---- copy current cross section -- Channel and ROB from 500 to 0

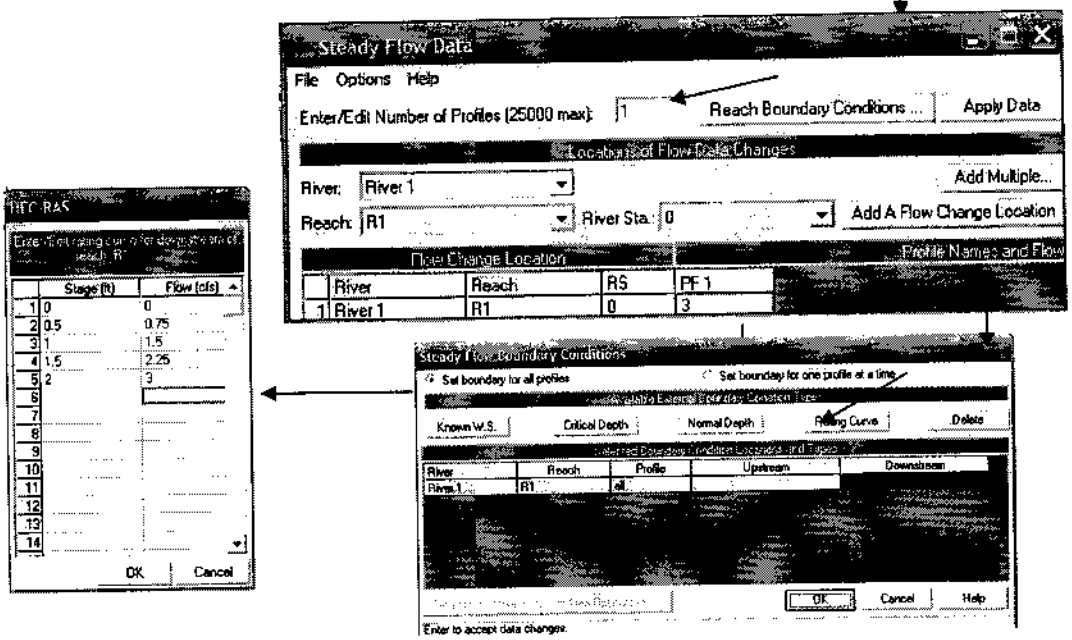


(Change the LOB,

Option ---- adjust elevation



3- Enter flow data and boundary conditions: Edit--- steady flow data

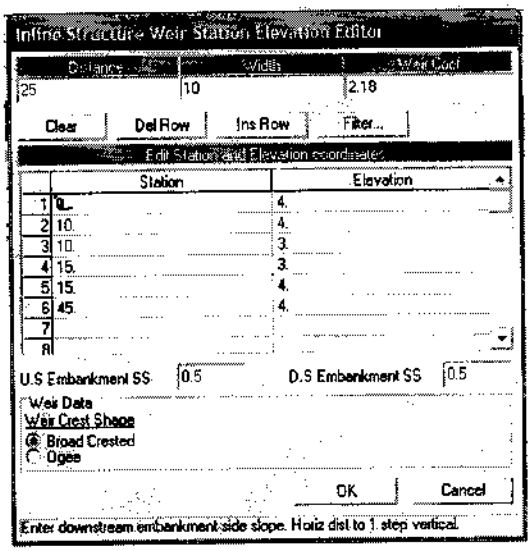


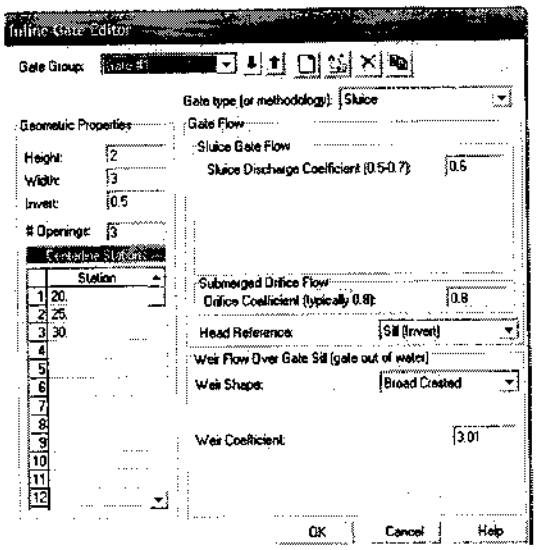
4- Performing the hydraulic calculations

Run---- steady flow data – Compute.

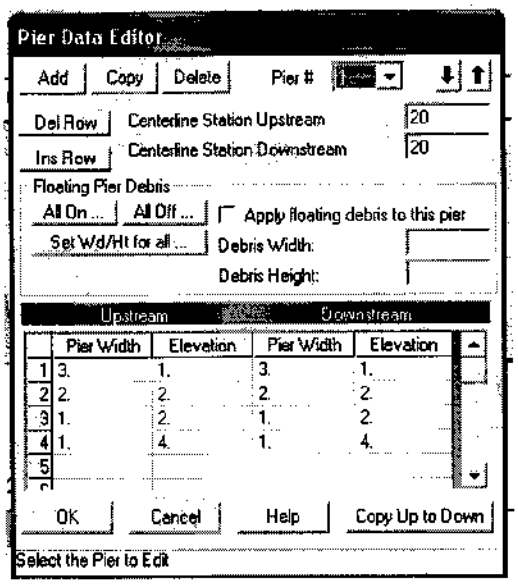
5- Viewing and printing results

Q3: :



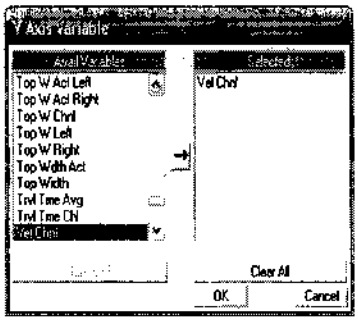


Q4:A:



Q4:B: View---- general profile plot---- Right click --- plot variable---- select vel Chnl

- View ----rating curve---then select the station number.

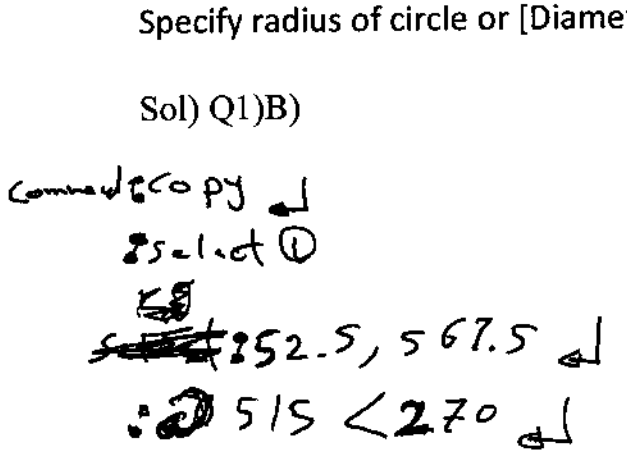


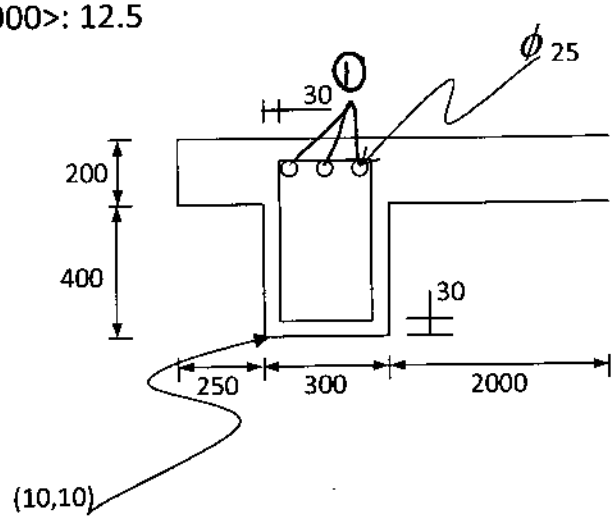
part 2 - Solution

Sol) Q1)A)

Command: _line Specify first point: 10,10
Specify next point or [Undo]: @400<90
Specify next point or [Undo]: @250<180
Specify next point or [Close/Undo]: @200<90
Specify next point or [Close/Undo]: @2550<0
Specify next point or [Close/Undo]:
Command:
LINE Specify first point:
Specify next point or [Undo]:
Command: l
LINE Specify first point: 10,10
Specify next point or [Undo]: @300<0
Specify next point or [Undo]: @400<90
Specify next point or [Close/Undo]: @2000<0
Specify next point or [Close/Undo]:
Command: rec
RECTANG
Specify first corner point or [Chamfer/Elevation/Fillet/Thickness/Width]: 40,40
Specify other corner point or [Area/Dimensions/Rotation]: @240,540
Command: c
CIRCLE Specify center point for circle or [3P/2P/Ttr (tan tan radius)]:
52.5,567.5
Specify radius of circle or [Diameter] <12.5000>: 12.5
Command: c
CIRCLE Specify center point for circle or [3P/2P/Ttr (tan tan radius)]:
160,567.5
Specify radius of circle or [Diameter] <12.5000>: 12.5
Command: c
CIRCLE Specify center point for circle or [3P/2P/Ttr (tan tan radius)]:
267.5,567.5
Specify radius of circle or [Diameter] <12.5000>: 12.5

Sol) Q1)B)





command? copy ↵

: select ②

: 52.5, 567 ↵

: @ 257.5 < 270 ↵

command : mirror ↵

select All

: 2560, 800 ↵

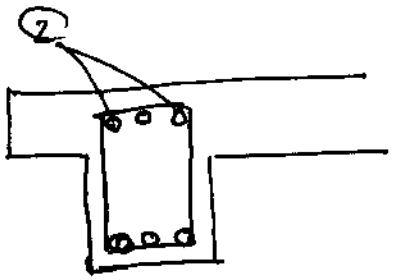
: 2560, 0 ↵

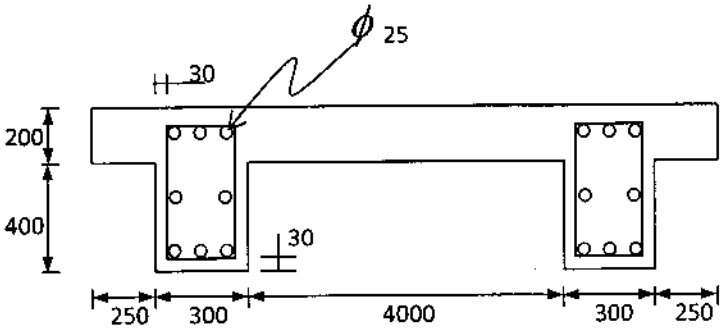
(N ↵

Command : Scale ↵

: Select ⊠ All

: 10, 10 ↵ → 0.5 ↵





Solve Q2)

SUPPORTS
1 4 FIXED
3 4 PINNED
LOAD 1 U.L.
SELFWEIGHT Y -1.2
JOINT LOAD
14 Fy -25
MEMBER LOAD
12 UNI GY -10 1.6667 2.6667
6 7 14 UNI GY -10 0 1.5
8 UNI Y -8 1.2 3.6
8 UNI GX -7 1.2 2.4
13 UNI GY -10
19 CON GY -20
START CONCRETE DESIGN
CODE ACI
DESIGN BEAM 5 to 7 12 to 14 19
DESIGN COLUMN 1 to 4 8 to 11 15 to 18
END CONCRETE DESIGN

Solve Q3)A)

A to B

command? Trim ↵

select all ↵

select ① =

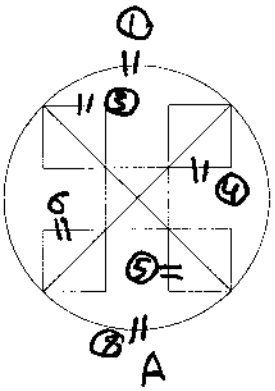
= ②

= 3

= 4

= 5

= 6



B to C

command: copy ↵

select All

one copy only

command: Rotate ↵

: select the copy one

: Center of circle ↵

: 45° ↵

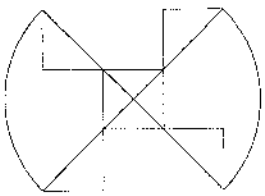
command: move ↵

: Select copy one

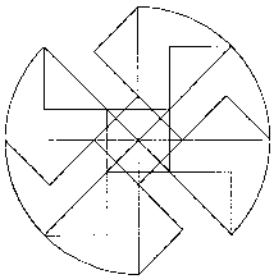
: Center of circle ↵

: move to center of circle

of the original



B



C

Solve Q3)B)

STAAD SPACE
INPUT WIDTH 72
UNIT METER KNS
JOINT COORDINATES

1	2.0	0.0
2	8.0	0.0
3	0.0	4.0
4	2.0	4.0
5	8.0	4.0
6	10.0	4.0
7	2.0	6.0
8	8.0	6.0

MEMBER INCIDENES

1	1	4
2	2	5
3	3	4
4	4	5
5	5	6
6	3	7
7	4	7
8	5	8
9	6	8
10	7	8

MEMBER PROPERTY AMERICAN
8 7 2 1PRI YD 0.4 ZD 0.4

```
 3TO 6 9 10 PRI YD 1.2 ZD 0.8 YB 0.4 ZB 0.6
CONSTANT
E CONCRETE ALL
DENSITY CONCRETE ALL
POISSON CONCRETE ALL
SUPPORT
 1FIXED
 2FIXED BUT FY MZ
LOAD 1 1
JOINT LOAD
 6 3FY -10.
 7 FX 6.1
MEMBER LOAD
 10CON GY -19.05
 4UNI GY -10. 2. 4.
PERFORM ANALYSIS
PRINT ANALYSIS RESULTS
START CONCRETE DESIGN
CODE ACI
DESIGN BEAM 3 TO 6 9 10
DESIGN COLUMN 1 2 7 8
END CONCRETE DESIGN
FINISH
```