Assignment #1 Cover Page

Name:

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#	Part A	Part B	Part C	Part D	Part E	Total
1	/5	/3	/2	--	--	/10
2	/2	/3	/2	/2	/1	/10
3	/3	/2	/3	/2	--	/10
4	/5	--	--	--	--	/5
5	Completing Online Class Survey					/2
Total						/35

Note: Assignments must use this cover page (assignments will not be marked without the cover page).

EARTH 458
Assignment # 1

Assigned:	Wednesday, September 28, 2016
Due:	Friday, October 7, 2016 (at the beginning of class)
Total possible marks:	35 points

NOTE: Please list the values of any constants used in your calculations and show all your work.

Question 1

A group of geologist went out to the field and performed a tracer test on the Ogallala Aquifer. They measured an average groundwater velocity of 0.02 m/d with a hydraulic gradient of -0.05. The field group determined that the effective porosity of the soil is 0.35.

a) Calculate the hydraulic conductivity (K) in m/s. (5 points)
b) Calculate the intrinsic permeability at 20°C. (3 points)
c) What type of soil do you think it is? (2 points)

Question 2

Two lakes are separated by 1,400 m and are connected by a confined aquifer. The first lake is at an elevation of 68 m, while the second lake is at an elevation of 46 m. Lab tests have determined that the hydraulic conductivity and porosity of the soil is 10^{-5} m/s and 0.30 respectively. The cross-sectional area of the aquifer is 3,000 m^2.

a) Draw a diagram of the lakes and groundwater; indicate the direction of flow. (2 points)
b) Calculate the specific discharge for the aquifer (in m/d). (3 points)
c) Calculate the groundwater discharge between the two lakes (in m^3/d). (2 points)
d) Calculate the average linear groundwater velocity (in m/d). (2 points)
e) What is the average time water takes to flow from the first to second lake (year)? (1 points)

Question 3

The sea and lake are separated by a confined aquifer as shown in Figure 1. The aquifer has four separate units each 100 m in length with values of $K_1 = 2x10^{-4}$ m/s, $K_2 = 6x10^{-3}$ m/s, $K_3 = 3x10^{-4}$ m/s, $K_4 = 8x10^{-5}$ m/s. The hydraulic head is held constant at both lake and sea boundaries of the aquifer. Assume that the system is steady state and that the density of the lake and sea are the same.

a) Calculate the horizontal bulk hydraulic conductivity of the aquifer. (3 points)
b) Calculate the specific discharge in the aquifer. (2 points)
c) Calculate the head drop in each of the sections. (3 points)
d) Plot head versus distance (x). (2 points)

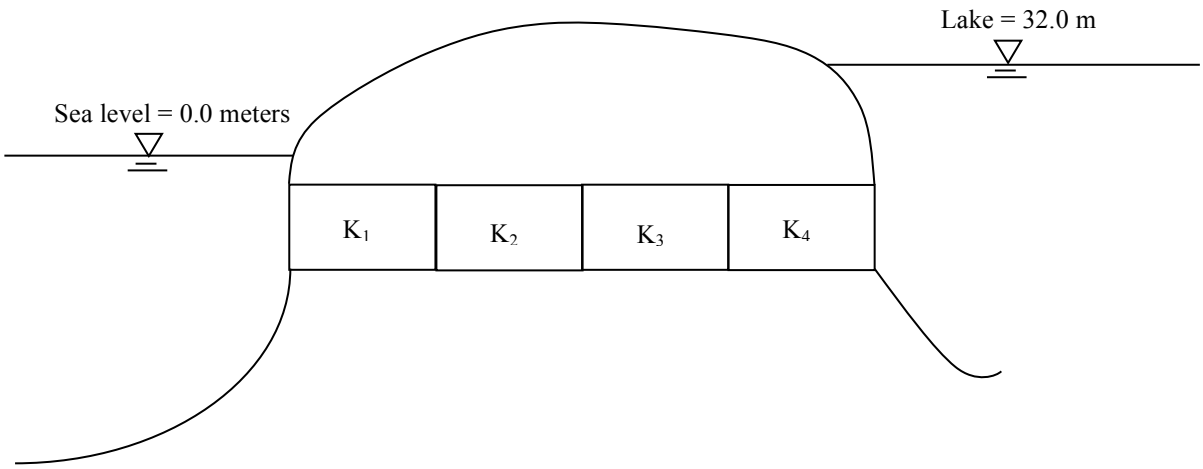

Figure 1

Question 4

Graphically determine the slope direction of the potentiometric surface from the hydraulic heads observed at the three wells illustrated in plan view bellow. Draw the hydraulic head and indicate flow direction with an arrow on the figure. (5 points)

C
222m

B
230m

A
226m