Department of Mathematics
Carnegie Mellon University

21-393 Operatons Research II
Test 1

Name:_____

Problem	Points	Score
1	33	
2	33	
3	34	
Total	100	

Q1: (33pts)
Solve the following linear program for all values of λ:

$$\begin{array}{lrcrcl} \text{minimise} & x_1 & + & x_2 & & \\ \text{subject to} & & & & & \\ & x_1 & + & 2x_2 & \geq & 6-\lambda \\ & 2x_1 & - & x_2 & \geq & 4-\lambda \end{array}$$

$$x_1, x_2 \geq 0.$$

[Hint: start the computation with the all slack basis.]

Q2: (33pts)
Solve the following integer program:

$$\begin{array}{lrcrcl} \text{maximise} & x_1 & + & 4x_2 & & \\ \text{subject to} & & & & & \\ & 2x_1 & + & x_2 & \leq & 4 \\ & x_1 & + & 2x_2 & \leq & 5 \end{array}$$

$$x_1, x_2 \geq 0 \text{ and integer.}$$

Q3: (34pts)
Formulate the following as an integer program:
A set of n items is to be stored in a warehouse. Item i has size s_i, arrives at time a_i and departs at time d_i. The problem is to minimise the size D of the storage facility, if upon arrival, item i is allocated an interval of storage $I_i = [x_i, y_i]$ where $x_i, y_i \in \{0, 1, \ldots, D-1\}$. The allocations must be such that if $I_j \cap I_k \neq \emptyset$ then $a_k \geq d_j$ or $a_j \geq d_k$.