CSE 3500: Problem Set 5
Due by 11:59 PM on Monday, Nov 27.

Please note:

- *Students are permitted to discuss general concepts and questions concerning the homework assignments, but sharing written solutions with others or using solutions provided by others, in part or in whole, is prohibited.*
- *Whenever a question asks you to give an algorithm for a problem, be sure to also prove its correctness and analyze its time complexity.*
- *If you consult an outside resource (e.g., web page, book, or research paper) to arrive at your solution, be sure to cite that resource.*

Suggested reading: Chapter 6 from textbook.

Homework questions:

Question 1. (10 points) Exercise 1 from Chapter 6, pages 312-313 of the textbook.

Question 2. (10 points) Suppose you visit a country where the coins are of denominations $d_1, d_2, \ldots, d_n$ and you wish to make change for value v. Provide an efficient dynamic programming algorithm for calculating the minimum number of coins required to make change for value v. For example, if the coin denominations are 1, 2, 5, and 7, then you would need at least 2 coins (i.e., 5, 5) to make change for value 10. You may assume that the coin denominations are such that it is possible to make exact change for any value.

Question 3. (10 points) Suppose that you run a fast-food restaurant business and wish to open a series of restaurants along a highway. There are n possible locations along the highway where you could open your restaurants, and these n locations are at distances of $m_1, m_2, \ldots, m_n$ miles, in increasing order, from the starting point of the highway. The expected profit from opening a restaurant at location i is p_i, where $p_i > 0$ and $1 \leq i \leq n$. Give an efficient algorithm to compute your maximum expected total profit, subject to the following two constraints: (i) You can open at most one restaurant at each location, and (ii) any two restaurants must be at least k miles apart along the highway, where k is a positive integer.

Question 4. (10 points) Exercise 5 from Chapter 6, pages 316-317 of the textbook.

Question 5. (10 points) Exercise 11 from Chapter 6, page 323 of the textbook.