Minufiya University
Faculty of Engineering
Final Exam
Academic Year: 2013-2014
Department: Architectural Eng.

Year: 2nd Arch.
Subject: Soil Mechanics & Foundations
Code: CVE 227
Time allowed: 3 hours
Date: 1/6/2014
Max. Degree: 60

Marks

Question (1): (15)

a) Discuss the difference between the following : (6)
- Physical and chemical weathering
- Water content and degree of saturation
- Well graded and poorly graded soil

b) The weight of a partially saturated soil sample is 115 gm and its volume is 86.2 cm^3. After oven drying the weight of the sample reduces to 50 gm. The specific gravity of the soil grains is 2.7. Find the water content, void ratio, degree of saturation and the dry unit weight. (4)

c) State whether the following statements are true or false and correct the false statements: (5)

1) Flocculated soil structure can not be transformed into oriented structure.
2) Gap- graded sand has particles mainly of just one size.
3) Effective stresses in soil increase when the water table rises.
4) A fine- grained soil has a liquid limit of 60% and a plastic limit of 25%. This soil is classified as: CL
5) Soil grains are incompressible. Their weight and volume remain the same at any void ratio.

Question (2): (15)

a) Explain how water content can be determined in the laboratory. (3)

b) Sieve analysis test on a sample of coarse soil weighing 500 gm was conducted with the following records: (6)

Sieve no.	4	10	20	40	60	100	200	pan
Sieve opening (mm)	4.75	2.00	0.85	0.425	0.250	0.15	0.075	_
Weight retained (gm)	0	50	150	75	75	100	35	15

Without drawing the grain size distribution curve, determine
- The percentage of fines, sand, and gravel in the sample.
- The uniformity coefficient and the coefficient of curvature.

c) Define the consistency limits of a cohesive soil. Use a sketch to show the different states and limits. (4)

d) Prove that: $W_c = \frac{S_r \times e}{G_s}$ (2)

Question (3): **(15)**

a) The soil at a site consists of 6.0 m of fine sand starting at ground surface followed by 8.0 m of clay. The water table is located at a depth of 2.0 m below the ground surface. The water content of the clay is 20% and G_s=2.70. The submerged unit weight of fine sand is 1.1 t/m^3 and its bulk unit weight is 1.84 t/m^3. Calculate the total vertical stress at mid height of the clay layer. (4)

b) A square footing of width (B) applies a uniform stress (q) to the underlying soil. Using the approximate method, estimate the depth at which the increase in vertical stress ($\Delta\sigma$) is 20% of the applied stress (q). (4)

c) Discuss using sketches the construction of 'Newmark's chart' and explain its use. (4)

d) Define the pressure bulbs and show how they can be used in deciding depth of boring. (3)

Question (4): **(15)**

a) Draw a neat sketch for the direct shear test. What are the advantages and disadvantages of this test? (6)

b) The following results were obtained at failure from direct shear tests on samples of soil: (4)

Normal load (kg)	144	72	36
Shear force (kg)	198	126	90

- Find the shear strength parameters.
- For what type of soil would results such as these be expected?

c) The soil at a site is formed of sand. The ground water table is located at a depth of 3.0 m below the ground surface. The angle of internal friction of sand is 35°. The bulk unit weight of sand is 1.80 t/m^3 and its saturated unit weight is 2.10 t/m^3. Determine the shear strength on a horizontal plane at depth 5.0 m below the ground surface. If the ground water table rises to the ground surface, find the change in shear strength at the same depth. (5)

With my best wishes,
Dr.Ahmed Abdel-Galil

This exam measures the following ILOs													
Question Number	Q1-a	Q2-c	Q3-c	Q3-d	Q4-a	Q1-b	Q2-b	Q2-d	Q4-b	Q4-c	Q1-c	Q2-a	Q3-b
Skills	a3-2	a3-2	a6-1	a6-2	a14-2	b5-1	b2-2	b5-2	b5-1	b2-1	c2-1	c5-1	c2-1
	Knowledge &Understanding Skills					Intellectual Skills					Professional Skills		