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

Date: 21- 5 - 2016
Time allowed: (3) hours
Full Mark: 75
Final Exam: 2 pages

Answer all questions. Any missing data to be reasonably assumed.

Question (1):

a) Describe how you can perform water content test.

b) Describe how you determine the liquid limit of the soil particles.

c) Describe how you determine the coefficient of hydraulic permeability for clay soil in the laboratory test.

Question (2):

a) Define Water Content – Specific Yield– Specific Retention - Porosity - Total Stress - Effective Stress - Aquifer - Aquitard- Confined Aquifer - Liquid Limit, Plastic Limit, Shrinkage Limit, and Plasticity Index.

b) For soil profile shown in Fig. (1); classify the shown soil and give short description.

c) A partially saturated soil from an earth fill has a natural water content of 19% and a bulk unit weight of 19.33 kN/m^3. Assuming the specific gravity of soil solids as 2.7, compute the degree of saturation and void ratio. If subsequently the soil gets saturated, determine the dry unit weight and saturated unit weight.

Question (3):

a) Drive an expression relating critical hydraulic gradient i_{cr}, void ratio e, and specific gravity G_s.

b) Fig. (2) shows a constant head permeability test. Where the cross section of soil sample is circular and discharge is 200 mm^3/sec. It is required to determine;

- The hydraulic gradient for soil 1 and soil 2.
- The coefficient hydraulic conductivity in soil 1 and soil 2.
- The pore water pressure at the boundary surface between the two soil.
- The seepage force for soil 1 and soil 2.

c) Construct a Newmark chart consists of 8 circles and 12 sectors (take z = 5cm)

d) The plan of a foundation is shown in Fig. 3. The uniform pressure on the soil is 50 kN/m^2. Determine the vertical stress increment due to the foundation at a depth of 5 m below the point A.

Question (4):

a) The result of a laboratory consolidation test on a soil sample at elevation 27.0 are given below:

Applied stress, kN/m^2	23.94	47.88	95.76	191.52	383.04	766.08
Void ratio	1.112	1.105	1.080	0.985	0.850	0.731

- Plot an e-log σ curve
- Plot an e- σ curve
- Find the coefficient hydraulic conductivity
- Find the settlement due to lowering of the phreatic surface only from elevation 39.0 m to 34.0 m using soil profile shown in Fig. (1)

(42.00)

Fill $\gamma = 16$ kN/m^3

(39.00)

γ_{sat} =16.5 kN /m^3

$D_{10\%} = 0.20$ mm $\quad e_{max} = 0.80$

$D_{30\%} = 0.60\ mm$

(32.00) $D_{60\%} = 1.50\ mm$ $\quad e_{min} = 0.25$

γ_{sat} =15.0 kN /m^3

L.L = 70, PL = 30, WC = 40

(22.00)

γ_{sat} =18.0 kN /m^3

$D_{10\%} = 2.50$ mm

$D_{30\%} = 5.0\ mm$

(15.00) $D_{60\%} = 9.0\ mm$

(12.00) Rock

Fig.(1)

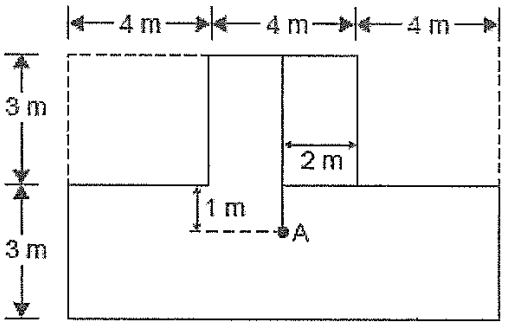


Fig.(3)

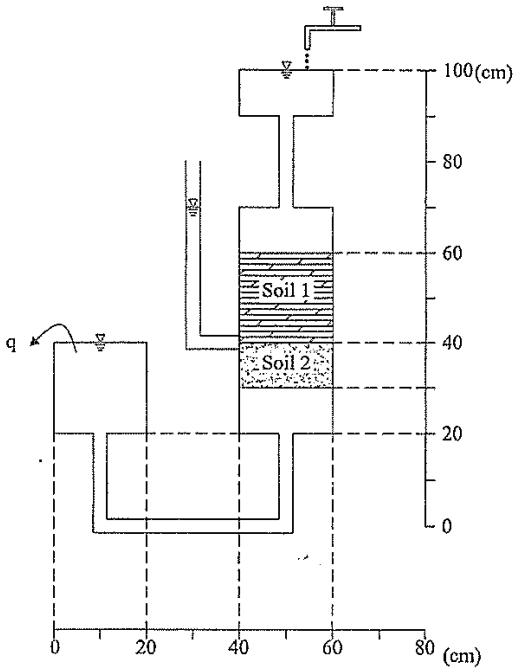
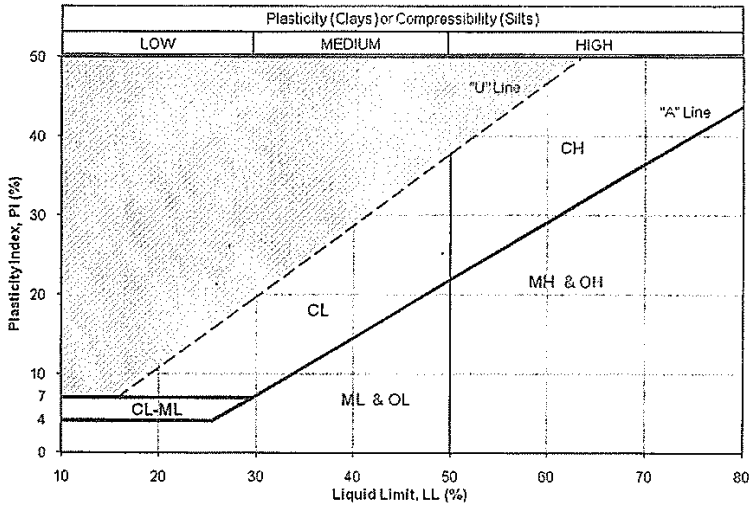


Fig.(2)



Best wishes **Dr Ali Mohamed Basha**