Algorithms Final, Spring 2022

*必填

1。 電子郵件 *

2。 Student ID *

3。 Student Name *

4。 (1) For all questions, you can write the answer in text. That means drawing figures is helpful but not mandatory. You'll get the full credit with either form as long as it is clear. (2) For the first part "Introduction & Simple Questions", you just need to answer the questions with brief answers. After that, you need to provide the necessary step-by-step procedure for all questions. You may also get partial credits by doing it if your final answer is wrong due to calculation errors.

單選。

- ◯ Understood.
- ◯ No.

Introduction & Simple Questions

A quick answer with brief explanation is good enoug

5。 Name one sorting method that has its worst-case complexity better than or equal to O(n lg n) and produces stable result.

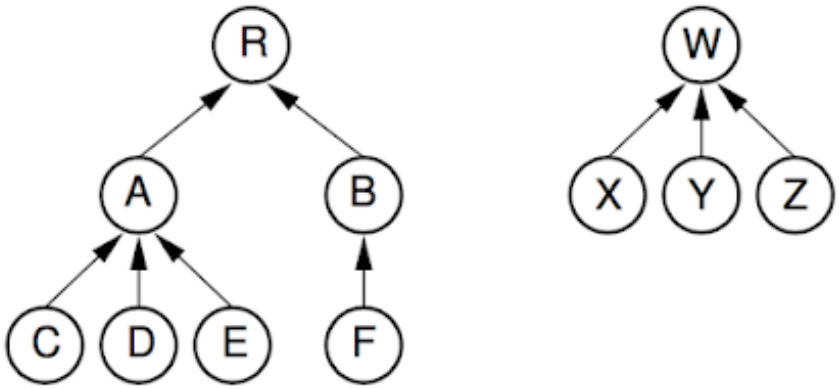
6。 Name one situation where counting sorting is not considered appropriate to apply.

7。 What is the best answer if you need to describe the following complexity?

$$O(n^2) + \Omega(n)$$

8。 Can we find a problem that can be solved by a greedy algorithm but can not be solved by any dynamic programming approach?

9。 Find the result after performing UNION(C, X).



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提交的檔案：

11。 How do you think of the online courses during the epidemic? Any way that we can improve it?

Before the Midterm

12。 Solving recurrence equation.

Find asymptotic behavior for the recurrence equation given by: T(n) = 3T(n/2) + lg n

13。 Quicksort

Watch the following video and write down what the difference is between this implementation and our implementation in class. Please be as precise as possible.

A quicksort by folk dance.

http://youtube.com/watch?v=ywWBy6J5gz8

14。 Compare between two deletion approaches in hashing.

One is to mark a special character, and the other is to put a NULL when deleting an element. Which one is better? In what sense you think it is better?

Dynamic Programming & Greedy Algorithms

15。 Longest Common Subsequences. 2

(a) Find LCS for two sequences X = "BACDBAC" and Y = "ABCABCA". (b) If we prefer an LCS ending with "BC", can you sketch an algorithm to achieve this? That is, we would like to find an LCS has its ending with "BC". But we simply output the regular LCS if it is not possible.

		A	B	C	A	B	C	A
B								
A								
C								
D								
B								
A								
C								

16。 Upload your result over here if necessary.

提交的檔案：

17。 Greedy algorithms 1

Let us have a set of coins with value 1, 5 and 10. If we want to use as few coins as possible to pay a given amount, suggest a greedy algorithm. Can you briefly explain why your algorithm works.

Graph Algorithms

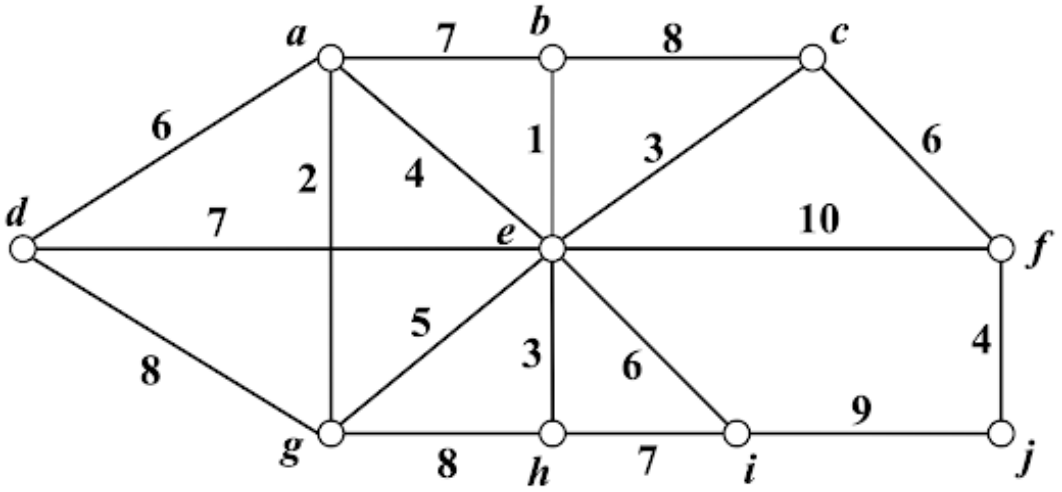
18。 Can you find a directed graph of five vertices where its BFS and DFS visits are the same? Assume we start from the same vertex and another constraint is that the depth of the BFS tree and DFS tree is three. 1

19。 Upload necessary figure over here.

提交的檔案：

20 。 Minimum Spanning Trees 2

(a) (7%) When finding the MST from the following graph by Kruskal's algorithm, which edge is the last one to be included? (b) (7%) If we choose Prim's algorithm to find the MST with the stating vertex to be d, can you conclude that edge fj must be included in the algorithm. (hint, what should be done when we need to include vertex f?) (c) (6%) Following (b), list all the key modifications for vertex f in Prim's algorithm, such as key(f) = infinite to start with.)



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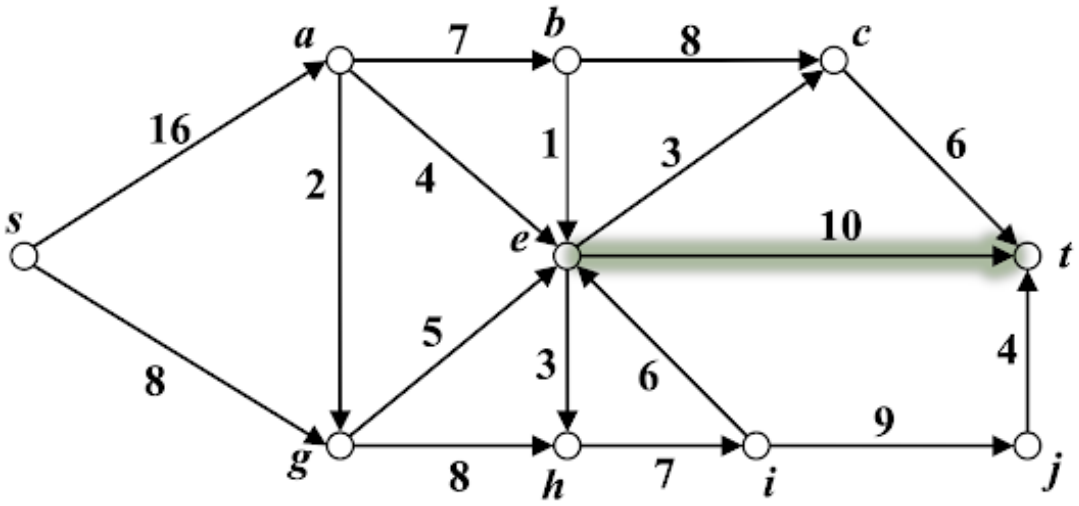
提交的檔案：

22。 Maximum Flow 2

(a) (10%) Find the maximum flow of the following network. Write down the paths one by one with necessary information is good enough if you do not want to draw the result. (b) (5%) Where is the minimum cut? (c) (5%) If we decrease the capacity of edge ef from 10 to 2, would we obtain a network where we can find its maximum flow easier? Why?



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提交的檔案：

Confirmation for submission

24。 Are you ready to submit your answer? *

單選。

- ( ) Yes

25。 Upload any other supplement files here.

提交的檔案：