Mansoura University
Faculty Of Engineering
Structural Engineering Department

3rd Year Civil, June 16th
Soil Mechanics&Foundation, 2014
Final Exam – 1st Part (65 points)

*Time Allowed (2.0 hours) – 2 pages*

- ***Any missing data can be reasonably assumed***
- ***Attempt all questions***
- ***Neat sketches are required***

**Question # 1 (35 points)**

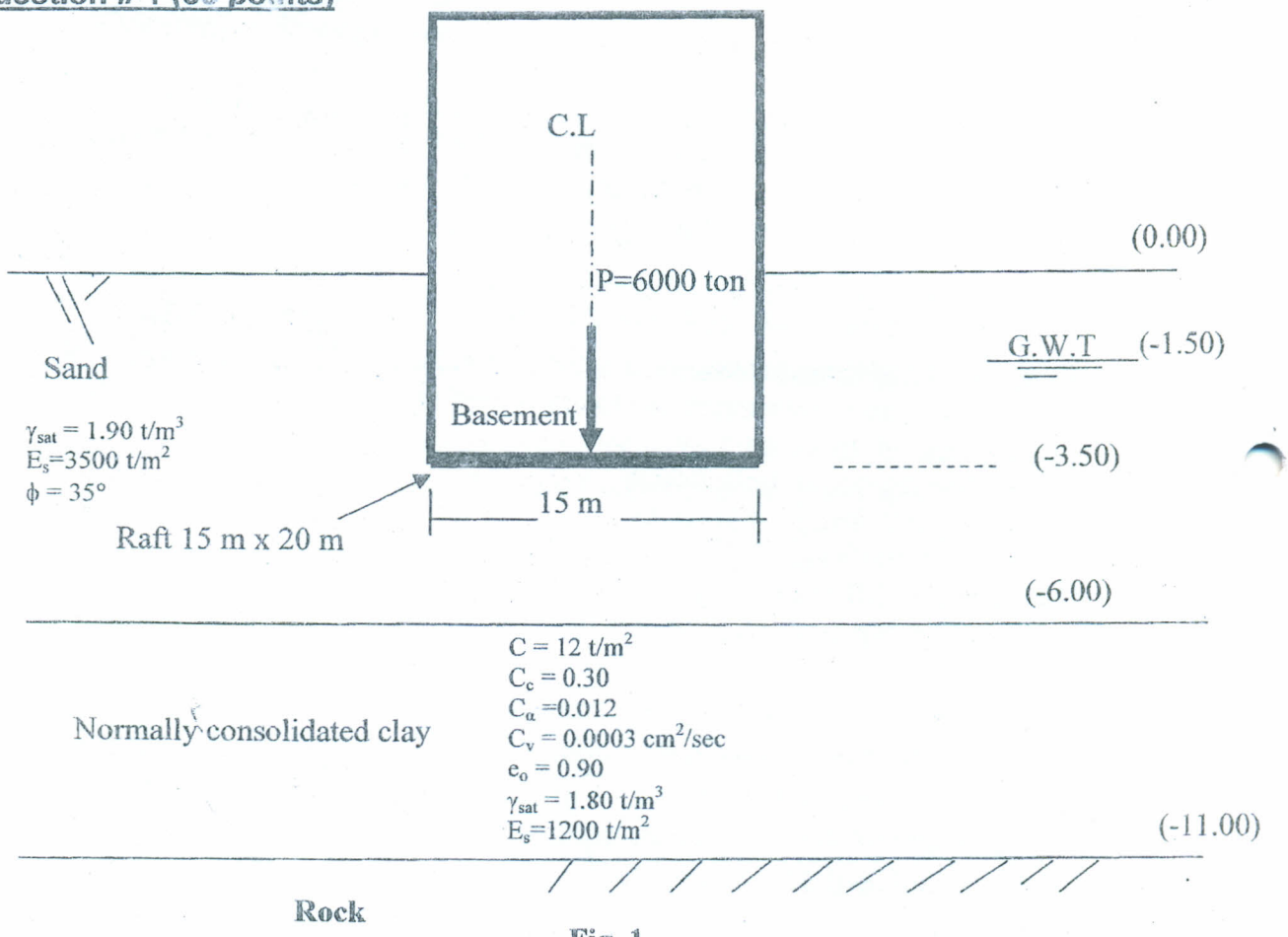



**Fig. 1**

Fig. (1) shows the raft foundation of a building with basement, the resultant of the building loads P is 6000 tons. The soil data are shown in the Figure 1. The time required for 100% degree of consolidation is equal to time required for 90% degree of consolidation.

**It is required to:**

a) **Calculate** the immediate settelement under the raft (flexible)? (5 points)
b) **Calculate** the total primary consolidation settlement under the middle of right edge of the raft.?.....(13 points)
c) **Calculate** the primary consolidation settlement under the middle of right edge of raft after 19 months from the construction.?.....(12 points)
d) If the ground water table (G.W.T) is lowered to a level (-3.5m) after one year from the construction, **what** will be the new total primary consolidation settlement. .....?.....(5 points)

## Question # 2 (15 points)

a) **Show** how one can graphically use the Newmark' chart?.....(3points)
b) **Explain** how one can determine the immediate settlement using the strain influence factor method.....(3 points)
c) **write** whether the following statements are **correct** or not and **correct the wrong one with explaination even true or wrong?:** .....(9 points)

1. The consolidation settlement occurs only for all sandy soils.
2. For caly soil, the immediate settlement is always higher than primary?
3. Newmark's chart method is more exact than 2:1 method.
4. Both of compression index and the swelling index are dimensionless.
5. The strain influence factor method is used for calculating the secondary consolidation settlement for sandy soil only.
6. Newmark's chart can be used only for regular shapes?

## Question # 3 (15 points)

**Determine the vertical total stress**
( due to external load and soil weight) at points **A and B** according to the loaded areas as shown in figure (2) where the depths of both points are 5.0 m, $q_1$=15.0 t/m$^2$ and $q_2$ = 10.0 t/m$^2$
Where the weight of soil if $\gamma_{sat.}$ = 18.1 kN/m$^3$
and the water table is 1.0 m below ground surface.

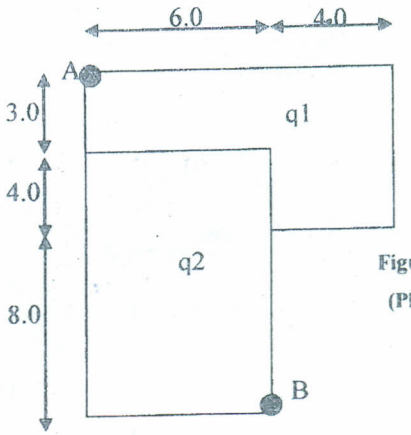
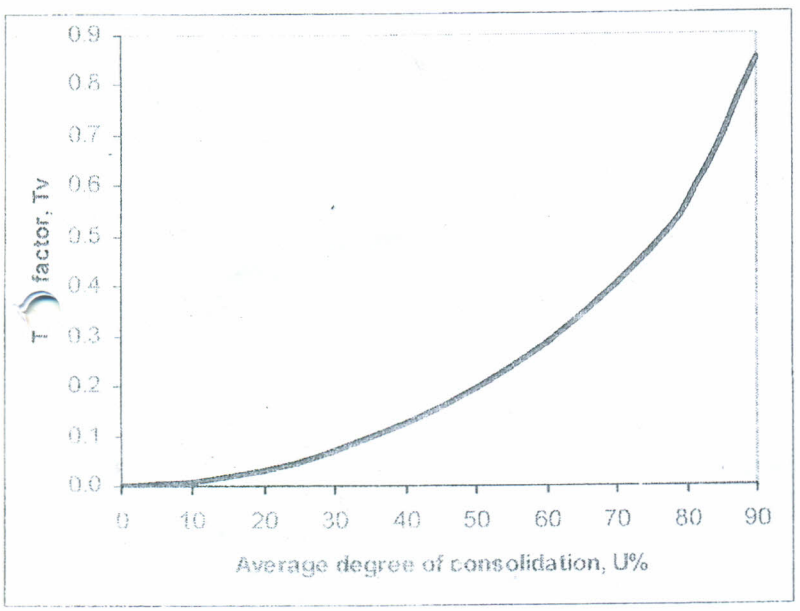
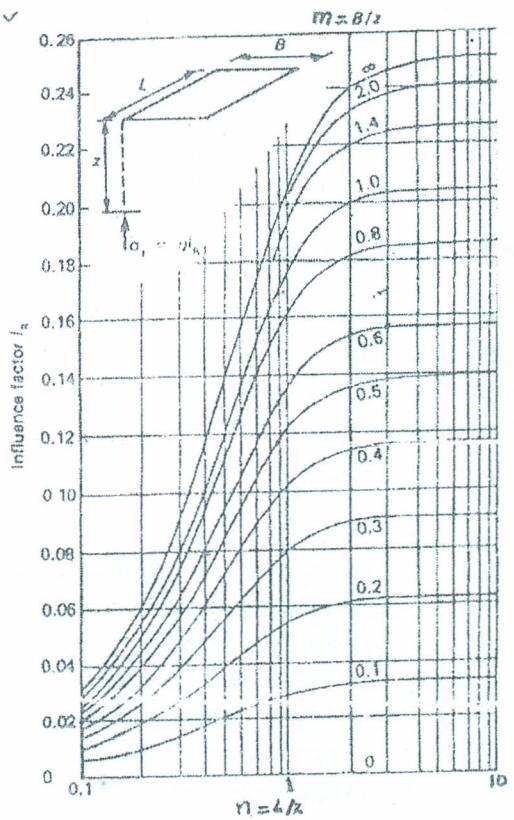


Figure 2
(Plan)



*Fadum's chart*

*With our best wishes*
*Examiner*
*Assist. Prof. Ayman Altahrany,*
*Monday, June16th*
*2014*

Page 2/2 End of Part # 1
Good Luck

**University of Mansoura**
**Faculty of Engineering**
**Structural Engineering Dept.**

**Soil Mechanics & Foundation**
**3rd Year Civil 2013-2014**
**Final Exam, June 2014**

**Time Allowed 2:00 hrs.**

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1. What are the factors which affecting the soil bearing capacity 10%
2. State using clear sketches the different types of shallow foundations and mention their application. 10%
3. A silo, 60.00 m by 25.00 m in plan, is to be constructed on a slab foundation 4.00 m below ground level in a uniform clay deposit with an average undrained shearing strength of 80.00 kN/m$^2$. The clay has saturated density of 19.00 kN/m$^3$ and the water table, although normally at 1.00 m blow the ground surface, may rise to 2.00 m above it in times of flooding.
   - Determine the maximum uniform vertical load which the silo may carry, assuming the dead weight of the complete structure to be $210\times10^3$ kN. Allow for soil adhesion on walls of the silo of 30.00 kN/m$^2$. 25%
   - What is the effect on the factor of safety of the rise of the water level? 10%
4. Determine the maximum vertical load at the ground surface for the column shown in Fig.1 to satisfy the reinforcement and concrete dimensions of the strap beam supported on footing (F) and ground beam (B). Also, make a complete design for the footing (F). The net allowable bearing capacity is 0.80 km/cm$^2$ at the foundation level. ($k_1$=0.40, and $k_2$=1750). 25%
5. For the trial slip surface shown in Fig.2, determine the overall factor of safety against slope failure. 20%

*Best Wishes*

*Prof. Adel Gabr*

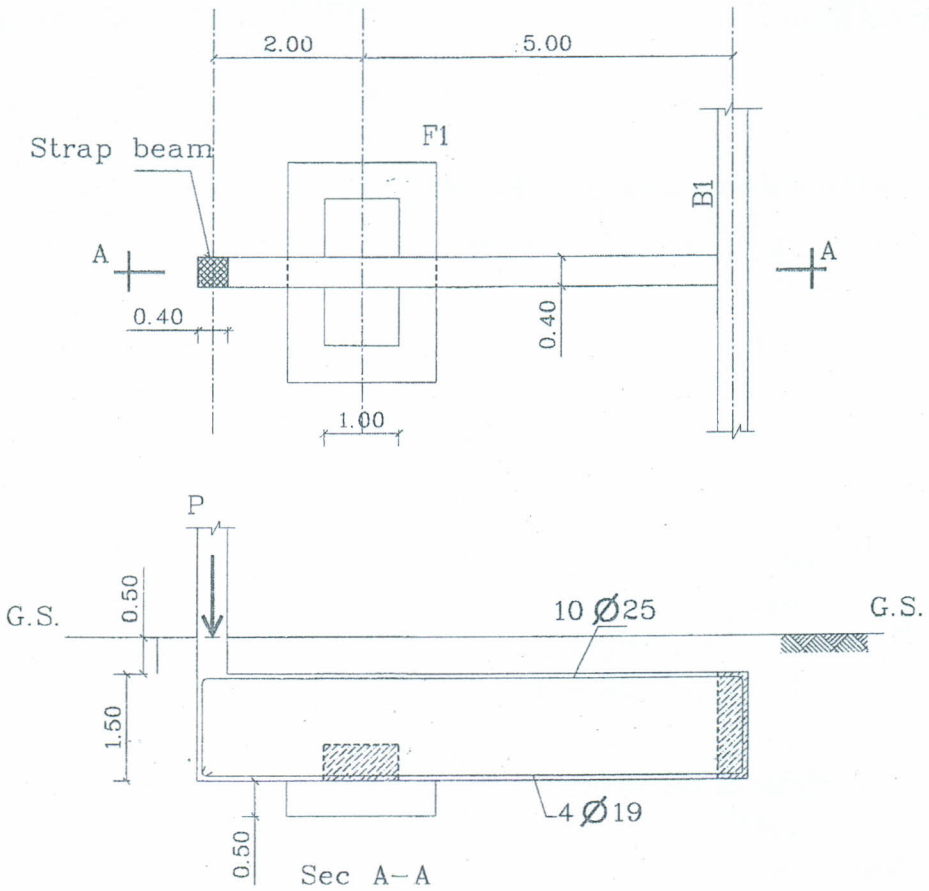
2.00
5.00
Strap beam
F1
B1
A
A
0.40
0.40
1.00
P
G.S.
0.50
10 Ø25
G.S.
1.50
4 Ø19
0.50
Sec A–A

Fig.(1)

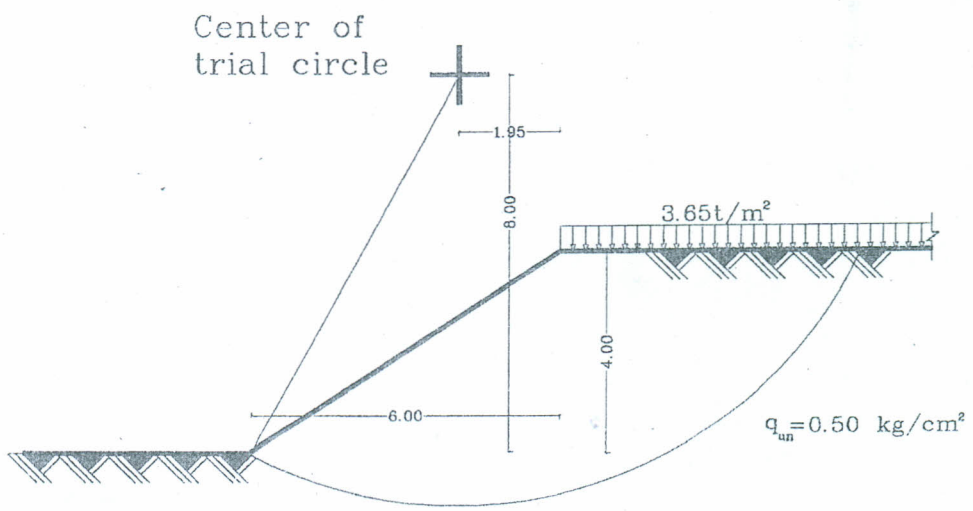
Center of
trial circle
1.95
8.00
3.65t/m²
4.00
6.00
$q_{un}$=0.50 kg/cm²

Fig.(2)