Uva Wellassa University of Sri Lanka
Faculty of Science and Technology
Department of Science and Technology
4th Year 1st Semester Examination – July/August 2016

Uva Wellassa University

MRT 454-2 Computers in Groundwater Modelling

Part B - Essay

(Provide answers in the given booklet)

1. (a) Identifying the distinct hydrogeologic units develop a 2-D conceptual model for the following groundwater environment. Graphically present it with appropriate labels.

An aquifer system consists of three stratigraphic units with differing hydrogeologic characteristics. The top unit is an unconsolidated sand layer with isotropic properties and acts as an unconfined aquifer. Below that occurs a silt layer with abundant horizontal clay pockets. The middle layer allows slow leakage of groundwater into the bottom sandstone layer and acts as an aquitard. The bottom sandstone layer can be considered as a confined aquifer. The lowest horizon of the sandstone aquifer contains saltwater. The above sequence is underlain by impermeable basement rock.

(b) Discretize the above domain into a finite difference grid appropriate for numerical modelling.

(c) Distinguish between steady-state and transient-state conditions applied in groundwater modelling.

(20 marks)

2. The aquifer system described in Question 1.(a) is bounded by two rivers along west and east boundaries. The top sand layer has full hydraulic contact with the rivers. Flow within the unconfined aquifer is from west to east. North and south boundaries are characterized by groundwater divides. A contaminated site occurs close to the western boundary of the aquifer system. Subsurface flow of the contaminant is captured by a pumping well located close to the eastern boundary.

(a) Schematically represent the above hydrogeologic setting with 3-D perception.

(b) Describe the boundary conditions and express them in mathematical form.

(c) Show how you would discretize the above domain into a finite difference grid. Note that it is necessary to have a higher resolution of the grid where processes are to be studied in detail.

(20 marks)

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(Please attach Part A and Part B)