ميكانيكا التربة (١)

Kafrelsheikh University
Faculty of Engineering
Department of Civil Engineering
2nd year, Soil Mechanics
Name: .....

Date: 21- 5 - 2018
Time allowed: (3) hours
Full Mark: 75
Final Exam: 2 pages

Answer all questions; Any missing data to be reasonably assumed
ILOS for this course are A2 ; A3; B2;B11; C1, C5; C7; D1 and D4.

Question 1 (25 Mark)

a) The result obtained from an oedometer test conducted on a sabkha soil sample for stress increment 224-448 kPa is shown in Fig. 1. The initial sample height is 19.0 mm, and there are porous stones on the top and bottom of the sample. Determine:

i) The secondary compression index, C_α.
ii) The coefficient of consolidation, C_v.
iii) The amount of primary consolidation settlement.
iv) The amount of secondary consolidation settlement.

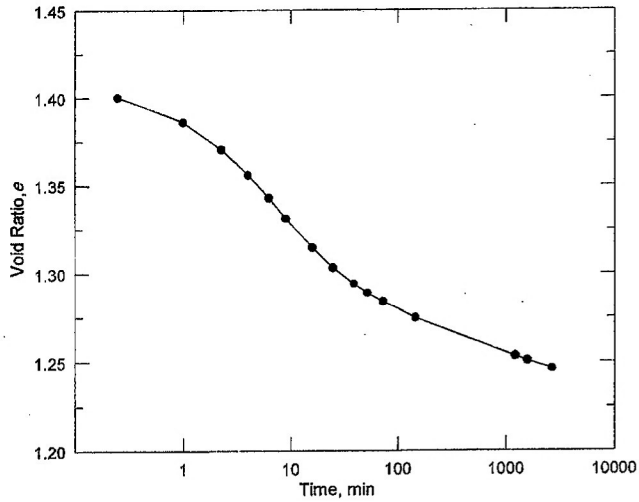

Fig. 1

b) Find the settlement at the end of 6 months of a clay deposit, 4-m thick, if it is additionally loaded to 60 kPa. The clay has a permeability of 0.02 m/year and is underlain and covered with a coarse sand. Tests on laboratory specimens indicate that 50% field consolidation will take place in 6 months. Consider the initial pore water pressure to be constant with depth.

Question 2 (25 Mark)

a) A number of assumptions were made in deriving Terzaghi's one-dimensional equation of consolidation. List four of these assumptions and discuss one of them in detail.

b) The maximum and minimum dry unit weights of a sandy soil were determined in the laboratory to be 16.5 kN/m^3 and 14.6 kN/m^3, respectively. If the relative density of compaction in the field for the same sand is 70%, determine: i) The soil relative compaction; ii) The soil dry unit weight.

c) A footing is to be located 2 m below ground level, as shown in Fig. 2. The base of the square footing is 2 m x 2 m and carrying a load of 2000 kN. The value of the compression index, C_c =0.28 and the initial void ratio e_o=0.85. a. Compute the expected primary consolidation settlement for the normally consolidated clay layer. Calculate the time required for 90% of settlement to complete in days if the coefficient of consolidation c_v=0.003cm^2/sec.

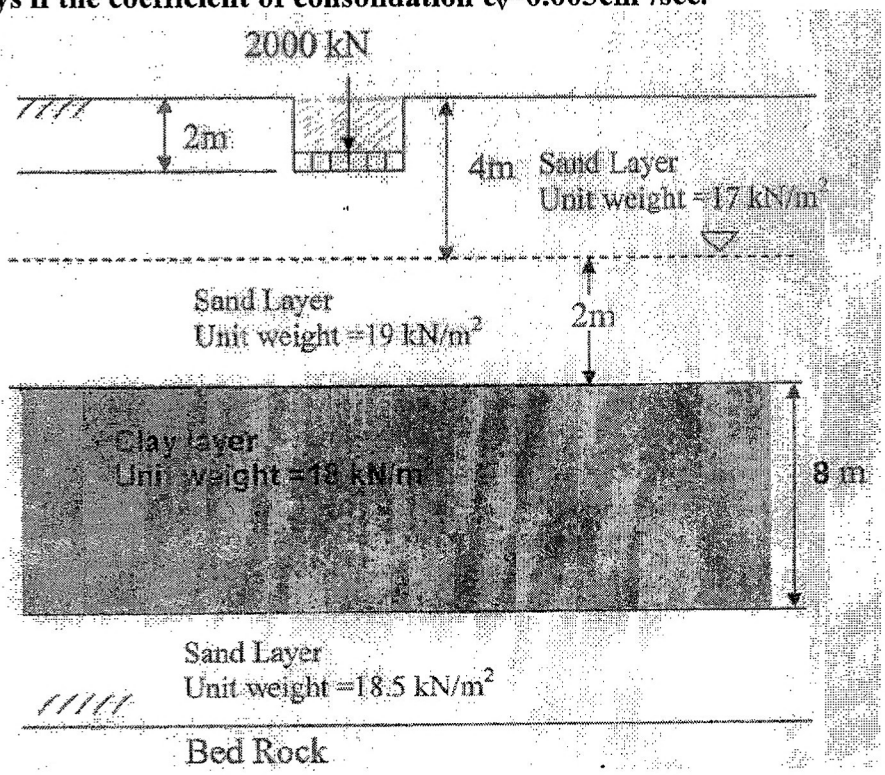

Fig. 2

Question 3 (25 Mark)

a) Find the increase of pressure at points A and B to loading q = 1200kN/m^2 on the given strip footing shown in Fig. 3. Provide solutions based on Boussinesq equation and Newmark charts. (Hint: scale line 4 cm ; 5 circle and 12 sector)

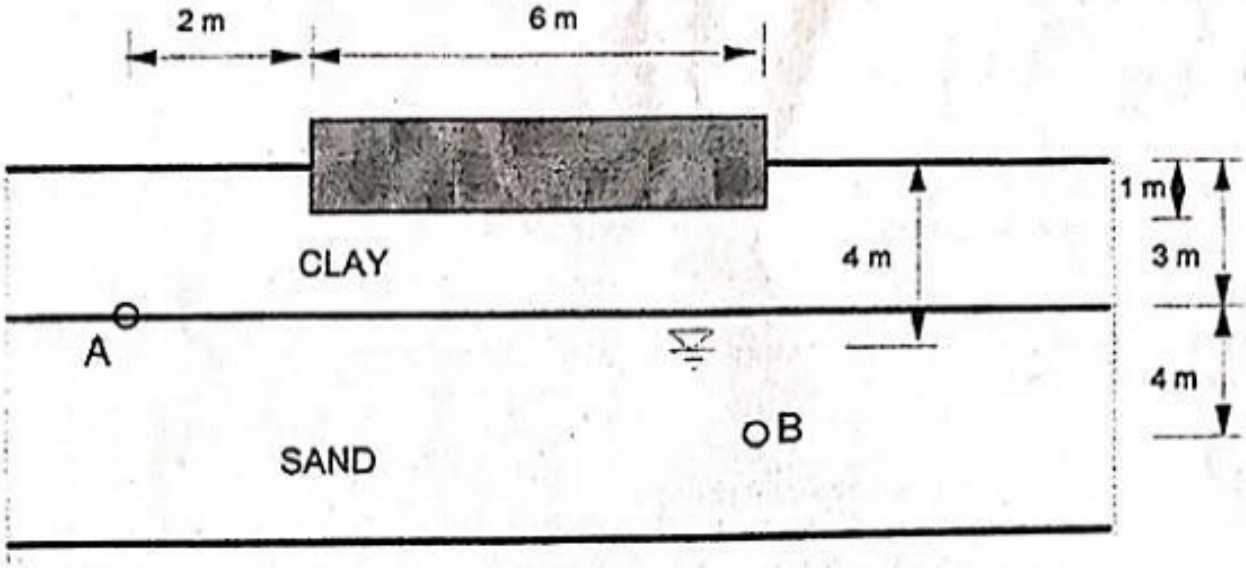

Fig. 3

b) Calculate and draw diagrams of distributions of the total stress, the effective stress and pore water pressure for the soil system presented in Fig. 4.

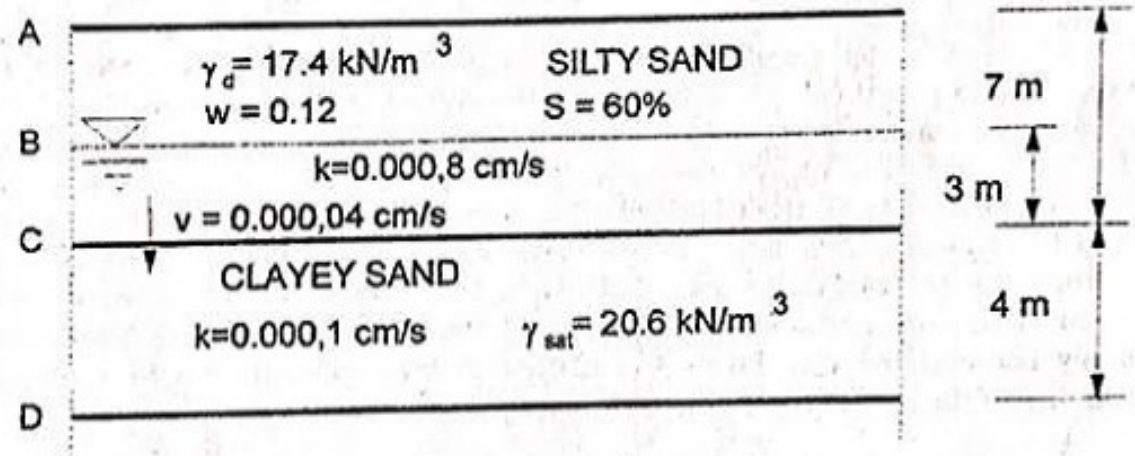

Fig. 4

c) A shear box test was carried out on a sandy clay yielding the following results;

Normal load (kg)	11.0	20.5	30.0	39.5	47.5	55.1
Shear load at failure (kg)	15.0	20.5	24.0	30.5	33.50	40.0

Determine the apparent cohesion and angle of shearing resistance for the soil. Describe the soil state.

c) A clay sample, containing its natural moisture content, weighs 0.333 N. The specific gravity of solids of this soil is 2.70. After oven-drying, the soil sample weighs 0.2025 N. The volume of the moist sample, before oven-drying, found by displacement of mercury is 24.30 cm3. Determine the moisture content, void ratio and degree of saturation of the soil.

d) State limitations for the direct shear test.

e) Distinguish between Texture and Structure of soil.

f) Briefly describe the processes of soil formation.

g) What is the effect of pore pressure in strength of soils?

Best Wishes