Discrete Optimization I - COMP566A

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

October 14, 2003   1:05 - 2:20pm

(5 pts) 1. (a)The manager at O'Hagan Booksellers, S. Shady, is considering a sales promotion of a new collection of fantasy novels and art books, and he plans to price the books so low as to actually take a loss: O'Hagan will lose \$3 on every fantasy novel and \$2 on every art book sold in the promotion. Since the store will only offer the art books to those who purchase two or more fantasy novels, the store will sell at least twice as many fantasy novels as art books, and also plans to sell at least 210 items in all. On the other hand, the store can spare up to 900 units of display space for the sale. S. Shady calculates that fantasy novels each require 3 units of display space, while art books require 2 units. Write down a linear program in standard form in order to lose the least amount of money in the sales promotion.

(5 pts) (b) You come up with the solution to sell 140 fantasy novels and 70 art books at a loss of \$560. Shady is angry as he does not want to lose more than \$500. Convince him your answer is optimum using duality theory.

(12 pts) 2. The table below refers to a primal/dual pair of linear programs in standard form. For each box, write a Y if the combination is possible and a N if it is not. In each case give a justification. You may use the weak or strong duality theorems, as long as you state them correctly.

Primal	Dual		
	Infeasible	Optimum	Unbounded
Infeasible			
Optimum			
Unbounded			

(5 pts) 3.(a) Explain briefly the Phase 1 procedure to find a feasible solution to an LP in standard form.

(3 pts) (b) Suppose you run Phase 1 on a problem and find a feasible solution. Is it possible that the artificial variable is still in the basis? If so, how would you proceed with Phase II. If not, prove the artificial variable cannot be in the basis.