

Name:

Student ID:

Instructions:

1. The duration of the exam is 2 hours.
2. There are three questions.
3. You are advised to solve the questions on a rough sheet first and then copy them here.

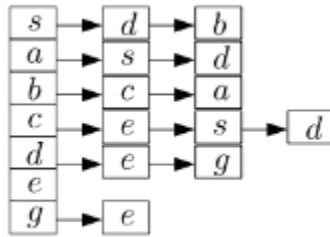
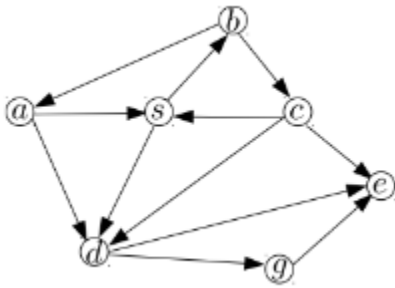
Q1] Let A be a given matrix whose entries are only 0 and 1. The objective is to find a square sub-matrix of maximum size whose all entries are 1. For example, in the following matrix the solution is shown in boldface and the answer is 3.

1	0	1	1	0	1
0	1	1	1	0	1
1	1	1	1	1	0
0	1	1	1	0	1
1	1	0	1	0	0

- Describe in simple English a brute force algorithm for this problem. Find its time complexity. [3 marks]
- Describe in simple English an efficient algorithm for this problem. Find its time complexity. [7 marks]

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Q2] Consider the following graph with start node s . Its adjacency list representation is also given.



- Find a sequence of vertices explored by the DFS algorithm. Also justify your answer. [5 marks]
- What is the number of back edges and cross edges you get after the DFS. Also justify your answer. [5 marks]

Q3] Describe in simple English an efficient algorithm that takes as input a set $A = \{a_1, a_2, \dots, a_n\}$ of n positive integers, and determines whether there exists a subset $B \subseteq A$ such that the sum of all the elements in B is 100. [10 marks]