



**University of Technology**  
**Building and Construction Eng. Dept.**  
**Final Exam – First Attempt – 2010/2011**



**Subject : Foundation Engineering**  
**Branch : Roads and Bridges Eng.**  
**Examiner : Dr. Kais Taha Shlash**

**Class: 4<sup>th</sup>**  
**Time : 3 Hours**  
**Date : 29/05/2010**

Closed book  
 (Attempt 10 questions only)

1. Determine the depth of boreholes required for the rectangular footings of a building of dimensions (2x3m) to be placed at a depth of 1 m below ground surface if total and dry unit weights of soil are 18 and 14.5 kN/m<sup>3</sup> respectively. The expected column load is 700 kN and water table is at ground surface.
2. Design a trapezoidal combined footing for the two 50x50 cm. columns shown in Fig. 1 (assume uniform pressure distribution),
3. For the footing shown in Fig. 2, calculate the ultimate bearing capacity.
4. Calculate immediate settlement of sand at corner of footing shown in Fig 3.
5. Calculate consolidation settlement of the footing shown in Fig. 3.
6. Calculate the time required for consolidation settlement of footing shown in Fig. 3 to reach 1 cm. Assume S<sub>c</sub>=2 cm.
7. Estimate the group capacity of piles shown in Fig. 4.
8. A 0.48 m dia. Vibro tube 15.25 m long is to be driven through sandy stratum to get an ultimate pile resistance R<sub>u</sub> =100 tons. The following data are available:  
 Wt. of single acting hammer=3.5 tons, Wt. of Vibro tube=4.58 tons  
 Height of fall of Ram=1.20 m , Inner tube dia.= 0.46 m  
 Wt. of driving cap & plastic dolly= 0.4 tons  
 To what set the tube must be driven ?
9. Estimate the ultimate pile capacity from the pile test results:
 

Load (tons)	sett.(mm)	Load(tons)	sett.(mm)
0.	0.	312.5	3.048
62.5	0.381	375.	4.953
125.	0.762	437.5	7.366
187.5	1.448	500.	9.779
250.	2.082		
10. Calculate the factors of safety (F.S.<sub>sliding</sub> & F.S.<sub>overturning</sub>) of the sheet pile shown in Fig. 5.
11. For the pile group shown in Fig. 6 , calculate P<sub>max</sub> , P<sub>min</sub> , and P<sub>5</sub>.
- 12 . Design a pile foundation (pile group) to carry a column load of 300 tons using precast piles 0.3x0.3 m .The capacity of each single pile is 30 tons.

Given:-  $R_u = \frac{W h \gamma}{s + c}$

$S_i = q B \frac{1 - \nu^2}{E_s} I_w$

$S_c = \frac{c_c}{1 + e} H \log \frac{P_0' + \Delta P_0'}{P_0'}$

$T = \frac{c_v \cdot t}{H^2}$  ,  $T = \frac{\pi}{4} \left( \frac{U_z}{100} \right)^2$

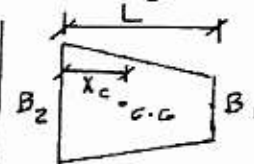
$E_g = 1 - \alpha \left[ \frac{(m-1)n + (n-1)m}{90 mn} \right]$

$q_{ult} = 5.14 S_u [1 + S_c' + d_c'] + q'$

ملاحظة:

١. الإجابة عن عشرة أسئلة فقط.

٢. توزيع ورقة بيانية



$X_c = \frac{L}{3} \frac{(2B_1 + B_2)}{(B_1 + B_2)}$

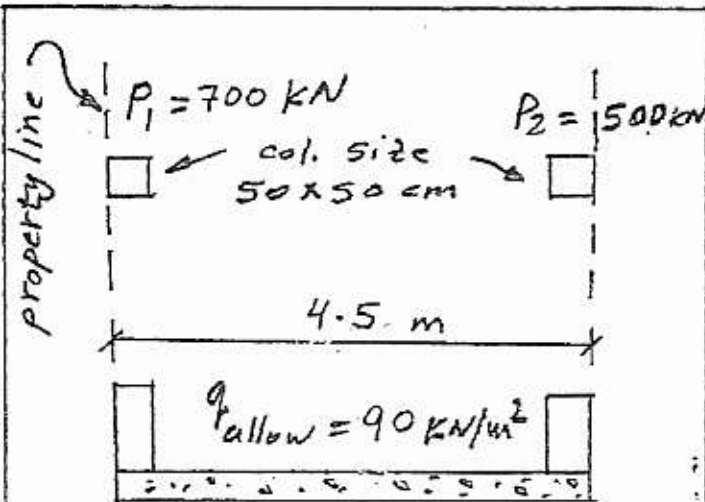


Fig. (1)

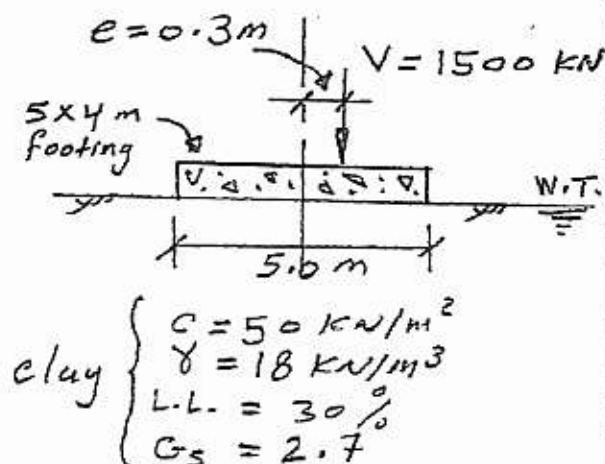
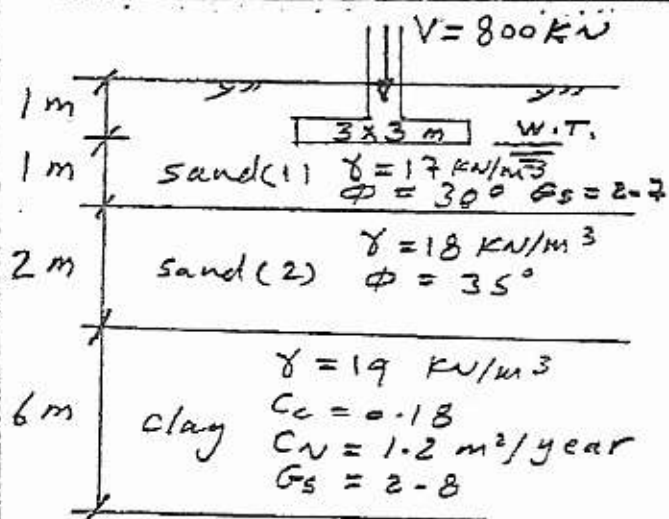


Fig. (2)



Sand  
Fig. (3)

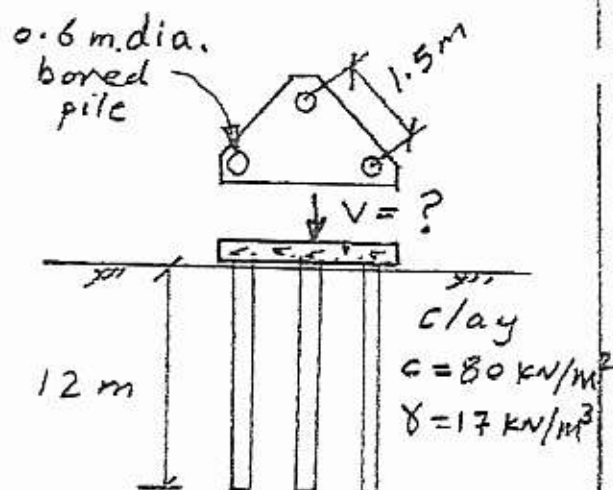


Fig. (4)

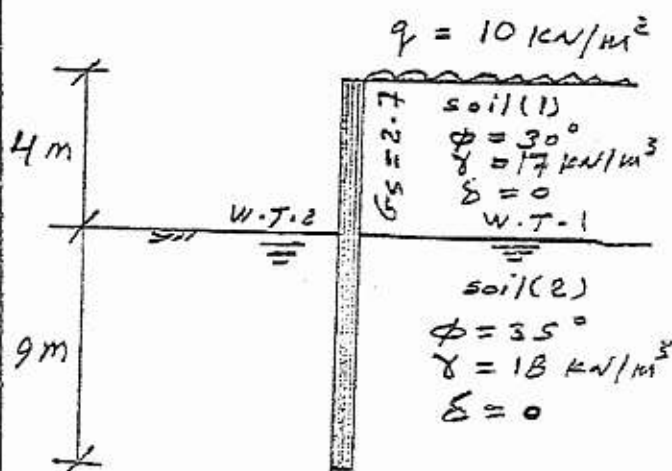


Fig. (5)

$V = 7000 \text{ kN}$   
 $M_y = 3000 \text{ kN}\cdot\text{m}$

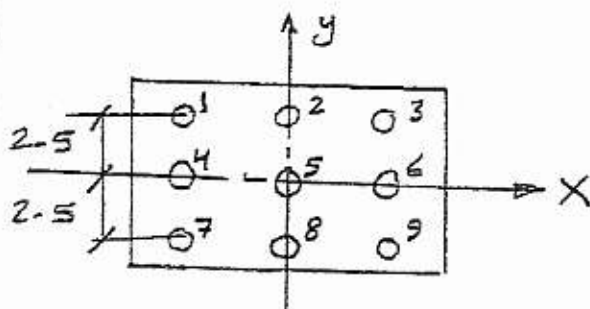


Fig. (6)