Algorithms and Data Structures, Academic Year 2013/2014

International Bologna Master in Bioinformatics

February 6, 2015

Please complete the following exercises by applying the concepts that have been illustrated to you during the classes. The score associated with each exercise and the expected time for completion is reported in the first line. Do NOT copy/exchange results (the parameters of each exercise are different).

Exercise 0 (2 points): write your name and surname in the first row of all the sheets you use.

Name:_____ Surname:_____

Exercise 1 (35 points, 60 minutes): please design the data structures and provide a high level description (e.g. pseudo-code) of the main components of the algorithm that you would implement to efficiently realize a function that takes in input a matrix MxN where the content of each element is the random value Odd or Even. The function also takes in input the coordinates of two elements of the matrix: the starting point (xs,ys) and arrival point (xa, ya). The function realized must return a value TRUE or FALSE depending on the fact that a path exists made of possible mix of **horizontal or vertical** moves going from (xs.ys) to (xa,ya) visiting elements such that the sum of the values of the elements in the path is Even (in other words, the path must contain only even elements or odd elements in a number multiple of two). Second, the function must return the set of coordinates (xs,ys), (….), (….), …., (xa,ya) of the valid identified path (if a path exists).

For the implementation of the solution, please provide a motivation for your design, and a sketchy discussion of average/worst-case complexity in space and computation.

(use additional sheets for this exercise, including the back of this sheet)