**Approximation Algorithms** **Homework 5**
**Date:** March 25, 2010 **Due:** April 6, 2010

1. (10 points) Problem 6.2.
2. (10 points) Problem 6.5.
3. (10 points) Problem 6.6.
4. (10 points) Problem 11.3. (Hint: Follow the argument for the 2-approximation algorithm for the survivable network design problem and instead of a $\frac{1}{2}$-edge argue that there is a 1-edge. Use a different token argument where 1 token for an edge is given $\frac{x_{uv}}{2}$ for vertex constraints of $u$ and $v$ and rest $1 - x_{uv}$ to the smallest set in laminar family containing both $u$ and $v$. Then show that the above token argument does give one token to each constraint and achieve a contradiction.)
5. (10 points) In an instance of the minimum bounded weighted-degree spanning tree we are given a graph $G = (V, E)$ and cost function $c : E \to \mathbb{R}^+$, a weight function $w : E \to \mathbb{R}^+$, a degree bound $B_v$ on each vertex $v$, and the task is to find a spanning tree $T$ with minimum cost and $\sum_{e \in \delta_T(v)} w(e) \leq B_v$ for all $v \in V$. Give a good bi-criteria approximation algorithm for the problem.