

Due: 2/3/09

Physical Hydrogeology

Problem Set 2

1. A constant-head permeameter has a cross-sectional area of 125 cm^2 . The sample is 34 cm long. At a head of 15 cm, the permeameter discharges 50 cm^3 in 335 seconds.
 - A) What is the hydraulic conductivity in centimeters per second and feet per day?
 - B) What is the intrinsic permeability if the hydraulic conductivity was measured at 20°C ?
 - C) From the hydraulic conductivity value, name the type of soil.
2. A confined aquifer has a specific storage of $7.24 \times 10^{-3} \text{ m}^{-1}$ and a thickness of 30 m.
 - A) How much water would it yield if the water declined an average of 3.5 m over a circular area with a radius of 240 m?
 - B) If porosity is 30% and the compressibility of water is $4.6 \times 10^{-10} \text{ m}^2/\text{N}$. What is the compressibility of the aquifer skeleton?
3. An aquifer has 3 different formations. Formation A has a thickness of 8.5 m and a hydraulic conductivity of 22.3 m/d. Formation B has a thickness of 2.8 m and a conductivity of 145 m/d. Formation C has a thickness of 33 m and a conductivity of 35 m/d. Assume that each formation is isotropic and homogeneous. Compute both the overall horizontal and vertical conductivities.
4. Below is a set of data representing the hydraulic conductivity of core samples from the same formation. Use Excel to perform the following:
 - A) Find the arithmetic mean of the data set
 - B) Find the geometric mean of the data set
 - C) Make a histogram of the data set
 - D) Make a histogram of the log transformed data

Sample Number	K (m/s)
1	4.3×10^{-4}
2	$6. \times 10^{-3}$
3	2.5×10^{-5}
4	1.2×10^{-4}
5	1.0×10^{-6}
6	7.1×10^{-3}
7	9.1×10^{-6}
8	2.2×10^{-3}
9	4.2×10^{-5}
10	8.7×10^{-4}
11	3.5×10^{-5}

5. The fluid pressure in the screen of a piezometer in a saline aquifer is $7.7 \times 10^5 \text{ N/m}^2$. The fluid density is 1055 kg/m^3 . The elevation of the piezometer screen is 46 m above sea level.
 - A) Compute the point-water pressure head
 - B) Compute the fresh-water pressure head
 - C) find the total fresh-water head