CSCI 338: Assignment 5 (6 points)

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This assignment is due on **Friday, April 17, 11:30pm**. 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 $M_1, ..., M_5$, 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 $m[-,-]$.

i \ j	1	2	3	4	5
1	0	9000	9000	165000	13600
2	X	0	6000	16000	11200
3	X	X	0	15000	6400
4	X	X	X	0	4000
5	X	X	X	X	0

Table 1: Solution to 1.1

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

The optimal number of multiplications is 13600. It is located at m[1,5] in the top right corner of the table.

Problem 2

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

G: $S \to AS|SB|\varepsilon$

$A \to AD|DA|a$

$B \to BB|BD|b$

$D \to DD|d.$

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 $table[-,-]$.

i \ j	1	2	3	4	5
1	B	B	B	B	B
2	X	D	$\emptyset$	$\emptyset$	$\emptyset$
3	X	X	B	B	B
4	X	X	X	D	D
5	X	X	X	X	D

Table 2: Solution to 1.1

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

G generates w if S is in the top right corner (table[1,5]).

Problem 3

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

Problem 4

Show that Independent Set $\in$ NP.