Midterm Exam (Remotely Proctored)

Due Feb 14 at 11:59pm **Points** 50 **Questions** 26
Available Feb 11 at 11:59pm - Feb 14 at 11:59pm 3 days **Time Limit** 70 Minutes

Instructions

Instructions

Material from weeks 1-5 (excluding the topic on Greedy technique) will be covered in the exam.

You are allowed to use the following materials:

- One sheet, 8.5x11", single-sided notes (typed or handwritten). You need to show the sheet at the beginning of the exam.
- Scratch Paper or any other notes are NOT allowed. You are allowed to use a whiteboard (large or handheld) or chalkboard (large or handheld) for scratch paper. You need to show the whiteboard/chalkboard empty at the beginning and the end of the exam. No other type of scratch paper is allowed.
- You are allowed to use the Proctorio whiteboard.
- If you begin this exam and are asked for a password/passcode or see a browser extension error, please reference this **Proctorio access code troubleshooting guide (https://ecampus.oregonstate.edu/faculty/exam-proctoring/ProctorioAccessCodeTroubleshooting.pdf)** for quick tips on how to fix the issue.
- Please refer to **Proctorio FAQ (http://click.email.oregonstate.edu/?qs=e0b1064e6f9b70c4209bb2506a76a22343f2a35c240d36e3334905566eaa266577a72d2f3d22875320c53c5** if you have questions about Proctorio.

This quiz was locked Feb 14 at 11:59pm.

Attempt History

	Attempt	Time	Score
LATEST	Attempt 1	57 minutes	30 out of 50

Score for this quiz: **30** out of 50
Submitted Feb 14 at 8:44pm
This attempt took 57 minutes.

Question 1 — 0 / 0 pts

Please show both sides of your blank dry erase board and the markers you are using (or your chalkboard and chalk) to the webcam.

orrect Answer

- [ ] I have done this.

Correct!

- [x] I am choosing to use the on-screen whiteboard tool provided by Proctorio. You will not see me physically writing on anything during the assessment.

Question 2

0 / 0 pts

This is just a reminder that this assessment does not (and cannot) measure you as a person; it's just here to assess your mastery of _____. All we ask is that you give your best effort!

Correct!

- (•) Sounds great!

Question 3

0 / 0 pts

Please use the webcam to slowly show the entire work surface your computer is on. There should be NO paper on this surface, so please place any paper out of reach before this step.

Correct!

- (•) I have done this

Question 4

1 / 3 pts

Match each of the following asymptotic notation with their correct definition.

f(n) and g(n) are some functions ; a and b are constants.

Correct!

Big-θ notation For large values n th

ou Answered

Big-O notation For any value of n th

Correct Answer For large values of n the running time of f(n) is at most b·g(n)

ou Answered

Big-Ω notation For any value of n th

Correct Answer For large values of n the running time of f(n) is at least b·g(n)

Other Incorrect Match Options:

- For any value of n the running time of f(n) is at least b·g(n)
- For any value of n the running time of f(n) is at least a·g(n) and at most b·g(n)
- For any value of n the running time of f(n) is at most b·g(n)

Question 5

1 / 1 pts

Select correct inequality for the asymptotic order of growth of the below function.

$n! > 2^n$

Answer 1:

Correct!

>

Question 6

1 / 1 pts

Select correct inequality for the asymptotic order of growth of the below function.

$nlogn \ < 2^n$

Answer 1:

Correct!

<

Question 7

1 / 1 pts

Select correct inequality for the asymptotic order of growth of the below function.

$n^2 > n \ \log n$

Answer 1:

Correct!

>

Question 8

0 / 1 pts

Select correct inequality for order of growth of the below function.

$5^n \ < n^5$

Answer 1:

ou Answered <

orrect Answer >

Question 9

0 / 1 pts

Select correct inequality for the asymptotic order of growth of the below function.

$\log\ n\ > \sqrt{n}$

Answer 1:

ou Answered >

orrect Answer <

Question 10

0 / 1 pts

Select correct inequality for the asymptotic order of growth of the below function.

$\sum_1^n (i)$ This means summation on i where i ranges from 1 to n = n^k

Where k>2

Answer 1:

orrect Answer <

ou Answered =

Question 11

4 / 4 pts

Identify each of the following statements as True/False

$\frac{n^2(n+1)}{3} \in O\left(n^4\right)$: [Select]

$\frac{n^2(n+1)}{3} \in O\left(n^3\right)$: [Select]

$\frac{n^2(n+1)}{3} \in \Theta\left(n^4\right)$: False

$\frac{n^2(n+1)}{3} \in \Omega\left(n^2\right)$: True

Answer 1:

Correct!

True

Answer 2:

Correct!

True

Answer 3:

Correct!

False

Answer 4:

Correct!

True

Question 12

1 / 1 pts

Given an array A of size n, we want to access the i^{th} element in the array, 0<i<n. What will be the time complexity of this operation?

- $O(n^2)$

O(log n)

O(n)

Correct!

O(1)

Question 13

1 / 1 pts

Given an array A of size n, we want to find if an element k belongs to this array. What will be time complexity of this search operation?

Assume that we don't know anything about the order of elements in the array.

O(log n)

O(n^2)

Correct!

O(n)

O(1)

Question 14

0 / 1 pts

Given a sorted array A of size n, we want to find if an element k belongs to this array. What will be the **best time complexity** to perform this search operation?

Note: best **time complexity** and not the best time

ou Answered

O(n^2)

O(n)

O(1)

orrect Answer O(log n)

Question 15

0 / 6 pts

Below algorithm performs a search operation. Fill in the blanks to complete the pseudocode.

//key is the element being searched in the array, arr.

//the default value of left = 0 and right = length of the array

```
def find(key, arr, left, right):
    pos = (left + right)/2

    if(key == arr[ pos ])
        return pos;

    if( key != arr[pos]
):
        return find(key, arr, left, pos-1)
    else:
        return []
```

Answer 1:

ou Answered key != arr[pos]

orrect Answer key<arr[pos]

Answer 2:

ou Answered return []

orrect Answer return find(key, arr, pos+1, right)

orrect Answer

return find(key, arr, pos, right)

Question 16

0 / 5 pts

Write the loop invariant for the following code:

```
item = -INF (minus infinite)
for (i = 0 to n-1)
  if (A[i] > item)
      item = A[i]
```

Your Answer:

item is [-inf:maximum of the A array]

the loop invariant condition is that 'item' is always maximum among the first i elements of array A.

Question 17

10 / 10 pts

Consider the following algorithm

```
1. def mystery(A[0..n-1, 0..n-1]):
2.     for(i = 0 to n-2):
3.        for(j = i+1 to n-1):
4.            if A[ i,j ] != A[ j,i ]
5.                return False
6.     return True
```

What does this algorithm compute? if A[i,j]= A[j,i], match

What is its basic operation, write the **line number** of code (1, 2, 3, 4, 5, or 6) that is executed maximum number of times? 4

What is the time complexity of this code? O(n^2)

Answer 1:

ou Answered

if A[i,j]= A[j,i], matching values next to each other.

orrect Answer

The algorithm returns “true” if its input matrix is symmetric and “false” if it is not.

Answer 2:

Correct!

4

Answer 3:

Correct!

O(n^2)

1st blank: 3 points

2nd blank: 3points

3rd blank: 4 points

Question 18

4 / 4 pts

Consider the subset sum problem.

Problem: Given an array of numbers find if there is a subset that adds to a given number. Return True if there exists such subset, else return False.

The subset of numbers need not be continuous in the array. We don't know anything about the order of the elements in the array.

Identify which of the following strategies can be used to solve this problem.

Dynamic Programming: Can be used

Backtracking: [Select]

Brute force Approach: [Select]

Divide and Conquer: [Select]

Answer 1:

Correct! Can be used

Answer 2:

Correct! Can be used

Answer 3:

Correct! Can be used

Answer 4:

Correct! Cannot be used

Question 19

1 / 1 pts

Which of the following is/are property/properties of a dynamic programming problem?

Correct! Both optimal substructure and overlapping subproblems

- Optimal Substructure
- Overlapping Subproblems
- Has a greedy solution

Question 20

1 / 1 pts

In dynamic programming, the technique of storing the previously calculated values is called _____

- Storing value property
- Saving value property

Correct!

- (•) Memoization
- Mapping

Question 21

1 / 1 pts

Which of the following techniques can be called as intelligent exhaustive search?

- Divide and Conquer Approach

Correct!

- (•) Backtracking
- Dynamic Programming
- Greedy Approach

Question 22

3 / 6 pts

Suppose you won a shopping spree and you can take any number of items from the Amazon store (assume that there is only one copy of each item). There are n items in the store each of value v[1..n] and weights w[1..n]. You are given a trolley that can only carry a total of W weight of items. Don't worry about the size of the items, they would some how magically fit in the trolley.

You want to find the maximum value of items that you can pick. Being a programmer you decide to use dynamic programming to solve this problem.

Write the recurrence formula that would represent the approach of your solution. Mention both the base case and the recursive case of the recurrence formula.

Your Answer:

Base case: T(n) = 0 for all n <=0

Recurrence: T(n) = T(n-w)+v)

f(x,i) = 0 if i=0 or x=0 #2points

f(x,i) = max{ vi + f[x-wi, i-1] , f[x, i-1]} #4points

not sure if that recurrence formula is correct

Question 23

0 / 0 pts

Please erase your dry erase or chalkboard and show it to the webcam.

orrect Answer

- [ ] I have done this

Correct!

- [x] I used the on-screen tool instead.

Question 24

0 / 0 pts

How would you rate this exam?

Correct!

- [x] Moderate

orrect Answer

- [ ] Easy

Correct!

- [x] Difficult

Question 25

0 / 0 pts

Was the time provided for the exam sufficient?

t Answer

- [ ] It was excess

orrect Answer

- [ ] Need more time

Correct!

- [x] Just sufficient

Question 26

0 / 0 pts

Please use this space to describe any irregularities that happened.

Your Answer:

None noted. Probably will have a white board with me next exam.

Quiz Score: **30** out of 50