Discrete Optimization - 308-566A

SECOND CLASS TEST

November 6, 2001 1:00 - 2:30pm

(8 pts) 1. Explain in some detail what an eta matrix is, and how they are used in the efficient implementation of the revised simplex method.

(12 pts) 2. Consider the LP

$$\begin{aligned} \textit{maximize} \quad & 20x_1 + 12x_2 \\ \textit{subject to} \quad & 2x_1 + x_2 \le 24 \\ & x_1 + x_2 \le 15 \\ & x_1, x_2 \ge 0. \end{aligned}$$

This has optimal dictionary

$$z = 252 - 8x_3 - 4x_4$$

$$x_1 = 9 - x_3 + x_4$$

$$x_2 = 6 + x_3 - 2x_4$$

(a)Work out the range of values of the coefficient of x_1 in the objective function for which the current basis is optimal.

(b)Show how to add the additional constraint

$$x_1 - x_2 \le 1$$

to the final dictionary. Then reoptimize using the **dual simplex method.**

(10 pts) 3. Consider the following LP:

$$\max \sum_{i=1}^{n} \sum_{j=1}^{n} c_{ij} x_{ij}$$

$$\sum_{i=1}^{n} x_{ij} = 1 \text{ for } \textit{all } j = 1, \ldots, n$$

$$\sum_{j=1}^{n} x_{ij} = 1 \text{ for } \textit{all } i = 1, \ldots, n$$

$$x_{ij} \ge 0 \text{ for } \textit{all } i \text{ and } j.$$

(a) Show that for any cost vector c the the optimum solution of this LP is achieved by integer valued variables.

(b) Characterize the basic feasible solutions for the constraint set of the LP.