Analysis of Algorithms: Assignment 9

Due date: April 12 (Thursday)

Problem 1 (5 points)
This problem is inherited from Exam 2; you should write a solution even if you received the full credit for solving it during the exam.

Suppose that G is a weighted directed graph, where all weights are integers between 1 and 5, and let u and v be two vertices of G. Describe an efficient algorithm $\textsc{Shortest-Path}(G, u, v)$ that finds a minimal-weight path from u to v.

Problem 2 (5 points)
Write pseudocode of an algorithm $\textsc{Greedy-Knapsack}(W, v, w, n)$ for the 0-1 Knapsack Problem, and give its running time. The arguments are an weight limit W, array of item values $v[1..n]$, and array of item weights $w[1..n]$. Your algorithm should use the greedy strategy described in class, and return the set of selected items.

Problem 3 (bonus)
This problem is optional; if you solve it, you will get one bonus point toward your final grade.

Suppose that the weights of all items in the 0-1 Knapsack Problem are integers, and the weight limit W is also an integer. Design an algorithm that finds a *globally optimal* solution, and give its time complexity in terms of the number of items n and weight limit W.