1. Determine the distribution of (a) the total stress, (b) the effective stress, and (c) the pore water pressure within the soil profile shown in the following figure. $H_1 = H_2 = H_3 = 4m$. Assume the degree of saturation in capillary rise zone is 60%. (15%)

![Soil Profile Diagram](image)

2. Three piezometers have been installed in the confined aquifer shown in the following figure. The coefficient of permeability of the aquifer is 0.2 cm/sec. Determine (a) the hydraulic gradient, (b) the direction of flow, and (c) the flow rate per unit width of the aquifer. (20%)

![Piezometer Diagram](image)
3. The friction angle of a normally consolidated clay specimen collected during field exploration was determined from drained triaxial compression tests to be 25\(^\circ\). The unconfined compression strength of a similar specimen was found to be 100 kN/m\(^2\). Determine (a) the pore water pressure, (b) the minor principle effective stress, and (c) the minor principle total stress, (d) the major principle total stress at failure for the unconfined compression test. (15%) 

4. (a) Estimate the resultant force acting on the retaining wall shown below left for conditions of the water table below the wall. (5%)  
(b) Estimate the resultant force if the water level behind the wall rises to the top of the backfill. (10%).

![Diagram of a retaining wall with soil properties](image)

5. A square footing shown above right is subjected to a load of 300 kN in a saturated clay layer. If the compression index \(C_c = 0.3\), recompression index \(C_r = 0.06\), preconsolidation stress \(P_c' = 40/\) kN/m\(^2\), and initial void ratio \(e_0 = 0.8\), calculate the settlement of the footing. (Assume the stress spread downward at a slope of 1 horizontal to 2 vertical from the edge of the loaded area.) (20%).

6. (a) What is likely to have greater axial capacity, a driven 60 cm diameter pile or a 60 cm diameter cast in place pile? Explain. (5%).  
(b) Is it possible for a footing to "fail" without exceeding the bearing capacity? Explain. (5%) 
(c) Why does the assumed stress distributions acting on a cantilever retaining wall differ from a braced cut? (5%).