465.420 Geothermal Energy, Fall 2009

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Homework #3

1.

Time-drawdown data collected at a distance of 30.5 m from a well pumping at a rate of 5.43×10^3 m^3/day are as follows. (10)

t, min	s (drawdown),m
1	1.2
2	1.6
3	1.9
4	2.1
5	2.3
6	2.5
7	2.7
10	3.1
20	3.7
40	4.3
80	4.8
100	5.0
300	5.8
500	6.2
1000	6.6

Calculate the transmissivity and storativity. What are the hydraulic conductivity, intrinsic permeability and specific storage when the thickness of the reservoir is 30 m and fluid property of water is used?

2.

Thermal conductivity data are given as follows.

Thermal conductivity of quartz: 8.4 W/m°C

Thermal conductivity of water: 0.462 W/m°C

1) Calculate (and plot) upper and lower bounds for the effective (equivalent) thermal conductivity of saturated sandstone consisting largely of quartz with a porosity of 0 % to 45% (5).

2) With a set of laboratory measurement on saturated sandstone given in the below, what can be said about the model and the measured results? Can you think of better model to predict the effective thermal conductivity of saturated rock? (5)

porosity (%)	saturated thermal conductivity (W/m°C)
20	3.5
25	3.4
30	3.3
33	3.1
35	3.0
37	2.9
40	2.9
45	2.7

Please be careful about the unit. Due by 9am 19 Oct 2009. Late submission by 9am 21 Oct 2009 with 20% penalty.