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Week 04 Quiz

Plagiarism declaration

By submitting work for this quiz I hereby declare that I understand the University's policy on academic integrity (https://academicintegrity.unimelb.edu.au/) and that the work submitted is original and solely my work, and that I have not been assisted by any other person (collusion) apart from where the submitted work is for a designated collaborative task, in which case the individual contributions are indicated. I also declare that I have not used any sources without proper acknowledgment (plagiarism). Where the submitted work is a computer program or code, I further declare that any copied code is declared in comments identifying the source at the start of the program or in a header file, that comments inline identify the start and end of the copied code, and that any modifications to code sources elsewhere are commented upon as to the nature of the modification.

This is a preview of the draft version of the quiz.

You should attempt the quiz after the lecture and your tutorial.

You may attempt the quiz multiple times (if you happen to get a question wrong, you can do it again)
Your score on the quiz will be recorded in the grade book.
The quiz might not display equations correctly in some browsers. If you experience problems, we recommend that you use Firefox.

Quiz Type	Graded Quiz
Points	7
Assignment Group	Assignments
Shuffle Answers	Yes
Time Limit	No Time Limit
Multiple Attempts	Yes
Score to Keep	Highest
Attempts	Unlimited
View Responses	Always
Show Correct Answers	No

One Question at a Time	Yes
Lock Questions After Answering	No

Due	For	Available from	Until
-	Everyone	-	Sep 1 at 23:59

Preview

Correct answers are hidden.

Score for this attempt: **7** out of 7
Submitted Aug 26 at 17:07
This attempt took 9 minutes.

Question 1

1 / 1 pts

Find the time complexity for the following function (the basic operation is the innermost loop body's assignment).

```
function f(n)
    r ← 0
    m ← 1
    for i ← 1 to n do
        m ← 3 × m
        for j ← 1 to m do
            r ← r + j
    return r
```

- ◉ $\Theta\left(3^n\right)$
- ○ $\Theta\left(n\right)$
- ○ $\Theta\left(n^3\right)$
- ○ $\Theta\left(n\ log\ n\right)$

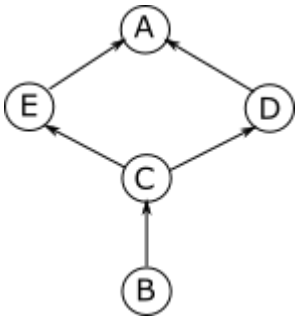
$\Theta\left(n^2\right)$

Yes, this requires a formula for the geometric series $3 + 3^2 + 3^3 + ... + 3^n$. (Actually it is easy enough to find $x = 3 + 3^2 + 3^3 + ... + 3^n$, by observing that we get back to x if we multiply the sum by 3, then add 3, and subtract 3^{n+1}. So just solve the equation $x = 3 + 3x - 3^{n+1}$.)

Question 2

1 / 1 pts

Consider the following directed graph:



Which of the following is the adjacency matrix for this graph?

(a)

	A	B	C	D	E
A	0	0	0	1	1
B	0	0	1	0	0
C	0	1	0	1	1
D	1	0	1	0	0
E	1	0	1	0	0

(b)

	A	B	C	D	E
A	0	0	0	0	0
B	0	0	1	0	0
C	0	0	0	1	1
D	1	0	0	0	0
E	1	0	0	0	0

(c)

	A	B	C	D	E
A	1	0	0	0	0
B	0	1	1	0	0
C	0	0	1	1	1
D	1	0	0	1	0
E	1	0	0	0	1

(d)

	A	B	C	D	E
A	0	0	0	1	1
B	0	0	0	0	0
C	0	1	0	0	0
D	0	0	1	0	0
E	0	0	1	0	0

(b)

In an adjacency matrix for a directed graph, row i and column j is 1 only if there is a directed edge from (leaving) vertex i to (entering) vertex j.

(a)

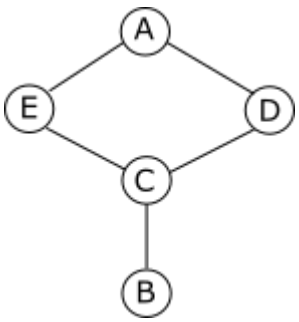
(c)

(d)

Question 3

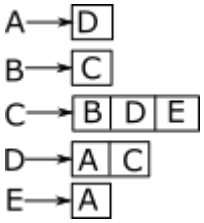
1 / 1 pts

Consider the undirected graph:

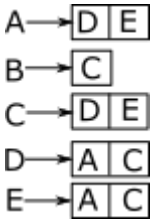


Which of the following is a valid adjacency list representation of the above graph?

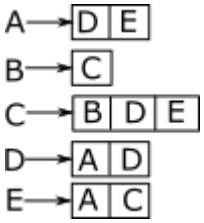
(a)



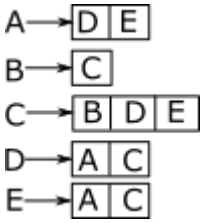
(b)



(c)



(d)



(b)

(a)

(d)

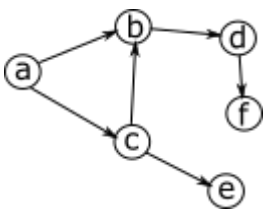
An adjacency list is a collection of lists, one for each vertex in our graph. For vertex v, its associated list contains the set of v's neighbours -- the vertices v' for which there exists an edge from v to v'. Let us consider vertex A in our graph. There is an edge between A and D, and between A and E. A's adjacency list contains vertices D and E.

(c)

Question 4

1 / 1 pts

Consider the following directed graph:



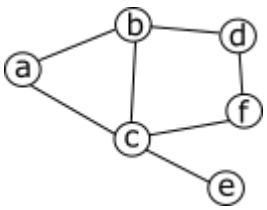
Which of the following represents a breadth-first traversal of the above graph, when **starting at node 'a'**?

- a, b, d, f, c, e
- a, b, c, d, e, f
- a, c, e, b, d, f
- BFS will not work on this graph

Question 5

1 / 1 pts

Consider the following undirected graph:



Which **one** of the following sequences **is not** a depth-first traversal of the above graph, when starting at node 'a'?

- a, b, c, e, f, d
- a, b, d, f, c, e
- a, c, d, f, b, e

The invalid sequence (a, c, d, f, b, e) could not be the result of a depth-first traversal. After visiting node 'c' in this sequence, the next visited node must either be 'b', 'f', or 'e'. Node 'd' is not adjacent to 'c'.

- a, c, f, d, b, e

Question 6

1 / 1 pts

Consider the dag with set of nodes V = {V1, V2, V3, V4, V5, V6, V7} and set of edges {(V1,V2), (V1,V3), (V1,V4), (V2,V5), (V3,V5), (V3,V6), (V4,V6), (V5,V7), (V6,V7)}. Which of the following node sequences are topologically sorted?

- [ ] V1, V2, V5, V3, V4, V6, V7
- [x] V1, V3, V4, V6, V2, V5, V7
- [ ] V1, V3, V2, V6, V4, V5, V7
- [x] V1, V4, V3, V2, V6, V5, V7
- [ ] V1, V3, V4, V5, V2, V6, V7

Yes, absolutely. Well done.

Question 7

1 / 1 pts

Which of the following statements about Adjacency Matrices are **true**? Note: You may select multiple answers.

- [x] An adjacency matrix for a graph with V vertices requires $O(V^2)$ space, irrespective of the number of edges in the graph.
- [x] Finding the existence of an edge in a graph given an adjacency matrix representation is an O(1) operation.
- [ ] Finding the neighbours of a vertex v, in a graph of V vertices, given its adjacency matrix representation is a $\Theta(V^2)$ operation.

Adjacency matrices are symmetric for both directed and undirected graphs.

Correct!

Given a graph with V vertices, its adjacency matrix representation stores VxV 0/1 values. The matrix is symmetric for undirected graphs, but may not be symmetric for directed graphs. To determine if there is an edge between a vertex i and j in a graph, given its adjacency matrix representation, we simply examine the value at row i and column j of the matrix. If this value is a 1, there is an edge between vertex i and j. To find the neighbours of a vertex i (the nodes we can travel to from i), we look at each value in row i of the matrix. To do so, we examine V elements of the matrix.

Quiz Score: **7** out of 7