Department of Mathematical Sciences
Carnegie Mellon University

21-393 Operations Research II
Test 2

Name:_____

Problem	Points	Score
1	35	
2	35	
3	30	
Total	100	

Q1: (35pts)
Use the KKT conditions to solve

Minimise $(x_1 - 2)^2 + (x_2 - 2)^2$ subject to $x_1 + 2x_2 \leq 3, 2x_1 + x_2 \leq 1$.

Q2: (35pts) There are two machines available for the processing of n jobs. The processing time of job j is $p_j > 0$ for $j = 1, 2, \ldots, n$. The objective is to assign jobs to machines in order to minimise $C_{\max} = \max\{C_j : j = 1, 2, \ldots, n\}$ where C_j is the completion time of job j. Let

$$P_1 = \sum_{j=1}^{n} p_j \text{ and } P_2 = \max\{p_j : j = 1, 2, \ldots, n\}$$

Show that the optimal solution satisfies

$$\frac{P_1}{2} \leq C_{\max} \leq \frac{P_1 + P_2}{2}.$$

Q3: (30pts)
In an inventory system for a single product there is a cost of $AQ^{1/2}$ for making an order of size Q. No stockouts are allowed. The inventory cost per period is $Ih^{1/2}$ where h is the average amount of stock held. Determine an optimal purchasing/stock strategy.