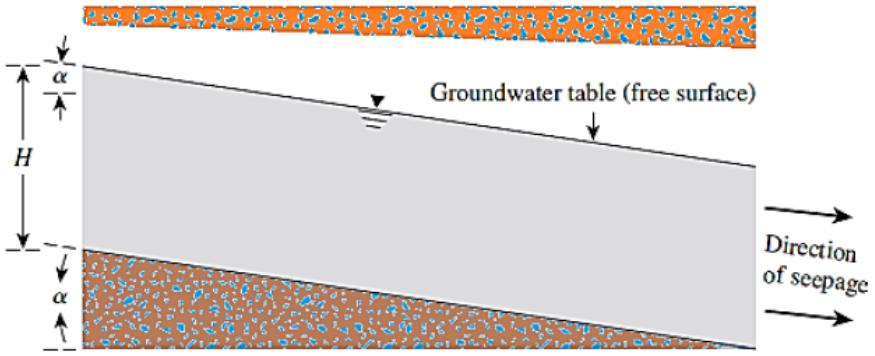
Birzeit University
Faculty of Engineering
Department of Civil and Environmental Engineering
ENCE 331, Soil Mechanics
First semester 2020-2021
Final Exam

Question 1: (15 Points)

A permeable soil layer is underlain by an impervious layer as shown in Figure. Knowing that k = $6*10^{-2}$ cm/sec for the permeable layer,
Calculate the rate of seepage through this layer m^3/day/m width. Given: H = 6 m and α= 6°.

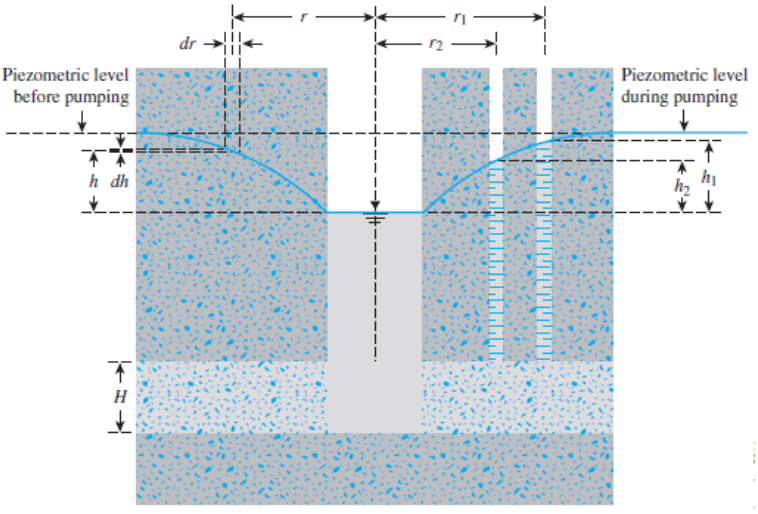


Question 2: (15 Points)

A pumping test was performed in a well penetrating a confined aquifer to evaluate the coefficient of permeability of the soil in the aquifer. When equilibrium flow was reached, the following data were obtained:

1. Equilibrium discharge of water from the well is 200 cm^3/sec.
2. Water levels (h_1 and h_2) = 6 and 4.5m and at distances from the well (r_1 and r_2) of 36 and 18m, respectively.
3. Thickness of aquifer =5m.

Find the coefficient of permeability (cm/day)

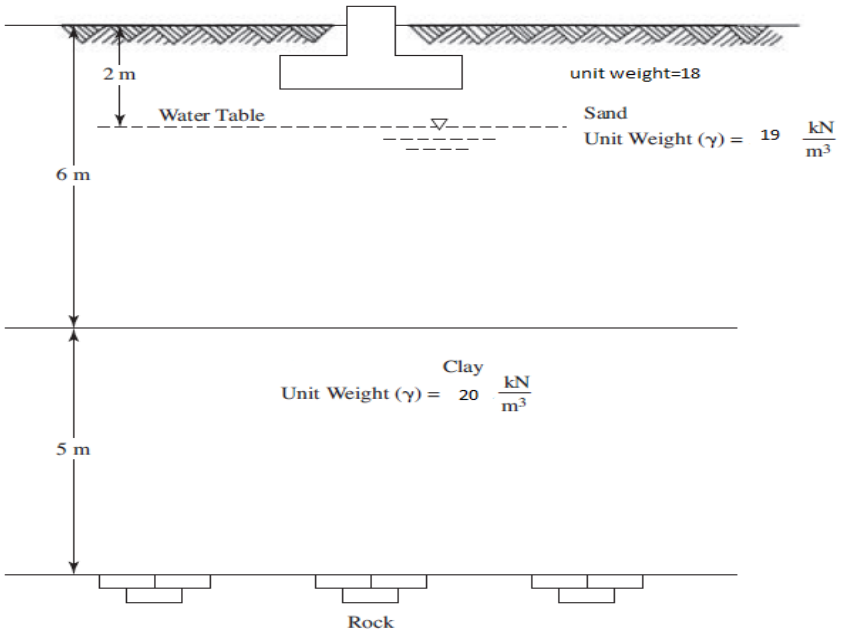


Question 3: (35 Points)

A square footing (2x2) m at a depth 1m from the surface, carrying a load of 4000 kN and resting on soil profile as shown.

- Given: e_0=1, $\sigma_c^{'}$ =70 KN/m^2, C_c =0.4, C_s=0.03, C_v=0.03 cm^2/sec, Calculate the expected primary consolidation settlement.

- If the primary consolidation is 20 cm
  1. What is the time in (days) required for 5 cm consolidation settlement to occur?
  2. After 25 days, what is the amount of consolidation settlement.
  3. What is the modulus of elasticity of the soil?



Question 4: (15 Points)

A series of direct shear tests were performed on a soil sample. Each test was carried out until the specimen sheared (failed). The laboratory data for the tests are tabulated as follows.

Sample No.	Normal stress (kN/m^2)	Shear stress (kN/m^2)
1	10	22
2	20	26
3	30	30
4	50	37

- Determine the shear strength parameters.
- What is the type of the soil?
- Plot the relationship between the shear displacement and shear stress also draw the failure envelope.