Fall 2020
EE 236A
Prof. Christina Fragouli
TAs: Mine Dogan and Kaan Ozkara

EE236A Linear Programming
Quiz 4
Tuesday November 24, 2020

NAME: _____ **UID**: _____

This quiz has 3 questions, for a total of 20 points.

Open book.
The exam is for a total of 1:00 hour. **Please, write your name and UID on the top of each sheet.**

Good luck!

Problem	Mark	Total
P1		6
P2		7
P3		7
Total		20

Problem 1 (6 points)

1) Derive the dual of the following problem using the Lagrangian.

$$\begin{aligned} \min_{x,y} \quad & 1^T x + 1^T y \\ \text{subject to} \quad & x \geq 0 \\ & y \geq 2c \\ & y - x = c \end{aligned} \tag{1}$$

where $x, y \in \mathbf{R}^n$ are variables, $c = \begin{bmatrix} c_1 \\ c_2 \\ \vdots \\ c_n \end{bmatrix}$ is a given constant vector in $\mathbf{R}^n$, with $c_i > 0$ for $i = 1 \dots n$.

2) What can you tell about the structure of the optimal solution and form of the vertices? How many vertices does this polyhedron have?

Problem 2 (7 points)

UCLA organizes the "host a foreign student for Thanksgiving" event; it has 100 foreign students participating and 50 families that volunteered to host 2 students each. UCLA would like to assign families to students, based on geographic location, so that the students do not have to drive far from their residence. Can you formulate an ILP to solve this problem so that the constraint matrix is TUM?

Problem 3 (7 points): Write an ILP that takes as input a graph and identifies whether the graph is bipartite or not. If you relax you ILP constraints, explain how the solutions of the resulting LP compare with those of your ILP - in particular, are the optimal solutions the same? are the feasible solutions the same? discuss why.