Assignment #2 Cover Page

Name:

1 _____

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5 _____

#	Part A	Part B	Part C	Part D	Part E	Total
1	/5	/5	--	--	--	/10
2	/6	/2	/2	/5	--	/15
3	/2	/3	/5	/5	--	/15
Total						/40

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

EARTH 458
Assignment # 2

Assigned:	Tuesday, October 11, 2016
Due:	Wednesday, October 21, 2016 (at the beginning of class)
Total possible marks:	40 points

NOTE: Please list the values of any constants used in your calculations and show all your work. Please be neat when preparing figures and maps.

Question 1

Consider the area shown in the accompanying map on which the locations of the 19 piezometers installed in the confined sand aquifer are indicated. The piezometer intake zones are such that the hydraulic head values are representative of the aquifer (listed in table 1). The sand is medium-grained, fairly well sorted and relatively homogeneous and has a porosity of 0.30 and a hydraulic conductivity 4.7×10^{-4} m/sec.

    a.) Prepare a map of the potentiometric surface of the sand aquifer in the instrumented area. Sketch in probable flow lines on the map. **(5 points)**
- Use 0.5m contour intervals.
- Assume that the sand is isotropic.

    b.) Estimate how long it would take in years for water to flow from point A indicated on the map to the point where it passes beneath the pumping station. **(5 points)**

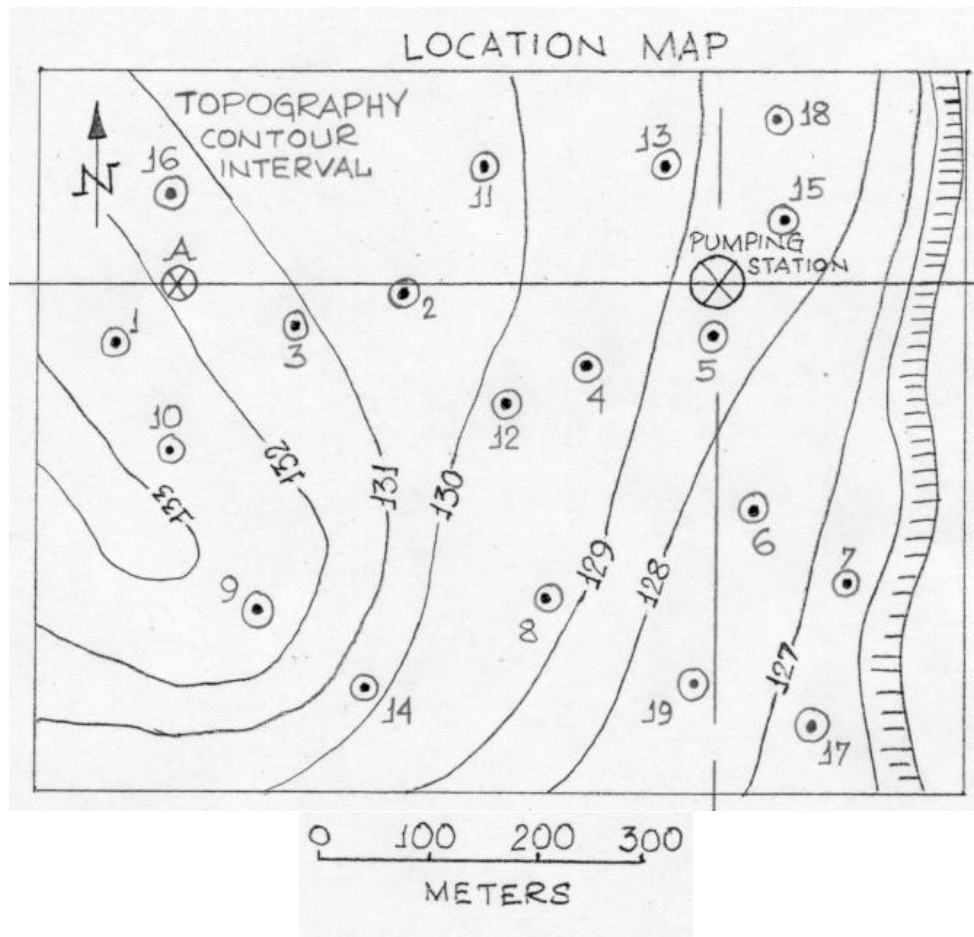| Table 1: Hydraulic Head for Piezometers # 1 to 19			
Piezometer #	Hydraulic Head (m)	Piezometer #	Hydraulic Head (m)
1	130.4	11	128.3
2	128.5	12	128.0
3	129.4	13	127.3
4	127.2	14	128.3
5	126.4	15	126.2
6	125.6	16	130.2
7	124.7	17	124.4
8	127.3	18	126.2
9	129.2	19	125.5
10	130.2		

Figure: 1.

Question 2

A confined aquifer (porosity 0.30) with an initial thickness of 40 m and an area of 100 square km consolidated 7 cm when the pressure head was uniformly lowered by 8 m.

    a.) Calculate the compressibility, specific storage, and storativity of the aquifer **(6 points)**
    b.) What geological material is the aquifer made of? Explain your reasoning.   **(2 points)**
    c.) Assuming that the 8 m pressure drop was caused by some kind of pumping, calculate the total volume of water pumped in m^3 (i.e., released from storage)   **(2 points)**
    d.) If the same 8 m pressure drop from pumping occurred in an unconfined aquifer having the same compressibility and a specific yield of 0.12, what would be the total volume of water pumped (i.e., released from storage)? Is this amount different than the answer from part c.? Explain why or why not. **(5 points)**

Question 3

The figure below shows a column of soil having a porosity of 0.25 and a hydraulic conductivity of 0.5 ft/min in which water is flowing vertically downward. Atmospheric pressure is maintained at the top of the water reservoir (elevation 12.0 ft) and at the bottom of the tail water (elevation 0.0 ft). Datum is taken at the bottom of the tail water.

Note: Please plot each figure separately.

    a) Plot the elevation head (z) vs. elevation. (**2 points**)
    b) Plot total hydraulic head (H) vs. elevation. (**3 points**)
    c) Plot pressure head (ψ) vs. elevation. (**5 points**)
    d) Plot the water velocity (v) vs. elevation. (**5 points**)