COMPUTER ENGINEERING DEPARTMENT,
SVNIT, SURAT

Design and Analysis of Algorithm, B.Tech. (2nd Year)

1. Quiz has total 30 questions, each question carries one mark.
2. The total duration of the examination is 60 minutes.
3. Exam Duration 14:00 am to 15:00 pm.
4. Click the “Submit” button to submit your exam. Do not press “Enter key” on the keyboard to submit the exam.
5. Never click the “Back” button on the browser. This will take you out of the exam and prevent Blackboard from tracking your selected answers.
6. Submit your response before 15:00 pm, without fail.

Your email address will be recorded when you submit this form.

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Any contiguous subarray A[i..j] must lie exactly in one the following places.

- ○ Entirely in the subarray A[low..mid], i.e., low <= i <= j <= mid
- ○ Entirely in the subarray A[mid+1..high], i.e., mid+1 <= i <= j <= high
- ○ Crossing the midpoint, i.e., low <= i <= mid < j <= high
- ◉ All of the above

Clear selection

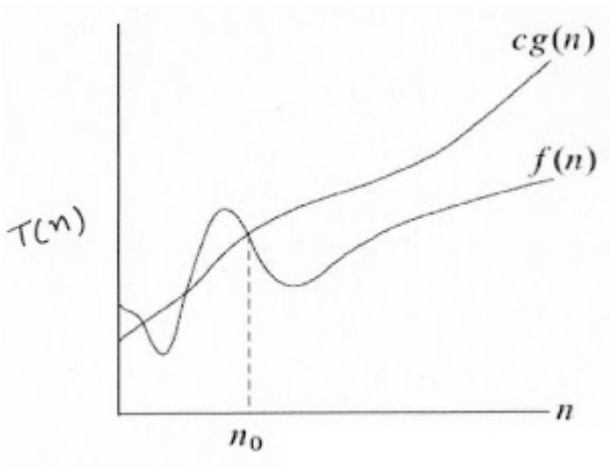
How many matrix multiplications required by the Strassen's matrix multiplication algorithm?

- ○ 0
- ◉ 7
- ○ 8

- None of the above

Clear selection

Given a figure, which of the following relations is correct?



- O(g(n)) = f(n)
- g(n) = O(f(n))
- f(n) = O(g(n))
- O(f(n)) = g(n)

Clear selection

Matrix Multiplication using Divide and Conquer takes _____ time.

- O(n)
- O(n^2)
- O(n^3)
- O(nlogn)

Clear selection

Write the following function in theta notation.

$$f(n) = 10^{80}$$

- ○ theta (n^2)
- ○ theta (n log n)
- ○ theta (n)
- ◉ theta (1)

Clear selection

Consider a situation where you don't have function to calculate power and you need to calculate x^n where x can be any number and n is a positive integer. What can be the best possible time complexity of your power function?

- ◉ O(Logn)
- ○ O(n)
- ○ O(LogLogn)
- ○ O(nLogn)

Clear selection

The following functions are arranged as per their growth from slowest growing function to the fastest growing function. Which of the following is incorrect?

- ◉ n, n^(1.1), n * log n, n^2
- ○ n, n * log n, n^(1.1), n^2
- ○ log n, n * log n, n^2, 2^n

1, n^2, (3/2)^n , 2^n

Clear selection

In the worst-case, the number of swaps required to sort n elements using selection sort is _____.

O(n^2)

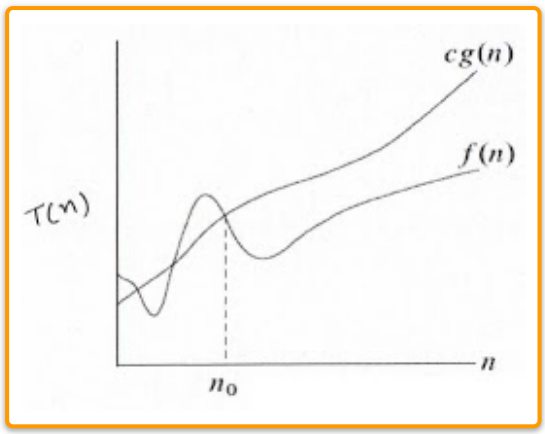
O(n log n)

O(n)

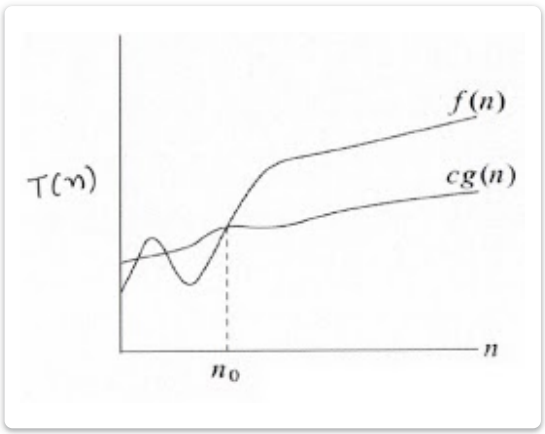
O(log n)

Clear selection

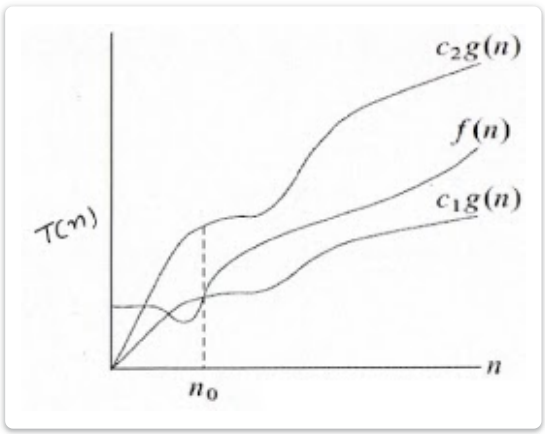
Which of the following represents that f(n) = O(g(n))? [Not: O means Big-oh]



Option 1



Option 2



All of the above

Option 3

Clear selection

O(g(n)) = {f(n}: there exists positive constants c and n_0 such that 0 <= f(n) _____ c g(n) for all n >= n_0}.

- <
- >=
- >
- <=

Clear selection

If f(n) = 2n + 5 and g(n) = 3n - 2, then _____.

- The function f(n) grows faster than g(n) when n approches infinity.
- The function f(n) grows slower than g(n) when n approches infinity.
- The function f(n) and g(n) grow at the same rate when n approches infinity.
- None of the above

Clear selection

You have a sorted array of n elements where each element is present twice except one, which is present once. You want to identify that element. The time complexity using divide and conquer is

- O(log n)
- O(1)
- O(nlog n)
- O(n)

Clear selection

Clear selection

For merging two sorted lists of sizes m and n into a sorted list of size m+n, we require comparisons of

- O(m)
- O(m+n)
- O(n)
- O(log m+log n)

Clear selection

The best-case running time of merge-sort algorithm is _____.

- O(n log n)
- O(n)
- O(log n)
- O(n^2)

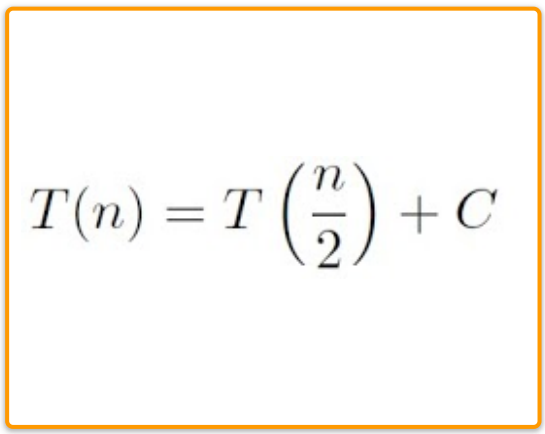
Clear selection

Which of the following is not a member of the set O(n^2)?

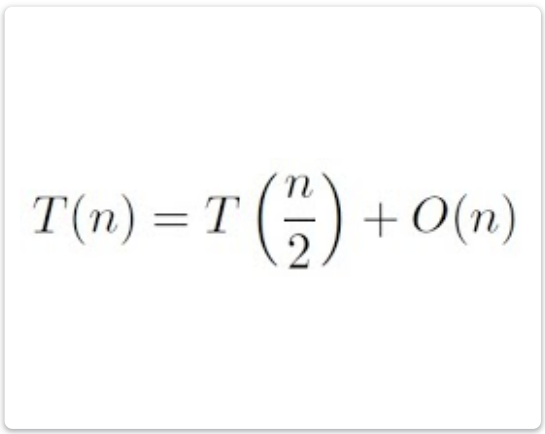
- (3^30) * n
- (n^5) / (sqrt(n))
- n^1.45
- All of the above

Clear selection

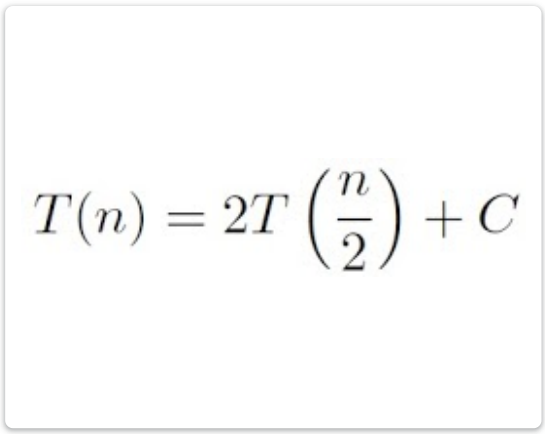
The recurrence relation of a binary search is _____.



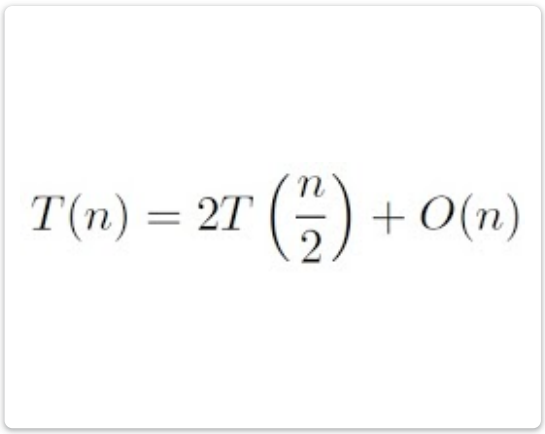
Option 1



Option 2



Option 3



Option 4

Clear selection

How many matrix additions/subtractions required by the Strassen's matrix multiplication algorithm?

- 0
- 8
- 18
- None of the above

None of the above

Clear selection

A sorting technique is called stable if:

- It takes O(nlog n)time
- It uses divide and conquer paradigm
- It takes O(n) space
- It maintains the relative order of occurrence of non-distinct elements

Clear selection

Which of the following statements is correct?

$$\lim_{n\to\infty} \frac{f(n)}{g(n)} = 0$$

- Function f grows faster than function g as input n approaches infinity.
- Function g grows faster than function f as input n approaches infinity.
- Function f and g grows at the same rate as input n approaches infinity.
- None of the above

Clear selection

When $n = 2^{2k}$ for some $k \geq 0$, the recurrence relation
$T(n) = \sqrt{2}\, T(n/2) + \sqrt{n}$, $T(1) = 1$
evaluates to :

- n log √(n)

- ○ √(n) log √(n)
- ◉ √(n) (log n + 1)
- ○ √(n) (log n)

Clear selection

What is the worst-case running time of the following algorithm? Array A of n integers is an input to the algorithm.

```
for j = 2 to A.length
    key = A[j]
    // Insert A[j] into the sorted sequence A[1 . . j − 1].
    i = j − 1
    while i > 0 and A[i] > key
        A[i + 1] = A[i]
        i = i − 1
    A[i + 1] = key
```

- ○ O(n log n)
- ◉ O(n^2)
- ○ O(n)
- ○ O(log n)

Clear selection

Which of the following is FALSE?

a) $(n + a)^m = O(n^m)$ where a is constant
b) $2^{2^n} = O(2^n)$
c) Assume $0 < a < b$ then $n^a = O(n^b)$
d) $2^n \neq O(n^k)$

- ○ c
- ○ a
- ◉ b
- ○ d

Clear selection

If T(n) = 5 * n^2, then T(n) = _____.

- O(n^2)
- O(n^2 * log n)
- O(n^3)
- [x] All of the above

Clear selection

Consider the following recurrence relation. Find T(n) in terms of θ notation.

$$T(n)=4T(\lfloor\sqrt{n}\rfloor)+\log^2 n$$

- This recurrence is not solvable
- θ(Log n loglog$n$)
- θ(Log log n)
- [x] θ(log^2 n log log n)

Clear selection

In a modified merge sort, the input array is splitted at a position one-third of the length(N) of the array. Which of the following is the tightest upper bound on time complexity of this modified Merge Sort.

- [x] N(logN base 3/2)
- N(logN base 3)
- N(logN base 1/3)

- ○ N(logN base 2/3)

Clear selection

Arrange the following functions in non-decreasing order of their growth.

$f_1(n) = n^{0.999999} log(n)$
$f_2(n) = 10000000n$
$f_3(n) = 1.000001^n \; f_4(n) = n^2$

- ○ f1(n); f2(n); f3(n); f4(n)
- ○ f1(n); f4(n); f2(n); f3(n)
- ◉ f1(n); f2(n); f4(n); f3(n)
- ○ f2(n); f1(n); f4(n); f3(n)

Clear selection

Consider the Quicksort algorithm. Suppose there is a procedure for finding a pivot element which splits the list into two sub-lists each of which contains at least one-fifth of the elements. Let T(n) be the number of comparisons required to sort n elements. Then

- ○ T(n) <= 2T(n/5) + n
- ○ T(n) <= 2T(4n/5) + n
- ◉ T(n) <= T(n/5) + T(4n/5) + n
- ○ T(n) <= 2T(n/2) + n

Clear selection

Given the following recurrence relation, which of the following is true?

$$T(n) = \begin{cases} 3T(\frac{n}{3}) + n^2 & \text{if } n > 2 \\ 1 & \text{if } n \leq 2 \end{cases}$$

- ○ T(n) = Theta (n^2 log n)
- ◉ T(n) = Theta(n^2)
- ○ T(n) = Theta(n)
- ○ T(n) = Theta(n log n)

Clear selection

Suppose we do merge sort with a three-way split: divide the array into 3 equal parts, sort each part and do a 3 way merge. What would be the worst-case complexity of this algorithm?

- ◉ O(n logn)
- ○ O(n^2 log n)
- ○ O(n^2)
- ○ O(n(logn)^2)

Clear selection

Let an array A = {11, 9, 17, 19, 22, 26, 6, 14}. Which of the following options represents the partially sorted array after the first four passes of the insertion sort?

- ○ {6, 9, 11, 14, 17, 19, 22, 26}
- ◉ {9, 11, 17, 19, 22, 26, 6, 14}

- ◯ {9, 11, 19, 17, 22, 26, 6, 14}
- ◯ None of the above

Clear selection

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