Uva Wellassa University, Sri Lanka
End Semester Examination – August/ September 2011
MRT 352-2 Principles of Hydrogeology
Time: Two (02) hours

Uva Wellassa University

Total **04** Questions
Answer **all** questions
Draw sketch diagrams where necessary
Semi-log paper and Piper plot are attached to the paper

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01) (i) Critically evaluate the Darcy's Law and Darcy velocity (15 marks)

(ii) A concrete channel obtains water from a river through 2500 feet long porous bed having a width of 25 feet and porosity of 0.5. Water levels in the river and stream are 125 and 115 feat a.M.S.L., respectively. Further, it is given that the hydraulic conductivity of the porous media is 0.30 feet per hour.

(a) Calculate the daily discharge of water to the channel.
(b) How long does it take for a water molecule to flow from inlet to outlet?

(10 marks)

02) (i) Plot the following data on the Piper plot and interpret the water type.

Constituent	Concentration (mg/L)
Na^+	5.3
K^+	2.6
Ca^{+2}	78.0
Mg^{+2}	43.0
Fe^{+2}	0.67
Mn^{+2}	0.15
Cl^-	17.0
HCO_3^-	364
SO_4^{2-}	50.0
NO_3^-	5.96
PO_4^{2-}	0.7

Atomic Weights of elements	Na – 22.99, K – 39.10, Ca – 40.08, Mg – 24.31, H – 1.01, O – 16.00, C – 12.01, Fe – 55.85, Mn – 54.94, S – 32.06, Cl – 35.45 and P – 30.97

(15 marks)

(ii) Only a few elements are plotted on the Piper plot. How would you justify it?
(10 marks)

03) (i) Write a detailed account on different methods of measuring hydraulic conductivity.
(15 marks)

(ii) What strategies would you employ in the selection of a piezometer for in fo measuring of the permeability of a particular soil type?
(5 marks)

(iii) Usually there is an elevated water table under topographic highs. Explain it usin the behaviour of equipotential lines.
(5 marks)

04) (i) Critically analyse the Hvorslev shape factor and conditions which it is applied for.
(7.5 marks)

(ii) Discuss the unfavourable conditions that would occur during a packer test. Ho would you identify them? Explain with examples.
(7.5 marks)

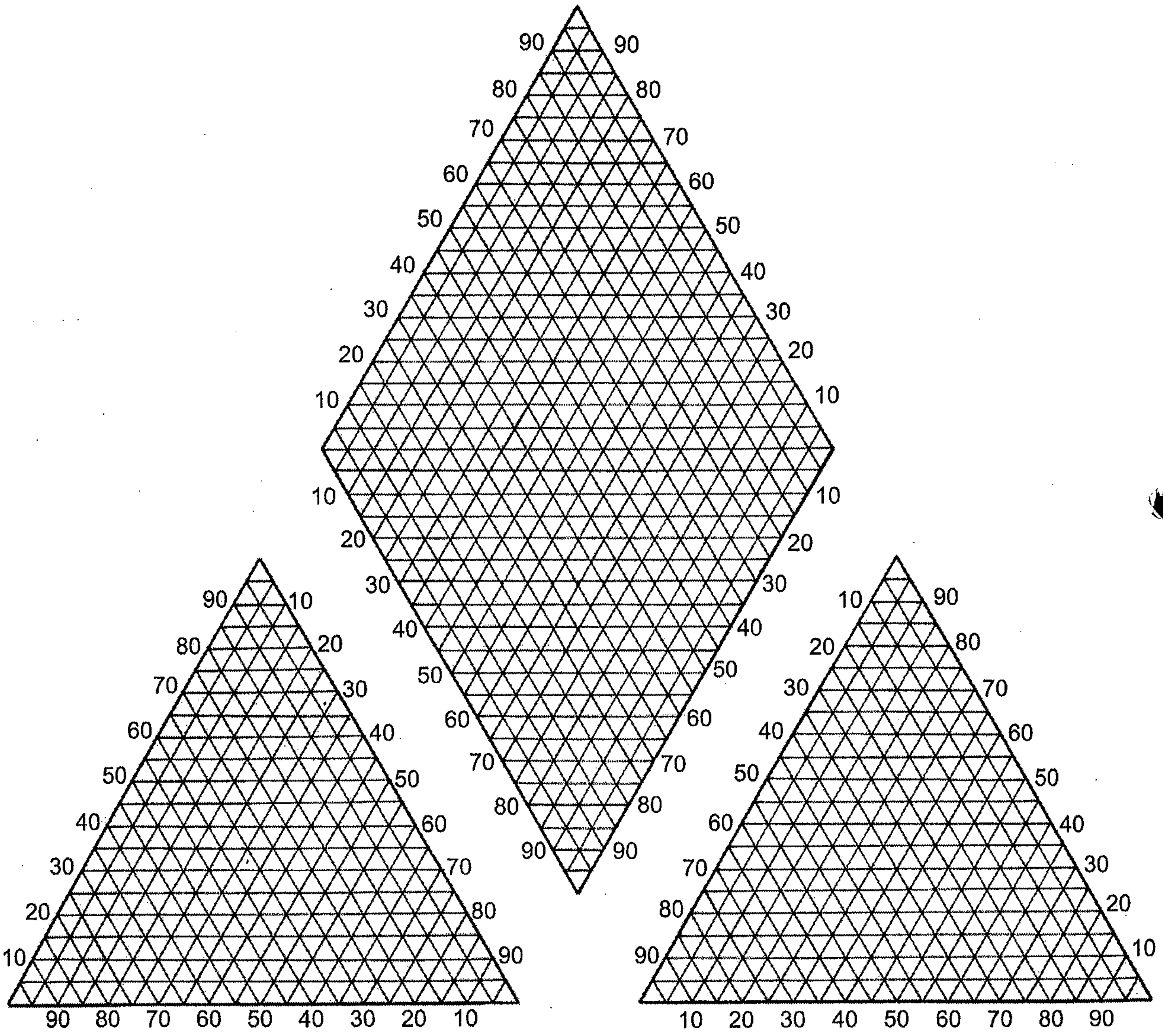
(iii) Following data were obtained from a slug test. Determine the hydrauli conductivity of the aquifer. State your assumptions very clearly.
(10 marks)

Screen top depth	0.94 m
Screen length	4.56 m
Casing radius	0.076 m
Screen radius	0.12 m

$$F = \frac{2\pi L}{\ln(L/R)} \qquad K = \frac{A}{F\Delta t_{37\%}}$$

Time (s)	Displacement (m)
0.709	0.239
1.74	0.192
2.73	0.152
3.78	0.119
5.97	0.0709
8.71	0.0293
12.5	0.0121
18.7	0.00497
28.8	0.002
38.8	0.00101

F – Shape factor
K – Hydraulic conductivity
A, L, R and t are conventional notations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