Dashboard My courses In21-S2-CS2023 (117329) Week 4 : Complexity Analysis - Analyzing Recursion I

Quiz 4

Started on	Sunday, 26 March 2023, 5:50 PM
State	Finished
Completed on	Sunday, 26 March 2023, 6:15 PM
Time taken	25 mins 8 secs
Marks	5.00/7.00
Grade	**7.14** out of 10.00 (**71**%)

Question **1**

Incorrect

Mark 0.00 out of 1.00

Select the asymptotic upper and lower bounds for T(n) in the following recurrence. Assume that T(n) is constant for n ≤ 3. Make your bounds as tight as possible.

$$T(n) = 7T(n/2) + n^3$$

Select one:

○ a. T(n) = Θ($n^{7/3}$)

○ b. T(n) = Θ(n^3)

● c. T(n) = Θ($n^{\log2(7)}$) ✖

○ d. T(n) = Θ($\log_7(2n)$)

Your answer is incorrect.

a=7,b=2,d=3

According to master thm T(n) = Θ(nd) = Θ(n3) because (b^d = 2^3 = 8 > a)

The correct answer is:
T(n) = Θ(n^3)

Question 2

Correct

Mark 1.00 out of 1.00

What is/are the best data structure(s) to implement recursive function calls?

□ a. Array

☑ b. Stack ✓

□ c. Binary Tree

□ d. Linked List

The correct answer is: Stack

Question 3

Correct

Mark 1.00 out of 1.00

Solve the following Recursive Algorithm:

$$T\left(n\right)=\begin{cases}1 \; if \; n=1\\ 2T(\frac{n}{2})+F'(n) \;\; if \; n>1\end{cases}$$

Note: $F'(n)$ function is in the order of $O(n)$

○ a. $T(n) = O(n)$

○ b. $T(n) = O(log(n))$

● c. $T(n) = O(nlog(n))$ ✓

○ d. $T(n) = O(n^2)$

The correct answer is: $T(n) = O(nlog(n))$

Question **4**

Correct

Mark 1.00 out of 1.00

For the following recurrence, select the correct expression for run time T(n) if the recurrence can be solved using Master Theorem, Otherwise, indicate that the Master Theorem does not apply.

T(n) =3 T(n/3) + $\sqrt{n}$

○ a. Master Theorem does not apply.

○ b. T(n) = Θ(nlogn)

○ c. T(n) = $\Theta(n^2)$

● d. T(n) =Θ(n) ✓

The correct answer is: T(n) =Θ(n)

Question **5**

Correct

Mark 1.00 out of 1.00

Given a set 'S' of n integers and another integer x, an algorithm should determine whether or not there exists two elements in S whose sum is exactly x . A possible algorithm for this task is described below.

1) Sort the elements in S using any efficient sorting algorithm.

2) Remove the last element from S. Let y be the value of the removed element.

3) If S is non-empty, look whether an element z exist in S where z=x-y

4) If S contains such an element z, then stop, since we have found y and z such that x=y+z; otherwise repeat Step 2.

5) If S is empty, then no two elements in S sum to x.

Select the correct statement(s) regarding above approach.

☐ a. There are algorithms which can solve this task with better time complexity than above described algorithm

☑ b. Step 1 can be acheived through merge sort with Θ(nlg n) time complexity. ✓

☐ c. Best time complexity to do Step 3 is Θ(n) .

☑ d. Time complexity of this algorithm is Θ(nlg n). ✓

The correct answers are: Step 1 can be acheived through merge sort with Θ(nlg n) time complexity., Time complexity of this algorithm is Θ(nlg n).

Question 6

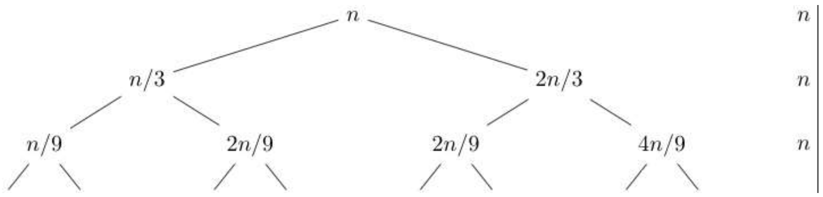
Correct

Mark 1.00 out of 1.00

Recursion Tree is one way to analyze recursive functions. Consider a function with following time complexity.

$T(n) = T(n/3) + T(2n/3) + n$

Following figure shows the first 3 levels of the recursion tree.



What is/are the number(s) which can be appear in the next (4th) level in this recursion tree?

☑ a. n/27 ✓

□ b. 16n/27

☑ c. 2n/27 ✓

☑ d. 8n/27 ✓

The correct answers are: n/27, 2n/27, 8n/27

Question 7

Incorrect

Mark 0.00 out of 1.00

A function is defined as following.

```
Function process(int n){
        If (n == 0) return;
        mark(n);
        process(n/3);
        process(n/3);
        process(n/3);
        process(n/3);
}
```

Assuming `mark(n)` function has the asymptotic bound of $\Theta(n^2)$, what is the asymptotic bound of process function.

Select one:

○ a. $T(n) = \Theta(n^3 \log(n))$

○ b. $T(n) = \Theta(n^2)$

○ c. $T(n) = \Theta(n^3)$

● d. $T(n) = \Theta(n^{\log 3(4)})$ ✖

Your answer is incorrect.

The recurrence of the process function is $T(n) = 4T(n/3) + \Theta(n^2)$

According to master theorem, time complexity is $\Theta(n^2)$

($a=4, b=3, d=2$ so $b^d > a$)

The correct answer is:
$T(n) = \Theta(n^2)$

Previous activity

◄ Analyzing Recursion - Take Home Assignment

Jump to...

Next activity

In-class lab exercise (In21-S2-CS2023) ►

Stay in touch

University of Moratuwa

🌐 https://uom.lk

☎ 0094 11 26 400 51

✉ info[AT]uom[.]lk

Data retention summary

Get the mobile app