IEOR 6400
HW 2
Due: December 3, 2007

1. Construct an instance for $\mathrm{P}|pmtn|C_{\max}$ for which an optimal schedule has at least $m-1$ preemptions.

2. Give a polynomial time algorithm to solve the problem $\mathrm{R}||C_{\max}$ when all the processing times p_{ij} are either 1 or 2.

3. Give a polynomial-time algorithm for $1|r_j, p_1 = 1|L_{\max}$. Make the running time of the algorithm as small as possible.

4. Give a polynomial time algorithm to solve the problem $\mathrm{R}|pmtn|L_{\max}$. (Hint: It is similar to $\mathrm{R}|pmtn|C_{\max}$, but you may need more variables.)

5. Analyze the performance of list scheduling for $\mathrm{P}|r_j, prec|L_{\max}$. You should be able to prove that it is a constant factor approximation algorithm.

6. Give an greedy algorithm that solves $1||\sum U_j$ in polynomial time.

7. a) Write an integer program for the problem $1|prec|\sum w_j C_j$ using variables y_{it} where y_{it} is 1 if job 1 *starts* at time t.

b) Write an integer program for the problem $1|prec|\sum w_j C_j$ using variables δ_{ij} where $\delta_{ij} = 1$ if job i runs before job j and 0 otherwise.

c) Can you prove that one formulation is *stronger* than the other? That is, can you prove that the feasible region of linear relaxation of one of the formulations is contained in the feasible region of the linear relaxation of the other program's feasible region.