

## COMP362 WINTER 2014 ASSIGNMENT 2

Due at 8:30 AM on February 5th 2013

- 1) Take the dual of the linear program you submitted for assignment 1. Obtain a dual solution somehow. Prove that this dual solution and the optimal solution you submitted for the primal problem for Assignment 1 are both optimal.
- 2) A dominating set of a graph  $G=(V,E)$  is a set  $D$  of vertices such that every vertex in  $V-D$  is joined by an edge to a vertex in  $D$ . Show that there is a polynomial time (for full marks linear time) algorithm to determine the smallest dominating set of a 2-tree.
- 3) We can formulate the dominating problem as an Integer Linear Program using an indicator variable for each vertex  $v$  which is 1 if  $v$  is in the dominating set and 0 otherwise as follows:

Minimize  $\sum_{v \in V} x_v$

Subject to:

For all  $v$  in  $V$ :  $x_v + \sum_{w \in E} x_w \geq 1$  and  $x_v$  is nonnegative and integer.

Take the dual of the Linear Program obtained by dropping the integrality constraint.

- 4) Show that every 2-tree  $T$  contains a triangle whose removal leaves a graph none of whose connected components contain more than half the vertices of  $T$ .

Please email your solutions to [yuditskyl@gmail.com](mailto:yuditskyl@gmail.com)

