# Problem Set 6

This problem set is due at **10:00 am** on **Tuesday, April 11th**.

**Problem 6- 1: Job assignment revisited**

You are given a matrix $M$ such that $M_{(w, t)} =$ percentage of task $t$ that worker $w$ completes in an hour. No worker can work for more than 10 hours, multiple workers can be assigned to the same task and workers can be assigned to multiple tasks. Write a linear program to find an assignment of workers to tasks which minimizes the total time taken to complete all the tasks, assume that it is possible to complete all the tasks. (Note: You do not need to write an algorithm to do this, just give a linear programming formulation of the problem.)

**Problem 6- 2: Reductions and algorithms**

For the following two problems, suppose that given a graph $G = (V, E)$ it is *not* possible to determine the existence of an independent set of size $|V|/(\log^3 |V|)$ in polynomial time.

- Is it possible to determine the existence of a vertex cover of size $|V| - 1000$ in polynomial time? If yes, give a polytime algorithm, if no, reduce the problem of finding an independent set of size $|V|/(\log^3 |V|)$ to the problem of finding a vertex cover of size $|V| - 1000$.

- Is it possible to determine the existence of a clique of size $|V|/(\log^3 |V|) + 1000$ in polynomial time? If yes, give a polytime algorithm, if no, reduce the problem of finding an independent set of size $|V|/(\log^3 |V|)$ to the problem of finding a clique of size $|V|/(\log^3 |V|) + 1000$.