C&O 367/CM 442 Nonlinear Optimization – Winter 2009

Assignment 5 Due date: Wednesday Apr. 1, 2009

Assignments are due before the start of class on the due date.
Write your name and ID# clearly, and underline your last name.

C&O 367
Assignment 1

Due on Thursday, Apr. 1 (before start of class)
Instructor H. Wolkowicz

1 LP and QP Duality

For each primal problem (P): construct the appropriate Lagrangian/payoff function $L(x, \lambda)$;
write down the equivalent max min for (P) and the min max problem for (D). (E.g. $\min_{x \in C} \max_{\lambda \in D} L(x, \lambda)$, for appropriate sets C, D.) Derive a dual using the appropriate *hidden constraint*.

1.1 LP —— 5 Marks

$$\begin{array}{lll} \min & \sum_{j=1}^{3} c_j x_j & \\ \text{subject to} & \sum_{j=1}^{3} A_{ij} x_j \quad \text{sign}_i & b_i, \quad i = 1,2,3 \\ & x_i \in C_i, & i = 1,2,3, \end{array}$$

where, for $i = 1, 2, 3$ we have sign $_i$ is $\geq, \leq, =$, respectively; and C_i is $\mathbb{R}_+, \mathbb{R}_-, \mathbb{R}$, respectively.

1.2 QP —— 5 Marks

$$\begin{array}{ll} \min & \frac{1}{2} x^T Q x + g^T x \\ \text{subject to} & Ax \geq a \\ & Bx \leq b \\ & Cx = c. \end{array}$$

2 Problems from Text

2.1 Page 236, #2 —— 5 Marks

2.2 Page 236-7, #7 —— 10 Marks

2.3 Page 267, #4,7 —— 10 Marks

3 BONUS: Page 269, #20 —— 5 Marks

(Note: This problem must be done on your own. No books, internet pages, etc... are allowed.)