58131 Data Structures (Spring 2009)

Homework 11 (6–17 April)

The deadline for finishing Round 7 of TRAKLA2 problems is **Sunday 19 April**!

1. Find the shortest paths starting from node \( a \) in the graph below, using the Bellman-Ford algorithm. Assume that the arcs are stored in the adjacency lists in alphabetic order.

```
   a -- 3 -- b
   |     |   6
   v     v
   c -- 2 -- d
   |       |
   v       v
   e -- 5 -- f

2. You are given a graph whose vertices present all airports of the world. The edges present all direct flights between two airports. The weight of each edge is the probability that the luggage of a passenger gets lost during the corresponding flight (this is calculated based on the statistics gathered by IATA). Your task is to plan a route from Helsinki to Addis Abeba where the probability of your luggage getting lost is as low as possible. How can you use Dijkstra’s algorithm to solve this problem?

3. A chessboard consists of 64 squares: 8 rows and 8 columns. One move of a horse consists of either transferring the piece first two squares vertically (up or down) and then one square horizontally (right or left) or transferring the piece first one square vertically and then two squares horizontally. Write a pseudocode for an algorithm which finds the shortest possible path for a horse from a given start position to a given final position. The algorithm should output the shortest sequence of moves that transfers the horse from the given start position to the given final position.

**Hint**: Think about a graph containing a node for each square in the chessboard and an edge \((a,b)\) if it is possible to transfer the horse from the position represented by node \(a\) to the position represented by node \(b\) by using exactly one move. However, write your algorithm for the chessboard.