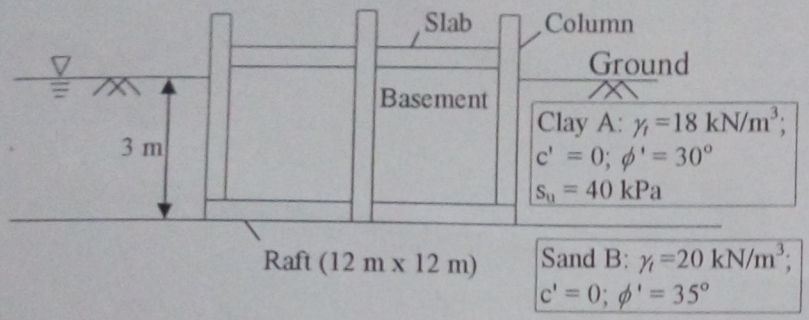
CEL 321 : Geotechnical Engineering

Minor Test II (October 9, 2014)

Max Marks: 15 Time: 1 hr

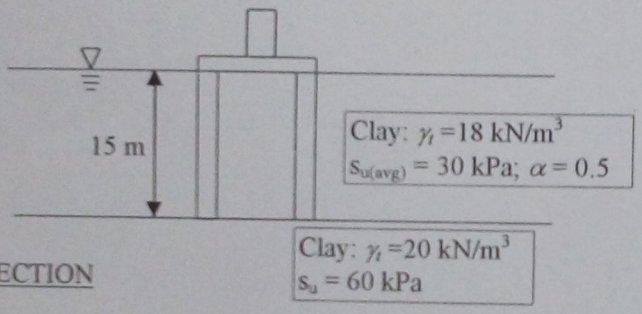
Q.1 Find the **ultimate** bearing capacity and **net safe** bearing capacity for the footing shown below using Terzaghi's theory. (3)



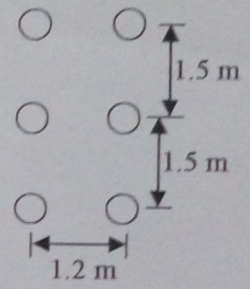
Use the following data:

ϕ	N_c	N_q	N_γ
30°	37	22	20
35°	38	41	42

Q.2 Compute the **net safe** bearing capacity of the 6-pile group shown below. (4)
(diameter of all piles = 600 mm)

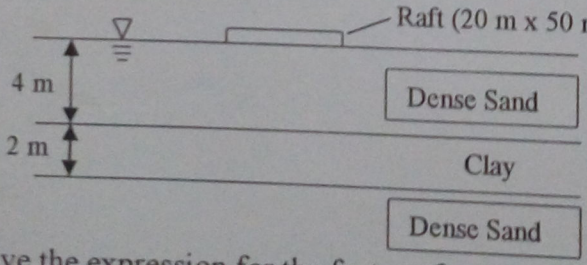


SECTION



PLAN

Q.3 The base of a 20 m x 50 m raft near the ground surface applies a stress of 100 kPa to the subsoil. The base rests on dense sand up to 4 m depth followed by a clay layer of 2 m thickness having compression index of 0.40 and initial void ratio of 1.0. The clay is followed by more dense sand. Find the maximum settlement that will occur due to consolidation of clay. Water table is at the ground surface and the total unit weight of dense sand is 20 kN/m^3 and of clay is 18 kN/m^3. For settlement calculation, divide clay layer in two equal parts. (4)



Q.4 Derive the expression for the factor of safety of an infinite slope on a sandy soil (c = 0 and $\phi = \phi$) wherein the ground water table is parallel to the slope at a height of mz ($0<m<1$) above the slip surface and steady seepage is taking place in a direction parallel to the slope, as shown. The slip surface is at depth z.
Using this expression, find the factor of safety for a slope with β = 15 degrees, z = 5m, m = 0.6, γ_{t1} = 16 kN/m^3, γ_{t2} = 20 kN/m^3, and ϕ = 30°. γ_{t1} and γ_{t2} are total unit weights above and below the ground water table. (4)