**COMP 7270 Assignment 2 10 Problems 200 points No late submissions!**

U**pload your submission well before this deadline. Even if you are a few minutes late, as a result of which Canvas marks your submission late,** **your assignment may not be accepted**.

Instructions:

1. This is an individual assignment. You should do your own work. **Any evidence of copying will result in a zero grade and additional penalties/actions.**
2. Late submissions **will not** be accepted unless prior permission has been granted or there is a valid and verifiable excuse.
3. **Think carefully; formulate your answers, and then write them out concisely** using English, logic, mathematics and pseudocode (no programming language syntax).
4. Algorithms should be provided in numbered pseudocode steps.
5. **Type your answers in this Word document and submit it. If that is not possible, use a word processor to type your answers as much as possible (you may hand-write/draw equations and figures), turn it into a PDF document and upload**.

All questions carry equal weight.

**1.** Problem 15.2-1 in the text. Show the s and m matrices (like Figure 15.5) and then provide the optimal parenthesization.

**2.** Convert the recursive characterization of equations (16.2) in text into a recursive algorithm and provide the algorithm below.

**3.** Write a memorized recursive algorithm RECURSIVE-MEMOIZED-LCS-LENGTH(X,Y) to compute the length of the LCS of X and Y based on equations (15.9), p. 393. You can do this later after 04/09’s class.

Please read 7270-09-DP Part I.pdf, pp 29 for the following two questions, which is also placed here:

* Another way of characterizing the structure of the optimal solution to this problem recursively is to say: we can first cut the rod into two pieces of length i and n-i inches each, and then recursively calculate the optimal cuts for each of those pieces; if we do that for each possible value of i from 1 to n-1 and calculate the total revenue ri+rn-i for each of those possible cuts, and then take the maximum of those and pn (the revenue if the rod is sold without cutting), that will give us the optimal revenue rn.
* This is formulated as equation 15.1 (p.362). Understand this equation.

1. Develop a corresponding recursive algorithm.

2. Show how this algorithm duplicates work by drawing a recursion tree for a specific input and pointing out duplicate recursive executions.

3. Modify the recursive algorithm to make it more efficient using memoization. Is this more/less/as efficient as Memoized-Cut-Rod?

4. Develop an algorithm to compute the optimal solution in a bottom up fashion using table lookup. Is it more/less/as efficient as Bottom-Up-Cut-Rod?

**4.** Do the Questions 1 & 2. The specific input for which you would draw a recursion Tree should be a rod of length 4 inches.

**5.** Do the Questions 3 & 4. As part of your answer. For Q4, you must explain the lookup table – what it’s dimensions are and the order in which its cells will be filled by the algorithm.