Discrete Optimization I - COMP566A

SECOND CLASS TEST No books, notes, calculators or cheating!

November 11, 2003 1:05 - 2:25pm

(10 pts) 1. Suppose you are presented with the optimum solution of a linear programming problem, along with a list of the basic variables. Describe how you would handle the following two situations:
(a) add a new constraint;
(b) add a new variable.
In each case you may choose either the revised simplex method or the dictionary method. Along with the optimum solution, you receive the corresponding basis Be sure to explain how to check if the current optimum solution remains optimum.

(10 pts) 2. Solve the following program by the **network simplex method.** You should
(a) draw a network corresponding to these constraints;
(b) choose a starting tree solution by inspection **that is not optimum;**
(c) pivot to optimality using the network simplex method.

$$\min \quad 5w_1 + 3w_2 + 7w_3 + w_4$$

$$\begin{aligned} w_1 + w_2 + \quad\quad\;\; &= 1 \\ w_3 + w_4 &= 1 \\ -w_1 \quad - w_3 \quad\;\; &= -1 \\ - w_2 \quad - w_4 &= -1 \end{aligned}$$

$$w_i \geq 0,\ i = 1, 2, 3, 4.$$

(10 pts) 3. Consider the zero sum matrix game between Alice (row player) and Bob (column player) with payoff matrix A for Alice given by:

$$A = \begin{bmatrix} 0 & -1 & 2 \\ 2 & 0 & -2 \\ -1 & 2 & 0 \end{bmatrix}$$

Consider the following two strategy pairs:
(i) Alice and Bob both play (2/10, 3/10, 5/10).
(ii) Alice plays (10/25,7/25,8/25) and Bob plays (10/25,8/25,7/25).

In each case determine if the strategy is an optimum minimax strategy or not by formulating the relevant LPs and checking the optimality conditions. If a strategy pair is not optimal, give a best reply for Alice which improves her expected payoff.