2004 Paper 4 Question 3

Data Structures and Algorithms

(*a*) Describe the structure of splay trees used to represent a set of key–value pairs.

[5 marks]

(*b*) Describe how new key–value pairs are added to the tree, how the value associated with a given key can be looked up, and how to delete a pair with a given key. [5 marks]

(*c*) State without proof the attractive properties of splay trees. [4 marks]

(*d*) Describe the ternary tree structure used to hold a dictionary of key–value pairs where the keys are variable-length strings. Illustrate the mechanism by showing the structure after items with keys `MIT`, `SAD`, `MAN`, `APT`, `MUD`, `ADD`, `MAG`, `MINE`, `MIKE`, `MINT`, `AT`, `MATE` and `MINES` have been added in that order to an initially empty ternary tree. [6 marks]