Technische Universität Berlin
Institut für Mathematik

Wintersemester 11/12

Computational Integer Programming

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Exercise sheet 8

Deadline: Nothing to submit this time!

The *Undirected Steiner Tree Problem* (USTP) involves an undirected graph $G = (V, E)$ with edge weights $c_{ij} \geq 0$ and a set of terminals $R \subseteq V$. A subset of edges T is *Steiner* if it spans the terminals, it is a Steiner tree if it is minmally Steiner, its weight is $c(T) = \sum_{ij \in T} c_{ij}$. The UTSP is to find a Steiner tree of minimum weight, if it exists. For non-negative edge weights, this is equivalent to finding a Steiner edge set of minimum weight.

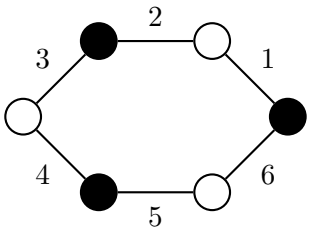

Figure 1: Undirected Steiner Tree Problem, terminals nodes are filled, $c \equiv 1$.

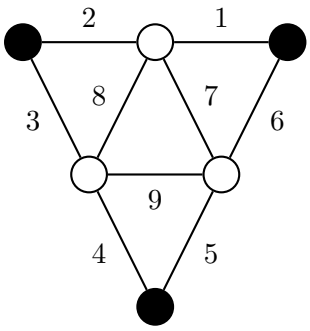

Figure 2: Undirected Steiner Tree Problem, terminals nodes are filled, $c_{ij} = 3.5$ on outer cycle, $c_{ij} = 4$ else.

Exercise 1. **(Tutorial session)**

Solve the Undirected Steiner Tree Problem depicted in Figure 1 separating cut and Steiner partition inequalities.

Exercise 2. **(Tutorial session)**

Use `porta` to compute a complete description of the USTP polytope associated with the problem in Figure 1.

Exercise 3. **(Tutorial session)**

Solve the Undirected Steiner Tree Problem depicted in Figure 2 separating cut and Steiner partition inequalities.

Exercise 4. **(Tutorial session)**

Use `porta` to compute a complete description of the USTP polytope associated with the problem in Figure 2.

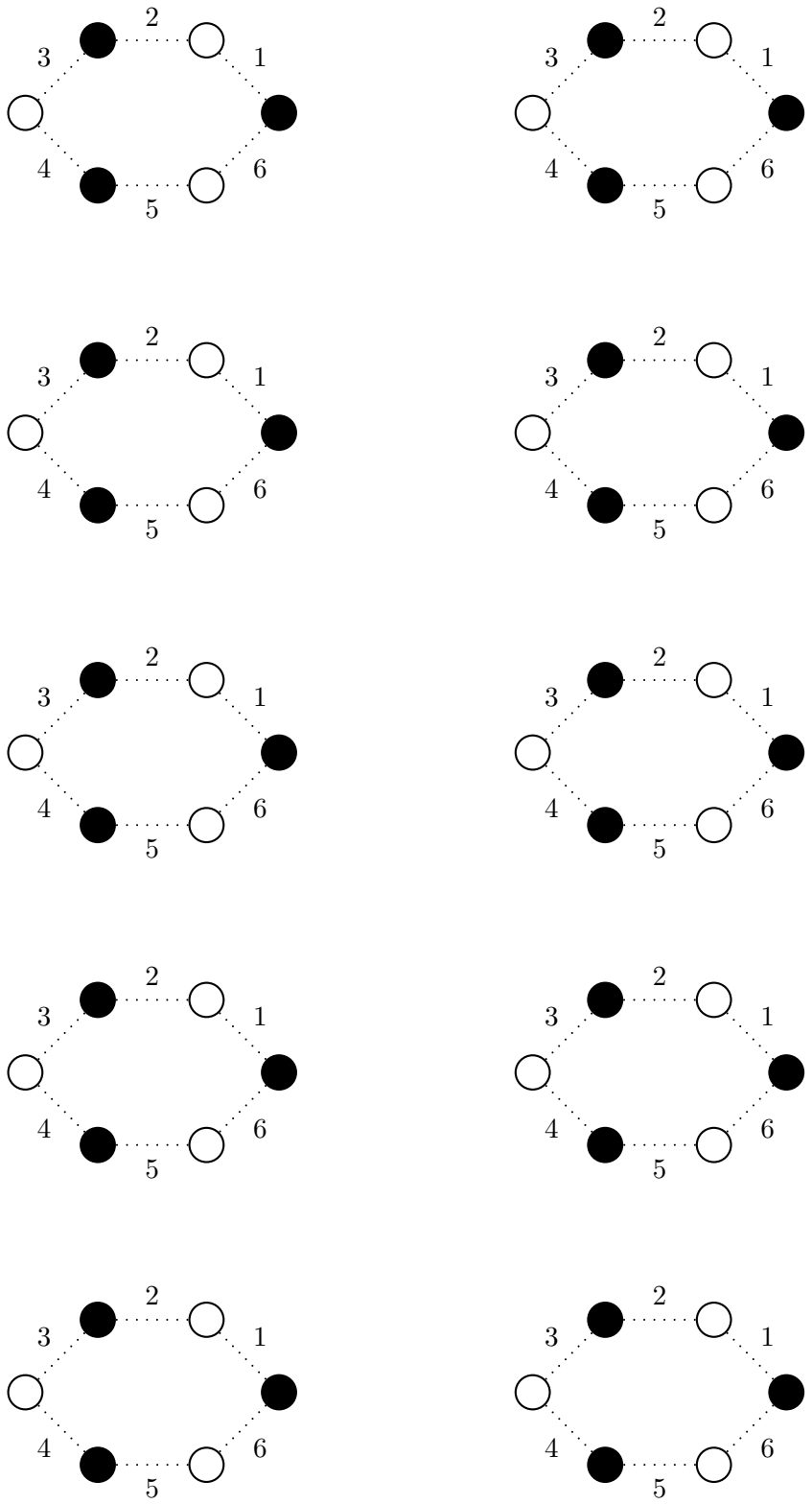

Figure 3: Draw LP solutions and cuts here.

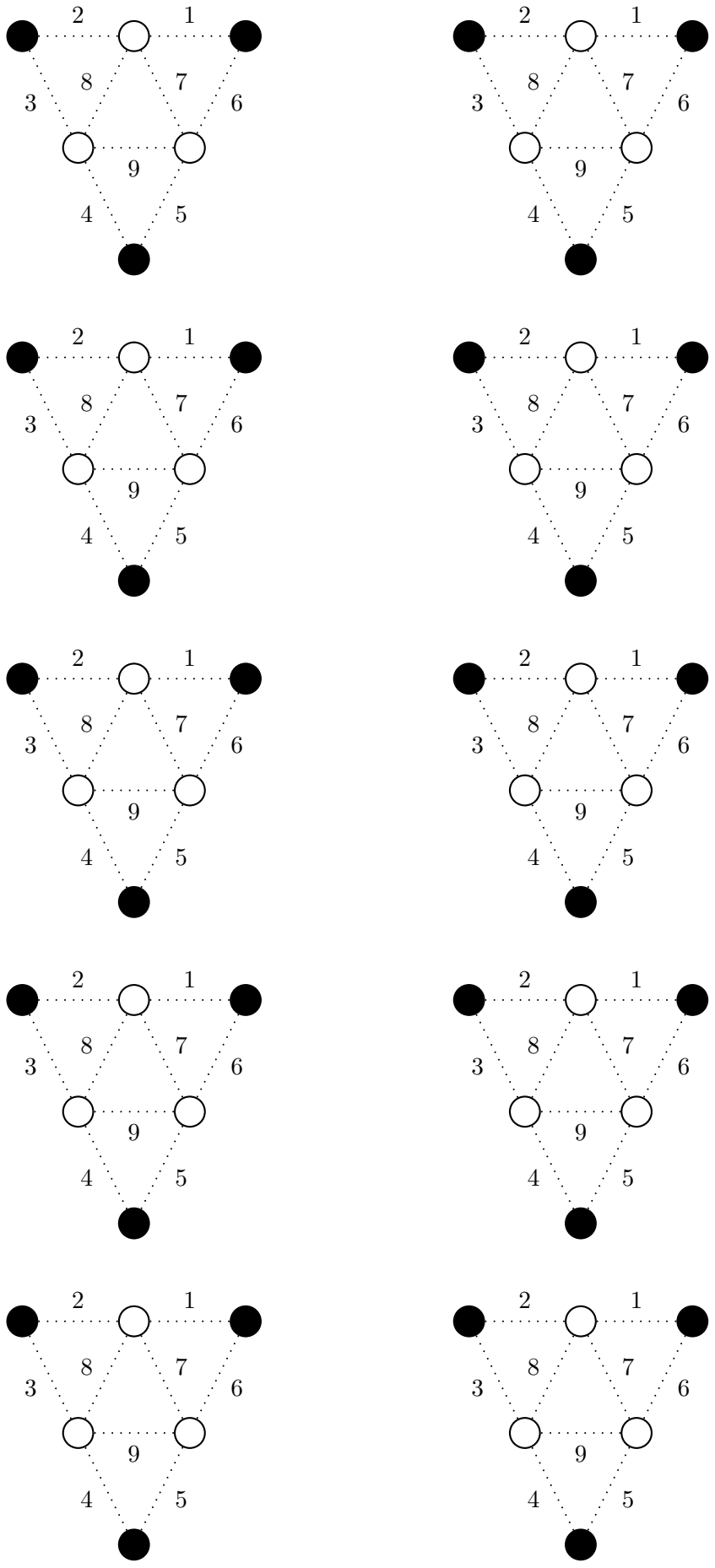

Figure 4: Draw LP solutions and cuts here.