Online and approximation algorithms

Due July 02, 2014 before class!

Exercise 1 (Metric TSP - 10 points)

Find a $\frac{4}{3}$-approximation for Metric TSP where all distances are either 1 or 2.

Hint: 2-matching (the problem of finding a minimum weight subset of edges $M \subseteq E$ such that each node is adjacent to exactly 2 edges in M) $\in \mathcal{P}$.

Exercise 2 (Max-k-Cut - 10 points)

We consider the Max-k-Cut problem. In this problem we want to partition the set of vertices of a graph $G = (V, E)$ into k parts $V_1, ..., V_k$ s.t. the weight of the cut edges between the partition is maximized.

Develop an algorithm for this problem and prove its approximation factor.

Exercise 3 (Sorted List Scheduling - 10 points)

In the lecture we showed, that the Sorted List Scheduling algorithm achieves an approximation factor of $\frac{4}{3}$. Show that this factor is tight.

Exercise 4 (Bin Packing - 10 points)

Prove that *Any Fit* (the set of strategies that only open a new bin if the item does not fit in any currently open bin) achieves an approximation factor of 2.