

NATIONAL UNIVERSITY OF SCIENCE AND TECHNOLOGY

APPLIED PHYSICS DEPARTMENT

MAPH 6121 – HYDROLOGY AND CONTAMINANT PROCESSES

MSC PART II: MAY 2005

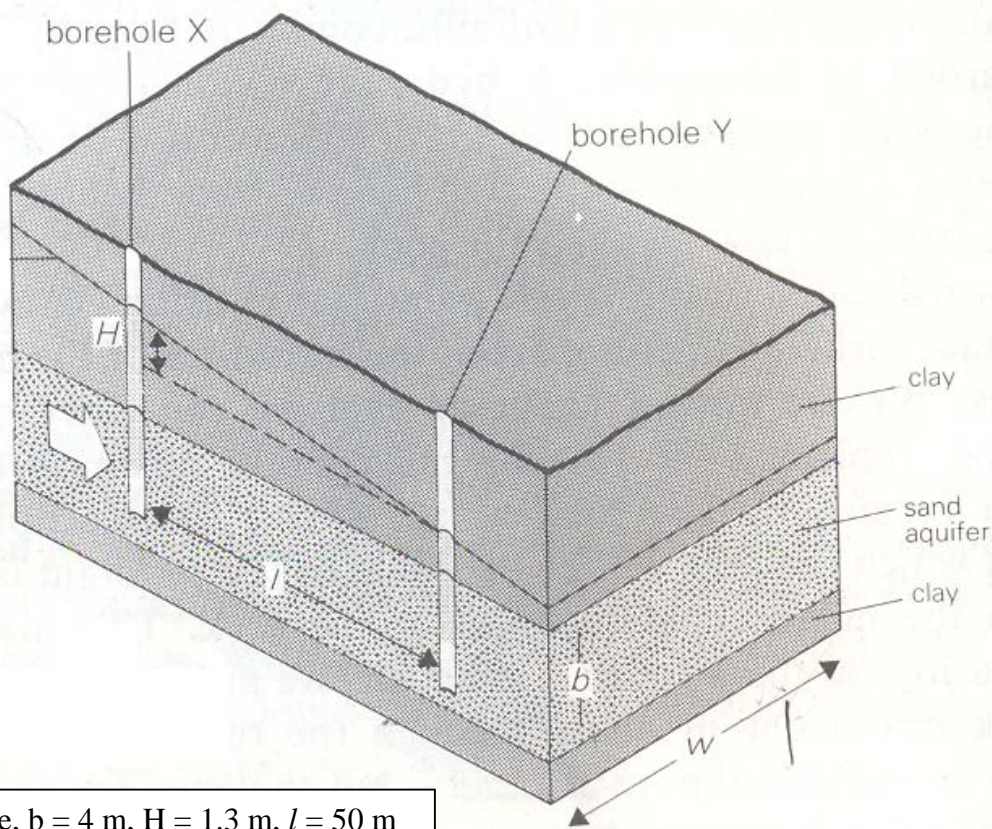
DURATION: 4 HOURS

ANSWER ALL QUESTIONS.

NOTE: You are encouraged to make use of sketches to further illustrate your answers where possible.

1. (a) Give an illustrative description of the chemical evolution of meteoric ground water. [10]
- (b) Briefly explain two (2) methods for measuring flow in streams. [6]
- (c) Show how total porosity is related to density measurements. [4]
- (d) Write down the relation used in fluid flow and explain clearly its usage. [5]
- (e) State the general rules of permeability [3]
- (f) Write short notes to explain the following terms (i) confined aquifer and (ii) unconfined aquifers? [4]
- (g) Give a concise description of the 'slug test', showing how it is used to determine transmissivity and storativity. [8]

2. (i) Explain the use of water balance models, illustrating a few components of any modeling technique. [10]
- (ii) Describe how electric flow is used to simulate / model groundwater flow. [10]
3. (i) Consider a strip of aquifer with flow occurring in the direction from borehole X to borehole Y (figure below). The hydraulic conductivity is 20 m/day. How much water flows through in a day?



Where, $b = 4$ m, $H = 1.3$ m, $l = 50$ m and $w = 15$ m.

[10]

- (ii) Using the Ghyben – Herzberg relation, explain how the shape and location of the interface between fresh water and salt water is determined in a salt-water / fresh-water interaction. [7]

- (iii) Give one major disadvantage of the Ghyben – Herzberg relation in the above mentioned analysis. [3]
4. (i) Give a definition of the term ‘Total Dissolved Solids’, relating the definition to water hardness. [5]
- (ii) Describe briefly, two mechanisms for the movement of contaminants through an aquifer. [10]
- (iii) Justify the use of septic tanks in waste disposal. [5]

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