2003 Paper 1 Question 6

Foundations of Computer Science

This question has been translated from Standard ML to OCaml

(*a*) Explain in detail how a binary search tree represents a dictionary. If reference types are not used, what is the average-case cost of an update operation?

[8 marks]

(*b*) A *mutable* binary tree is either a leaf or a branch node containing a label and references to two other mutable binary trees. Present the OCaml variant type declaration for mutable binary trees. [2 marks]

(*c*) Describe how to use this type to implement (mutable) binary search trees. Give OCaml code for the lookup and update operations. The update operation must never copy existing tree nodes. [10 marks]