In the name of Allah, Most Gracious, Most Merciful

King Fahd University of Petroleum & Minerals

Civil Engineering Department

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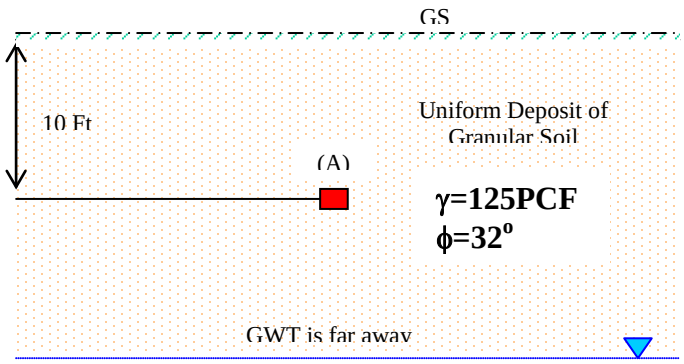
CE 353

Homework # 09

Due May 03rd (Monday), 2010

Question 1



Referring to Fig. 1 shown above, answer the following questions:

(a) What is the shearing strength of the soil on a horizontal plane at point (A) assuming water table has insignificant influence?

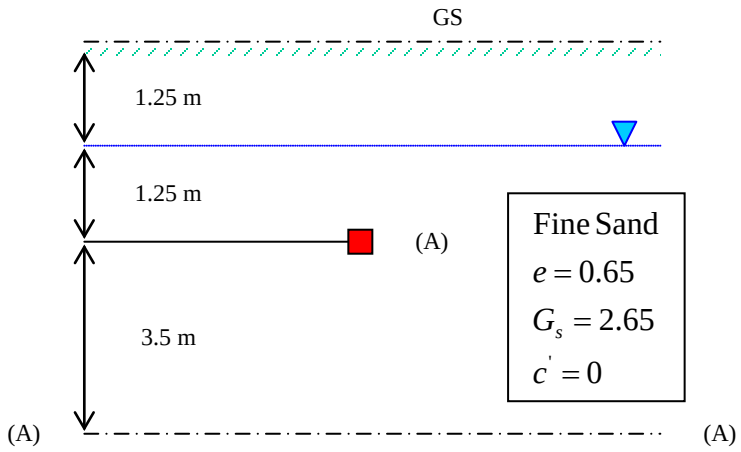
(b) If a proposed structure will cause the vertical stress to increase 1200 PSF at point (A), assuming that the weight of the structure also causes the shearing stress to increase to 1000 PSF on the horizontal plane at point (A). Does this shearing stress exceed the shearing strength of the soil? Show up your calculations.

(c) What is your answer to part (b) if the ground water table has risen to the ground surface?

Question 2

A cohesive soil has an angle of shearing resistance of $\phi_u = 15°$ and a cohesion of $C_u = 30$ kN/m^2. If a specimen of this soil is subjected to a triaxial compression test, then (by means of Mohr's Circle Method) find the value of the lateral pressure in the cell for failure to occur at a total axial stress of 200 kN/m^2.

Question 3



Referring to Fig. 2 shown above, answer the following questions:

(a) Compute the unit weight of the sand in the following cases:
   i) if the sand is dry
   ii) if the sand has reached 50% saturation
   iii) if the sand is fully saturated

(b) Draw a diagram showing the distribution of the effective vertical pressure and pore water pressure on horizontal sections (A-A) through the deposit to a depth of 6m, if the water table stands at 1.25m below ground level (assuming the soil is fully saturated above the water table).

(c) Estimate the percentage increase in shear strength of the sand at point A. If due to drainage the water table is lowered to 3m below ground level (assuming that the soil remains fully saturated for a height of 1.5m above the water table, and that above this level it has a mean degree of saturation of 50%).

Question 4

For the element shown in Fig. 3 below, and using Mohr's Circle Method, determine the following:

(a) the magnitude and direction of the principal stresses
(b) stresses on the horizontal plane A-A