

G51APS, Algorithmic Problem Solving

Coursework 2, 2012/2013

River Crossing

School of Computer Science
University of Nottingham

September 28, 2012

Abstract

This document details the second of 5 courseworks for the module G51APS in the academic year 2012/2013. The coursework does not count towards the final assessment but, if submitted by the deadline, will be marked and returned for feedback purposes. A substantial proportion of the (unseen 90 minute) examination will be based on the five courseworks. Marks shown are indicative of the marks that would be awarded in a written examination. A record will be taken of submitted work; non-submission may result in your being assumed to have withdrawn from the course.

Answer ALL questions.

1 River Crossing

Two presidents each have one bodyguard. A couple is a president and his bodyguard. Both couples want to cross a river but their boat can only carry two people at one time. Neither president should ever be with the other president's bodyguard unless his own bodyguard is also present.

- a) List all the valid states for this problem. You should not name individual presidents and bodyguards: give only sufficient information to deduce the position of the boat, how many couples are on each bank and how many individual bodyguards or presidents. **(5)**
- b) Construct a state-transition diagram that shows all possible ways of getting the four couples across the river. Be sure to make clear the symmetry between the left and right bank in your state-transition diagram. **(10)**
- c) Suppose the presidents and bodyguards are named (as in, for example, P1, B1, P2, B2). Suppose you were to construct the state-transition diagram again but now using the naming to distinguish the different states. (So states where couple 1 is on the left bank and

couple 2 is on the right bank is different from the state where couple 2 is on the left bank and couple 1 is on the left bank.) How many states would the state-transition diagram then have? Compare the number of different ways of getting the two couples across when the individuals are named and when they are not named.

To answer this question, it should not be necessary to construct the state-transition diagram; you should be able to work out the answer using your solution to (b). (10)

What to Submit and When

Your solutions should be submitted to the School Office by **3.00pm on Friday, 26th October**. Feedback on this coursework is planned for the week beginning Monday, 5th November.