

Exercise Set 10

Exercise 10.1. Let $n \geq 4$ and $c : E(K_n) \rightarrow \mathbb{R}_{>0}$ be such that (K_n, c) is an instance of the METRIC TSP, and let T be a tour on K_n . Show that there is a tour $T' \neq T$ such that

$$|c(T') - c(T)| \leq \frac{2}{n} \cdot c(T).$$

(4 points)

Exercise 10.2. Let $n \geq 3$ and $x : E(K_n) \rightarrow [0, 1]$ be such that it satisfies all degree constraints of the TSP but not all subtour elimination constraints. Show that there is a non-empty set $S \subsetneq V(K_n)$ such that

$$\sum_{e \in E(K_n[S])} x_e > |S| - 1$$

and $x_e < 1$ for all $e \in \delta(S)$.

(4 points)

Exercise 10.3. Consider the ANOTHER HAMILTONIAN CIRCUIT PROBLEM: Given an undirected graph G and a Hamiltonian circuit C in G , decide whether there is any other Hamiltonian circuit in G . Show that this problem is \mathcal{NP} -complete.

(5 points)

Exercise 10.4. Show that the TRAVELING SALESMAN PROBLEM, restricted to instances that are the metric closure of a weighted tree, can be solved in polynomial time.

(3 points)

Deadline: December 21st, before the lecture. The websites for lecture and exercises can be found at:

http://www.or.uni-bonn.de/lectures/ws17/co_exercises/exercises.html

In case of any questions feel free to contact me at silvanus@or.uni-bonn.de.