UNIVERSITY OF MINES AND TECHNOLOGY, TARKWA

FIRST SEMESTER EXAMINATIONS, NOV. – DEC. 2018

COURSE NO: GL 375

COURSE NAME: HYDROGEOLOGY

CLASS: GL 3 **TIME: 3 Hours**

Name**:** _____Index Number: _____

Answer all Questions

Question 1

Define or explain the following

i Hydrograph
ii Hydrologic cycle
iii Groundwater modelling
iv Confined aquifer
v Base flow
v. Hydraulic conductivity
vi Artesian well
vii. Phreatophytes
ix. Cone of depression
x. Groundwater monitoring

(4 Marks X 10) = 40 Marks

Question 2

a). A monitoring well has a land surface elevation of 29.15 m, and is 27.00 m deep. Depth to water is 15.27 m. What is the pressure head in this well? What is the elevation head? What is the total hydraulic head? Assume that the screen length is short enough so that it does not affect your calculations. Draw a simple sketch to illustrate your answer. ***10 Marks***

b). Describe an influent stream ***5 Marks***

c). A sandstone aquifer has an average thickness of 200m and is 10km wide. The distance from the recharge area to the discharge point is 20km and the head difference is 60m on average. If the hydraulic conductivity is 5m/d, calculate the discharge Q. ***10 Marks***

Question 3

a). The details of a gauging carried out by the velocity–area method is shown in the table. Estimate the discharge. ***(10 Marks)***

Chainage(m)	0	50	100	150	200	250	300	350	400	450	470
Depth(m)	0	1.7	2.5	3.3	4.1	4.4	3.6	2.4	1.6	1.6	0
Mean velocity(m/s)	0	0.27	0.4	0.38	0.51	0.54	0.52	0.42	0.38	0.26	0

b). An aquifer has three different formations. Formation A has a thickness of 22.1 m and a hydraulic conductivity of 245 m/d. Formation B has a thickness of 20.5 m and a conductivity of 145 m/d. Formation C has a thickness of 29.5 m and conductivity of 125 m/d. Assume that each formation is isotropic and homogenous, compute the equivalent horizontal and vertical hydraulic conductivities ***(10 Marks)***

Question 4

a). A confined aquifer was pumped at a constant rate of 200 gallons per minute (assume 2 significant figures for the pumping rate). Drawdown was measured in an observation well located 250 m away, and results are given in the table below. What are the transmissivity, hydraulic conductivity and storativity of this unit? ***(10 Marks)***

Time (min)	Drawdown (m)	Time (min)	Drawdown (m)	Time (min)	Drawdown (m)	Time (min)	Drawdown (m)
0	0	5	1.49	24	2.36	120	3.28
1	0.66	6	1.59	30	2.49	150	3.42
1.5	0.87	8	1.75	40	2.65	180	3.51
2.0	0.99	10	1.86	50	2.78	210	3.61
2.5	1.11	12	1.97	60	2.88	240	3.67
3.0	1.21	14	2.08	80	3.04		
4.0	1.36	18	2.20	100	3.16		

b). A well pumping at 77,000 m^3/day has observation wells located 10, 40, 150, 300, and 400 m away. After 0.14 days of pumping, the following drawdowns were observed: ***(10 Marks)***

Distance (m)	10	40	150	300	400
Drawdown (m)	15.1	9.4	4.4	1.7	0.25

Find T and S

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