

Introduction To Algorithms
CS430

Fall 2015
HomeWork 5
Due 21st October

1. Given a directed graph G with positive distance and weights on edges, suppose we wish to determine the shortest traveling salesman tour in a graph but the tour must also have total weight less than W . Design an algorithm to solve this problem.

(20)

2. Suppose we wish to make change for a bill of a certain value into smaller coins of denominations $d_1, d_2 \dots d_n$. Given unlimited coins of the denominations, design a dynamic programming algorithm to determine if it is possible to make change for an input bill of value v .

(20)

3. Suppose we have a grid of size $n \times n$ the column and rows numbered 1 through n left to right and top to bottom, respectively. A mouse gathers a bunch of cheese bits while moving from matrix square numbered $(1, 1)$ to (n, n) and at each matrix element (i, j) is able to gain cheese worth $c(w(i, j))$ calories, where $w(i, j)$ is the weight of the cheese at the $(i, j)^{th}$ square and $c(w)$ is a function that maps weight to calories and that the mouse can compute. The mouse can only move right or down, i.e. from square (i, j) he can go to either $(i + 1, j)$ or $(i, j + 1)$. Find a path from $(1, 1)$ to (n, n) so that the mouse can maximize the total value of the cheese gathered. Use the following steps:

- (a) Set-up a recurrence $W(i, j)$ that represents the maximum value of cheese that the mouse can gather starting from square (i, j) .
- (b) Solve it using memoing.

(20 pts)