# EL9343 Homework 5

*All problem/exercise numbers are for third edition of CLRS text book*

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*Reminder: If you have already submitted solutions for problems 1,2, you do not have to re-submit them for this homework.*

**1.** Exercise 22.4-1

**2.** Show how the procedure Strongly-Connected-Components works on the graph in Figure 1. Show the finishing times computed in line 1 and the forest produced in line 3. Assume DFS considers vertices in alphabetical order and and the adjacency lists are also alphabetical order.

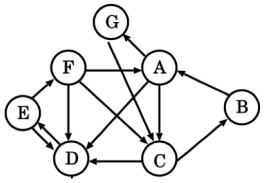


Figure 1: Directed Graph for Question 2

**3.** Given an $M \times N$ matrix $D$ and two coordinates $(a, b)$ and $(c, d)$ which represent top-left and bottom-right coordinates of a sub-matrix of the given matrix, propose a dynamic-programming approach to calculate the sum of all elements in the sub-matrix. What is the complexity of your solution?

| | | | |
|---|---|---|---|
| 0 | -2 | -7 | 0 |
| 9 | 2 | -6 | 2 |
| -4 | 1 | -4 | 1 |
| -1 | 8 | 0 | -2 |

Figure 2: Example of a sub-matrix where $(a, b) = (1, 0)$ and $(c, d) = (4, 2)$

**4.** Propose a dynamic-programming approach to obtain the minimum number

of coins required to get a desired change. Assume that you are given sufficiently many coins of various denominations. For example, consider possible denominations of $(1, 2, 5, 10)$ and desired change of 17. The minimum number of coins is 3 $(2 + 5 + 10)$. What is the complexity of your solution?

**5.** Exercises from CLRS Textbook: 15.1-3, 15.4-3, 15-1, 16.1-1