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reviewer4@nptel.iitm.ac.in ⌄

NPTEL (https://swayam.gov.in/explorer?ncCode=NPTEL) » **Design and analysis of algorithms (course)**

Announcements (announcements) **About the Course (https://swayam.gov.in/nd1_noc20_cs27/preview)**

Ask a Question (forum) Progress (student/home) Mentor (student/mentor)

Unit 4 - Week 1 Quiz

Course outline

How does an NPTEL online course work?

Week 1 : Introduction

Week 1 : Analysis of algorithms

Week 1 Quiz

○ **Quiz : Week 1 Quiz (assessment?name=93)**

Week 2 : Searching and sorting

Week 2 Quiz

Week 2 Programming Assignment

Week 3 : Graphs

Week 3 Quiz

Week 1 Quiz

The due date for submitting this assignment has passed. **Due on 2020-02-12, 23:59 IST.**
As per our records you have not submitted this assignment.

All questions carry equal weightage. You may submit as many times as you like within the deadline. Your final submission will be graded.

1) An image processing application begins with two n×n matrices A and B. The first phase of preprocessing the inputs takes O(n^2) steps for each of A and B. The second step involves a convolution of A and B to yield a new matrix C in time O(n^3). This is followed by an edge detection phase that takes times O(n^2) for matrix C. What is the most accurate and concise description of the complexity of the overall algorithm? ***2 points***

○ O(n^2)
○ O(n^3)
○ O(n^2+n^3)
○ O(n^5)

No, the answer is incorrect.
Score: 0

Feedback:
When there are multiple phases in sequence, the largest of the phases dominates the overall complexity. Here the second phase is O(n^3) and the first and third phases are O(n^2).

Accepted Answers:
O(n^3)

2) We are trying to determine the worst case time complexity of a library function that is provided to us, whose code we cannot read. We test the function by feeding large numbers of random inputs of different sizes. We find that for inputs of size 300 and 3.000, the function always returns well within one second, but for inputs of size 30,000 it sometimes takes about 1 second and for inputs of size 300,000 it sometimes takes 1-2 minutes. What is a reasonable conclusion we can draw about the worst case time complexity of the library function? (You can assume, as usual, that a typical desktop PC performs 10^9 basic operations per second.) ***2 points***

Week 3 Programming Assignment

Week 4 : Weighted graphs

Week 4 Quiz

Week 4 Programming Assignment

Week 5: Data Structures: Union-Find and Heaps

Week 5 : Divide and Conqure

Week 5 Quiz

Week 6: Data Structures: Search Trees

Week 6: Greedy Algorithms

Week 6 Quiz

Week 6 Programming Assignment

Week 7: Dynamic Programming

Week 7 Quiz

Week 7 Programming Assignment

Week 8: Linear Programming and Network Flows

Week 8: Intractability

Week 8 Quiz

Text Transcripts

○ $O(n \log n)$

○ $O(n^2)$

○ $O(n^3)$

○ $O(n^3 \log n)$

No, the answer is incorrect.
Score: 0

Feedback:

Assuming a CPU with 10^9 operations per second, 300^2 and 3000^2 would be well under 10^9 whereas 30000 is $9×10^8$ = $0.9×10^9$ (about 1 second) and 300000^2 is $90×10^9$ (about 1.5 minutes).

Accepted Answers:
$O(n^2)$

3) Suppose f(n) is $2n^3+4n+5$ and g(n) is $7n^5 + 5n^3 + 12$. Let h(n) be a third, unknown function. ***2 points***
Which of the following is **not** possible.

○ h(n) is O(f(n)) and h(n) is also O(g(n))

○ h(n) is O(f(n)) but h(n) is not O(g(n))

○ h(n) is O(g(n)) but h(n) is not O(f(n))

○ h(n) is not O(f(n)) and h(n) is also not O(g(n))

No, the answer is incorrect.
Score: 0

Feedback:

Since f(n) is O(g(n)), if h(n) is O(f(n)) it must also be O(g(n)). All other combinations are possible.

Accepted Answers:
h(n) is O(f(n)) but h(n) is not O(g(n))

4) How many times is the comparison `i >= n performed in the following program?` ***2 points***

```
int i = 200, n = 80;
main(){
  while (i >= n){
    i = i-2;
    n = n+1;
  }
}
```

○ 40

○ 41

○ 42

○ 43

No, the answer is incorrect.
Score: 0

Feedback:

After 40 iterations, `i` is 200-80=120 and n is 80+40=120. At this point, `i`==n so the 41st iteration succeeds The next test of the `while` condition fails and exits the loop. Hence, overall the while condition is checked 42 times.

Accepted Answers:
42

5) If T(n) is $O(n^2 \sqrt{n})$ which of the following is **false**? ***2 points***

○ T(n) is $O(n^2 \log n)$

○ T(n) is $O(n^3)$

○ T(n) is $O(n^3 \log n)$

○ T(n) is $O(n^4)$

Books

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No, the answer is incorrect.
Score: 0

Feedback:
$\sqrt{n}$ is not $O(\log n)$

Accepted Answers:
$T(n)$ is $O(n^2 \log n)$