

## **INFS4205/7205 – Spatial and Multimedia Database**

**Semester 1, 2012**

**Assignment 1** [*Total: 25 marks*]

**Due date:** 5pm 20 April 2012

*(Online submission only)*

After the recent flooding in Queensland and the frequent bush fires in Western Australia, an insurance agency decided to make better use of spatial information to evaluate the premium rate against the risk. Three datasets need to be created. One is to record land information for each land block for its boundary, the centre of the approved building site(s), elevation of the centre. The second dataset is obtained from relevant government agency which mark the geographical regions affected by flooding, and attached with each region is the risk classification of flooding “high”, “medium” and “low”. The third dataset record estimated fuel load (i.e., the total amount of combustible material in a defined space) for identified fire risk areas.

**Question 1** [6 marks] Design a database for these three datasets. You may choose to use spatial data types such as POINT, LINE and POLYGON. This database should support at least the queries in Question 2 below. Use SQL create-table statements to present your design. [*Assume elevation is measured by the number of meters relative to the sea level, and fuel load is measured in units between 0 and 100. You can document other design assumptions if necessary.*]

**Question 2** Write two queries in an SQL-like query language,

- (1) [3 marks] to find all the land blocks which are in the flooding region of high risk (including overlap) or whose elevation is lower than 10 meters of sea level.
- (2) [3 marks] to find all high fire risk land blocks (defined as any land block with some area containing fuel load of 30 units or higher, or within 2500 meters of the area containing fuel load over 70 units).

[*Please define any non-standard SQL operations, relationships and constants you choose to use in a query.*]

**Question 3** Design a step-by-step query execution plan, which minimizes the data to be accessed in processing the query,

- (1) [6 marks] to process the query you give in Question 2.1. Please make use of Z-value based spatial indexes.
- (2) [7 marks] to process the query you give in Question 2.2. Please use R-tree as spatial indexes.

[*All data structures including spatial indexes used in the execution plan need to be clearly described. Execution plan description can be in either plain English, or some kind of pseudo code, and the description must be clear and concise. You can make use of non-spatial indexes too. Please explain how data access is reduced by using spatial indexes and your execution plan.*]