

2006 Paper 1 Question 6

Foundations of Computer Science

(a) Contrast *ordinary lists*, *lazy lists* and *mutable lists* by

(i) presenting the ML datatype declaration of each type of list, and [3 marks]

(ii) implementing a filter functional for each type of list. [7 marks]

(The mutable version should remove the elements that do not satisfy the given predicate, rather than constructing a new list.)

(b) The *intersection* of two dictionaries is the largest dictionary that agrees with them both. For example, if one dictionary is cat=3, dog=2, rabbit=9 while the other is cat=4, dog=2, hamster=9, then their intersection is dog=2.

Code an ML function to compute the intersection of two dictionaries, where dictionaries are represented by binary search trees. You may assume that the dictionary lookup and update operations are provided. For full credit, your solution must be simple and clear. [10 marks]