Problem Set
Introduction to Contemporary Algorithms
(Theory of Discrete Algorithms)
Prof. Kazuo Iwama

This is a take-home test. You can discuss with your friends, but it is strictly prohibited to make a copy (or a similar one) of another person's submission. Please submit your answers using A4 papers to the BOX at Building No. 8 by July 31, 2014. This is again a hard deadline and no late submissions will be considered.

1. Recall the problem for matching n men to n women. We studied the protocol in the class that figures out if each woman's preference is a matching or not without leaking information. This protocol was "almost" ok in this security goal, but was not perfect. Describe why it is not perfect and discuss how to fix it.

2. We studied the move-to-front algorithm for the linear list access problem. Design a different algorithm that still achieves a competitive ratio similar to that of MTF.

3. Design an algorithm for the bin-packing problem. Your algorithm should have an approximation ratio of strictly less than 2.0 (give a proof). Be advised not to visit the literature (related web pages) but use your own idea. (Hint: if almost all items have size $1/2 + \epsilon$, then nothing can be done and the opt is also bad. Otherwise try to make all the bins well more than $1/2$ full at the end.)