Problem Set 5

> **Due dates:** Electronic submission of .tex and .pdf files of this homework is due on **2/21/2014 before 11:00am** on csnet.cs.tamu.edu, a signed paper copy of the pdf file is due on **2/21/2014** at the beginning of class.

Name: (put your name here)

Resources. (All people, books, articles, web pages, etc. that have been consulted when producing your answers to this homework)

On my honor, as an Aggie, I have neither given nor received any unauthorized aid on any portion of the academic work included in this assignment. Furthermore, I have disclosed all resources (people, books, web sites, etc.) that have been used to prepare this homework.

Signature: ____________________________

Watch the dynamic programming video before the class on Monday. Bring you laptop to class on Monday (if you have one).

P 1. (10 points) Program the dynamic programming solution to the coin change problem. The output should be the **number of coins**. I suggest that you use this example to learn a little bit Ruby (but you are also allowed to program it in C, C++ or Java). Make sure that you document your program well to get full credit.

Solution.

P 2. (10 points) Modify the dynamic programming solution to the coin change problem so that it will output the **multiplicities** $m[n], \ldots, m[2], m[1]$ of the coins with values $v[n], \ldots, v[1]$ for a given amount C, that is, the multiplicities need to satisfy

$$C = m[n]v[n] + \cdots + m[1]v[1],$$

and the sum of the multiplicities should be the minimum for this amount of change. In other words, derive the **pseudocode** to determine the optimal amount of change for a given amount.

Solution.

P 3. (10 points) Modify your dynamic programming solution to the coin change problem from P1 so that it outputs the actual coins needed to give the exact amount of change using your algorithm from P2. This should be your **implementation** of the algorithm that you describe in the previous problem.

Solution.

P 4 (15 points)**.** Solve Exercise 15.4-1 on page 396. Show your work!

Solution.

P 5 (15 points)**.** Solve Exercise 15.4-2 on page 396.

Solution.

P 6 (20 points)**.** Solve Exercise 15.4-5 on page 397.

Solution.

P 7 (20 points)**.** Solve Problem 15-2 on page 405. [Hint: Given a sequence $s = \langle s_1, s_2, \ldots, s_n \rangle$, a subsequence is obtained by deleting elements from s, that is, a subsequence of s is of the form $\langle s_{i_1}, s_{i_2}, \ldots, s_{i_m} \rangle$, where the indices satisfy $1 \leq i_1 < i_2 < \cdots < i_m \leq n$. Suppose the sequence is represented by an array s. Consider the sub-arrays $s[i..j]$. Notice that $s[i, j]$ contains a palindrome of length ≥ 2 when $s[i] = s[j]$. Let $l[i, j]$ denote the length of a maximum length palindrom in $s[i, j]$. Relate $l[i, j]$ to subproblems.]

Solution.

Discussions on ecampus are always encouraged, especially to clarify concepts that were introduced in the lecture. However, discussions of homework problems on ecampus should not contain spoilers. It is okay to ask for clarifications concerning homework questions if needed.

Checklist:

☐ Did you add your name?
☐ Did you disclose all resources that you have used?
(This includes all people, books, websites, etc. that you have consulted)
☐ Did you sign that you followed the Aggie honor code?
☐ Did you solve all problems?
☐ Did you submit (a) your latex source file and (b) the resulting pdf file of your homework?
☐ Did you submit (c) a hardcopy of the pdf file in class?