Professor Dr. Jens Vygen
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Exercise Set 10

Exercise 10.1. Let $x \in [0,1]^{E(K_n)}$ with $\sum_{e\in\delta(v)} x_e = 2$ for all $v \in V(K_n)$. Prove that if there exists a violated subtour constraint, i.e. a set $S \subset V(K_n)$ with $\sum_{e\in\delta(S)} x_e < 2$, then there exists one with $x_e < 1$ for all $e \in \delta(S)$.

(4 points)

Exercise 10.2. Let G be an undirected graph and $T \subseteq V(G)$ with $|T| = 2k$ even. Prove that the minimum cardinality of a T-cut in G equals the maximum of $\min_{i=1}^{k} \lambda_{s_i,t_i}$ over all pairings $T = \{s_1, t_1, \ldots, s_k, t_k\}$, where $\lambda_{s,t}$ denotes the maximum number of pairwise edge-disjoint s-t-paths.

(5 points)

Exercise 10.3. Let $(E, \mathcal{F})$ be a clutter. Show that the blocking clutter of the blocking clutter of $(E, \mathcal{F})$ equals $(E, \mathcal{F})$.

(4 points)

Exercise 10.4. Give an example of a clutter $(E, \mathcal{F})$ and prove that your example does not have the Max-Flow-Min-Cut property.

(3 points)

Deadline: Dec 17$^{\text{rd}}$, before the lecture. The websites for lecture and exercises can be found at:

`http://www.or.uni-bonn.de/lectures/ws24/co_exercises_ws.html`

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