

## CSCI 338: Assignment 5 (7 points)

This assignment is due on **Tuesday, April 13, 8:00pm**. It is strongly encouraged that you use Latex to generate a single pdf file and upload it under *Assignment 5* on D2L. But there will NOT be a penalty for not using Latex (to finish the assignment). This is **not** a group-assignment, so you must finish the assignment by yourself.

### Problem 1

We are given 5 matrices  $M_1, \dots, M_5$ , their dimensions (i.e., rows by columns) are as follows:  $M_1$  is  $15 \times 20$ ,  $M_2$  is  $20 \times 30$ ,  $M_3$  is  $30 \times 10$ ,  $M_4$  is  $10 \times 50$ , and  $M_5$  is  $50 \times 8$ .

(1.1) Run the dynamic programming algorithm for *matrix chain multiplication* that we covered in class to produce the table  $m[-, -]$ .

(1.2) What is the optimal solution value? Where do you find it?

## Problem 2

We are given a context-free grammar  $G$  as follows:

$$\begin{aligned} G: S &\rightarrow AS|SB \\ A &\rightarrow AD|DA|a \\ B &\rightarrow BB|BD|b \\ D &\rightarrow DD|d. \end{aligned}$$

We are also given a string  $w = bdbdd$ .

(2.1) Run the dynamic programming algorithm for  $A_{CFG}$  that we covered in class to produce the table  $table[-, -]$ .

(2.2) How do we know whether  $G$  generates  $w$  from the table?

### **Problem 3**

Show that  $ALL_{DFA} \in P$ .

### **Problem 4**

Show that Independent Set  $\in NP$ .