Spring 2012 **CMSC 858T: Homework 2** Samir Khuller

Due in class: Due date: Mar 7.

(1) Prove that minimizing the weighted completion time with precedence constraints is an NP-hard problem. The goal is to non-preemptively schedule n jobs on a single machine with weights and processing times.

(2) We have a collection of N jobs of unit length. Each client is interested in a subset of jobs. Consider a permutation of jobs σ, then the *satisfaction* time of the client is the position of the last job of their subset. IF we have jobs A, B, C, D, E scheduled in this order, then if a client wants $\{A, E\}$ then their satisfaction time is 5. If a client wants $\{A, C\}$ their satisfaction time is 3.

Develop a 2 approximation for the problem of minimizing the sum of the satisfaction times of the clients.

(3) Consider the following problem. We have n interval requests. An interval request R_i is a request for a resource from time $[t_s^i, t_e^i]$. Suppose we have k resources. How can bwe maximize the number of requests we satisfy? Design a polynomial time algorithm.

(4) Describe the proof given in the Aspnes et al paper on scheduling jobs on related machines in an online manner. Jobs are assigned in an order given by the adversary. (I already asked you to read this paper.)