CIVE 6361 Engineering Hydrology
Spring 2007
Final Exam

Instructions

Work each problem and prepare a written solution. Scan or typeset the solution and e-mail to **cleveland@uh.edu** your solution on or before May 10, 2007. Preferred file format is Adobe Portable Document Format (PDF). The problems are relatively simple, you should be able to complete this exam within an hour or two (not counting time to write up solution). Be sure your name is on the solution.

Problem 1

Table 1 is a record of water table decline in an unconfined aquifer during an extended drought period.

Table 1: Water level declines in Bear Creek Aquifer

Sub-basin	Area (mi^2)	Decline (ft)
A	14	2.75
B	7	3.56
C	28	5.42
D	33	7.78

The total volume of water removed from storage in this aquifer during the time period was 5.7385×10^4 acre-feet.

Estimate:

(A) The average specific yield of this aquifer.

Problem 2

A creek penetrates a 3 meter thick confined aquifer as depicted in Figure 1. During a long drought the flow in the creek decreases by 1.15 cubic meters per second between two gaging (flow measurement) stations along the creek located 6 kilometers apart. On the west side of the creek the hydraulic head contours run parallel to the bank of the creek and the contour levels decrease as one moves away from the creek at a rate of 0.00074 m/m. The head contours on the east side of the creek are also parallel to the creek and the levels decrease as one moves towards the creek at a rate of 0.00031 m/m.

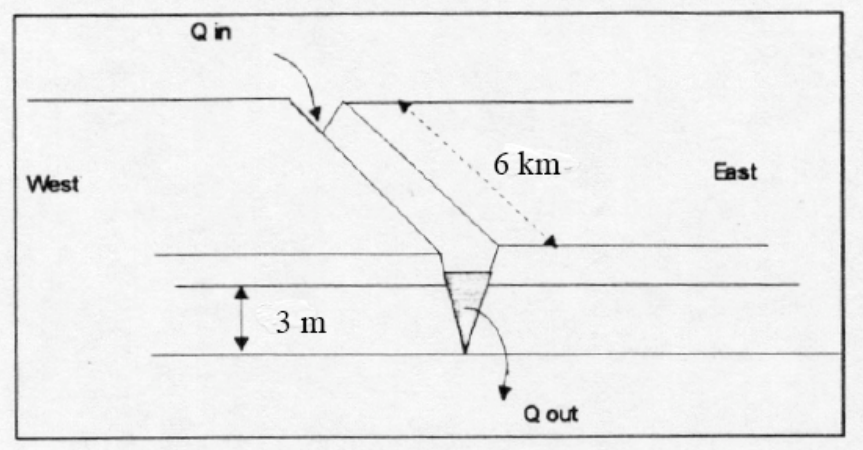

Figure 1: Schematic of Dog Run Creek river-aquifer system

Determine:

(A) A water balance equation for the **aquifer** in the 6 km section near the creek.

(B) The hydraulic conductivity of the aquifer.

Problem 3

An aquifer is monitored by three wells located as shown in Figure 2[1]. The head in each well is indicated on the map [2].

(A) Find the magnitude and direction of the hydraulic gradient in this aquifer.

(B) Estimate the hydraulic conductivity of the aquifer if the aquifer has a porosity of 30% and a tracer released near Well #1 arrives near Well #3 in 40 *days*.

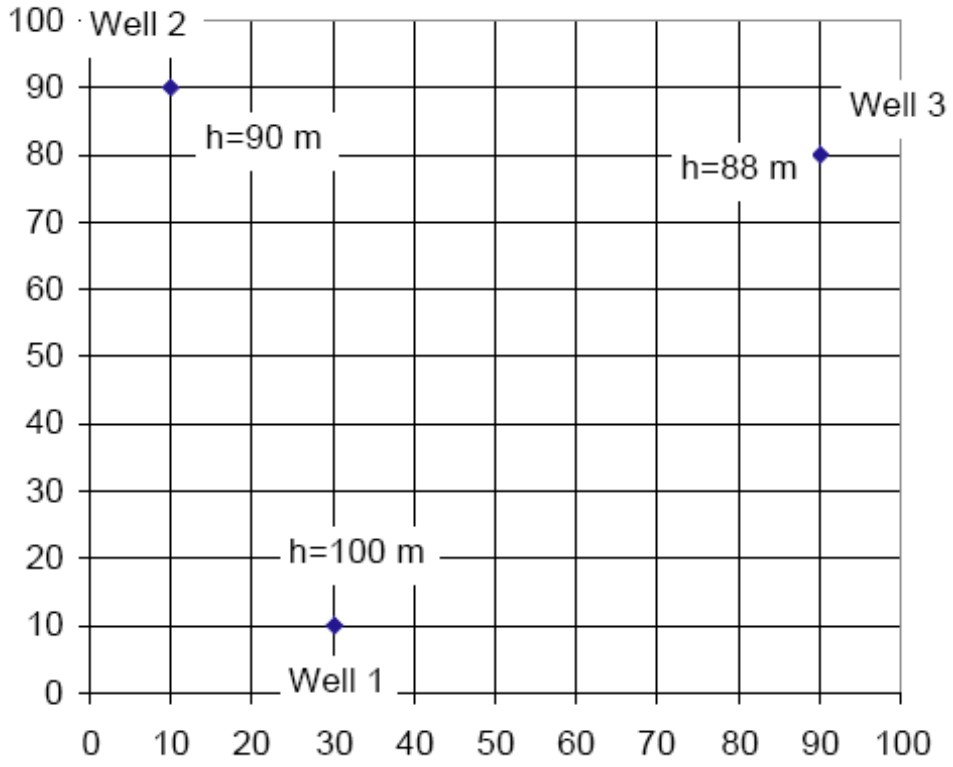

Figure 2: Three monitoring wells in an aquifer

[1]Probably a repeat of homework, but important enough to repeat
[2]Drawing is not to scale get the coordinates and redraw

Problem 4

Figure 3 is a four-cell conceptualization of an aquifer with the properties listed in Table 2. Using this conceptual structure and the hydrologic properties:

(A) Write the steady-flow balance equations for average water levels in the four cells

(B) Solve these equations (find the average water levels) to determine if the aquifer is a **net** supplier of water to the river or not.

Table 2: Aquifer system properties

Sub-Basin	Pumping (10^6 m^3/yr)	Recharge (mm/yr)	K (m/day)
Cell 1	17.8	200	40
Cell 2	0	420	40
Cell 3	6.3	300	30
Cell 4	2.7	300	30

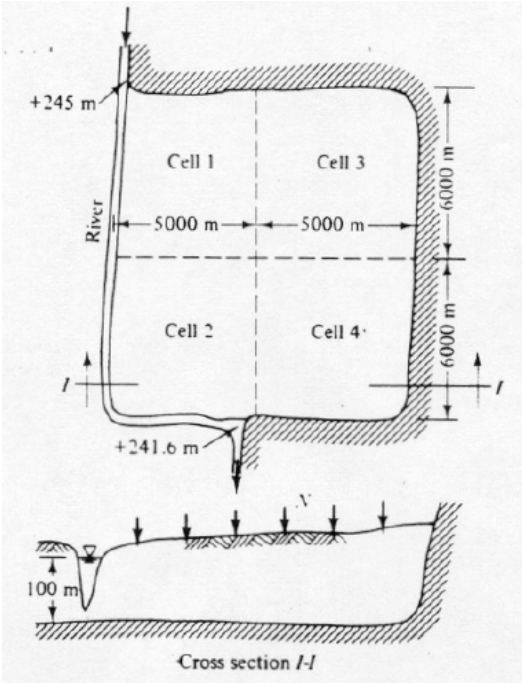

Figure 3: 4-cell aquifer system model