CEE3430 Engineering Hydrology

Homework 4. Groundwater and Well Hydraulics

Objective. Gain experience applying solving problems related to groundwater flow and to wells.

1. A sandy loam has Brooks and Corey parameters (Mays Table 3.7.1 of λ=0.35, h_b=21 cm, θ_r=0.10, ϕ=0.4, K_s=14.5 cm/hr.

   a) Plot graphs of matric potential and hydraulic conductivity for moisture content ranging between 0.2 and its upper bound.

   b) Consider the following field situation. A and B are vertical tensiometers that measure pore water pressure (tension) relative to atmospheric pressure, at depths 30 and 50 cm below the ground.
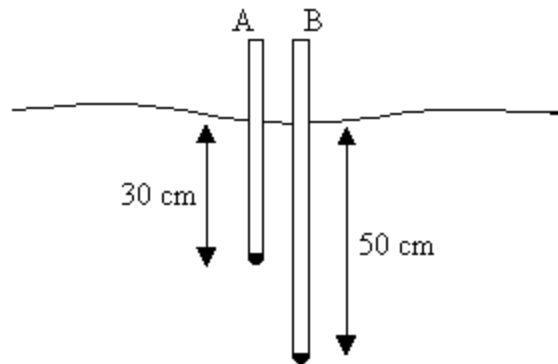
   Both tensiometers record a pressure of -3500 Pa (negative denoting suction here). Calculate the head gradient from A to B and the flux (infiltration rate).

   c) Now consider the following pressure measurements recorded at A and B. Negative denotes suction.

   - Pressure at A (Pa)   -4000
   - Pressure at B (Pa)   -3000

   Evaluate the following
   - Pressure head (ψ) at A (cm)
   - Pressure head (ψ) at B (cm)
   - Total head at A (cm)
   - Total head at B (cm)
   - The direction of flow (i.e. is it downwards into the ground from A to B, or upwards from B to A)

2. Mays 4.1.1

3. Mays 4.1.2. This problem needs porosity for the confining layer. Use $\alpha=0.5$.

4. Mays 4.1.5

5. Mays 4.1.8

6. Mays 4.2.1

7. Mays 4.2.2

8. Mays 4.2.7

9. Mays 4.2.8