Analysis of Algorithms

Exam 2 : 22 May 2000

1. Give an $O(n^2)$-time algorithm to find the longest monotonically increasing subsequence of a sequence of n numbers.

2. The edit distance between a string x and a string y is the minimum number of edit operations that convert x to y. An edit operation is one of the following: (1) deletion of a character from x, (2) insertion of a character into y, and (3) change of a character in x by a different character in y. For example, if $x = abcdefg$ and $y = ahcefig$, the edit distance is 3. Given x of length n and y of length m, find an $O(nm)$-time algorithm to find the edit distance between x and y.

3. Show the results of inserting the keys: C G S F K L H T V M R N P in order into an empty B-tree when $t = 3$.

4. Show how depth-first search works on the following graph. Assume that the DFS visits vertices in alphabetical order. Show the discovery and finishing times for each vertex, and show the classification of each edge.

5. Suppose that the graph $G = (V, E)$ is represented as an adjacency matrix. Give an $O(n^2)$-time implementation of Prim's algorithm for this case, where $n = |V|$.