

Exercise Set 12

Exercise 1:

Consider the following problem: Given a complete bipartite graph G with $V(G) = A \dot{\cup} B$, $|A| = |B|$, and edge lengths $c : E(G) \rightarrow \mathbb{R}_+$ satisfying

$$c(\{v, w\}) + c(\{w, v'\}) + c(\{v', w'\}) \leq c(\{w', v\}) \quad \forall v, v' \in A, w, w' \in B,$$

find a minimum weight Hamiltonian circuit. Prove: If there is a k -factor approximation algorithm for this problem, there is also a k -factor approximation algorithm for the METRIC TSP.

(5 Points)

Exercise 2:

Consider the EUCLIDIAN TSP. Find a class of instances for which the quality of Christofides' algorithm is arbitrarily close to the guaranteed factor of $\frac{3}{2}$. *Hint: Modify the solution of exercise 1b of exercise set 11.*

(5 Points)

Exercise 3:

Modify Christofides' algorithm to find a traveling salesman path (a path that visits every city exactly once) whose length is at most $\frac{3}{2}$ times the length of an optimal path.

(5 Points)

Please return the exercises until Tuesday, **July 14nd, at 2:15 pm.**