CMPT 280

ASSIGNMENT 1

"""

NAME : Jeet Agrawal

NSID : jea316

STUDNET ID : 11269096

"""

QUESTION 1

|  |  |  |  |
| --- | --- | --- | --- |
| PART | Expression | Most quickly growing term | Big-Oh (tight bound) |
| a) | n log2 n + n4log280 n + 2n/42 | 2n/42 | O(2n) |
| b) | 0.4n4 + n2logn2 + log2(2n) | 0.4n4 | O(n4) |
| c) | 4n0.7 + 29nlog2n + 280 | 29nlog2n | O(nlog2n) |

QUESTION 2

(A)

1. False
2. False
3. True
4. True

(B) The Big-Theta notation for:

TA(n) = 1/280n2 + 42log n + 12n3 + 280√n is O(n3)

QUESTION 3

|  |  |  |
| --- | --- | --- |
| PART | Expression | Big-Oh (tight bound) |
| a) | O(n2) + O(log n) + O(n log n) | O(n2) |
| b) | O(2n ) · O(n2) | O(2nn2) |
| c) | 42O(n log n) + 18O(n3) | O(n3) |
| d) | O(n2 log2 n2 ) + O(m) | O(MAX(n2 log2 n2,m)) |

QUESTION 4

(A)

1. For the first loop inside for there must be n steps and 1 step when it is false.

Therefore, (n+1) steps for the inner for loop but the inner loop will run n times because the outer for loop will run n times.

i.e. n(n+1) for the entire inner for loop

2)

Now for the outer for loop it will run n times + 1 step when its false.

i.e. (n+1) times

3)

And the print statement will work whenever it is within both the for loops

i.e. n(n)

Therefore , 1 + 2 + 3 = n(n+1) + (n+1) + n(n) = n2 + n + n + 1 + n2 = 2n2 + 2n + 1

(B)

Therefore, Big-Theta notation for this will be Θ (n2).

QUESTION 5

(A)

1. (n – i ) and (1) step for the loop within the for loop because 1 time will be for every time its false.

Therefore, total of (n – i + 1) steps.

Hence, the summation of this is:

+ = n\*(n-1) + n(n-1)/2 + n = n(n+1)/2

1. n + 1 steps for the outer for loop.
2. steps for the print statement running every time the loops are true:

= n(n -1) – n(n-1)/2 = n(n-1)/2 steps.

1. And 1 step for the assignment of n to the length of array.

i.e. T(n) = 1 + 2 + 3 + 4 = n+1 + n(n+1)/2 + n(n-1)/2 + 1 = n2 + n + 2.

(B)

Therefore, the Big Theta notation for it is Θ(n2).

QUESTION 6

I choose my active operation as the inner for – loop which has a print statement within it , so the inner – for loop will run n times as the outer for starts from 0. And the inner for loop is running (n – i) times + 1 for the false condition,

Therefore,

Total Steps are

n\*(n-1) + n(n-1)/2 + n = (n2 + n)/2 using active approach.

Therefore, the Big Theta notation for it is Θ(n2).

QUESTION 7

I choose my active operation as the function call inside the while loop which is going to execute n times as the length of the list data. And, then the function call is a binarySearch algorithm on an array of length m, considering the time complexity for the function call to be O(log2m), the time complexity for the whole function must be n times O(log2m)

Therefore, the time complexity for the given pseudocode is O(nlog2m).

THE END.