CSCI210

Fall 2021 Middle Exam

Instruction: (a) Use a notepad/TextEdit to compose your answer, and save answers to the local disk.

(b) The format of answer is

1. whatever your answer

2. whatever your answer

3. whatever your … (don’t duplicate the question text!!!)

(c ) Aftering saving file, copy-paste All text to the BB “write Submission”. Don’t do attachment.

1. Exactly follow the process described in the Selection Sort to sort the array of numbers

{7, 9, 3, 4, 1, 2} manually in increasing order.

The number of comparisons is \_\_\_\_\_,

and the number of swaps is \_\_\_\_\_.

2.Someone has partially sorted an array using insertion sort. The incomplete array with

first 3 sorted elements is {2, 9, 11, 4, 1, 2}.

Complete the rest of inserttion sort, i.e, sorting

4, 1 and 2.

The number of comparisons is \_\_\_\_\_,

and the number of swaps is \_\_\_\_\_.

3. As discussed during the class, the revised insertion sort uses the binary search method

to find the location to insert the i-th element.

(a) Suppose the array size is N, what is the best upper-bound estimate of the number of

comparisons? (answer in terms of N:\_\_\_\_\_\_\_\_\_\_\_).

(b) Suppose original insertion sort spends T seconds to move elements, what is the best

estimate of time this revised insertion sort spends to move the elements?

(answer in terms of T: \_\_\_\_\_\_\_\_\_\_)

(c) If an array is already sorted but we still apply this revised sorting method to it,

will this method perform better than the original insertion sort? (answer \_\_\_\_\_\_\_\_\_ )

4. Given array {1, 9, 2, 3, 4, 5}. Apply the maximum algorithm scanning from left to right to find the maxima. The maxima is \_\_\_\_\_\_\_\_, and the number of comparisons is \_\_\_\_\_\_\_

5. The pre-condition of binary search of an array X is that \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

6. Given an array {1, 5, 11, 14, 18, 21, 23, 28} and searching target 3, demonstrate a bianry search in the array for the target by listing all pairs of numbers you compare.

7. Which is the correct order?

(a) O(N) < O(log(N)) < O(2^N)

(b) O(log(N)) < O(N) < O(2^N)

(c) O(2^N) < O(N) < O(log(N))

(d) O(log(N)) < O(2^N) < O(N)

8. Given the array {2, 8, 6, 5, 9, 3, 11, 7, 1}.

Which element is the best element among the array as a pivot of quicksort partitioning?

Demonstrate how to use that element to perform a partition by listing all pairs of elements of swapping.

9. If you sort an array of N elements busing bubblesort. What is the number of comparisons

in terms of N?

10. Given an array x, develop a method to test if it is sorted and how.

Test your method in a text driver, but only submit the method body.

int howsorted(int [] x)

{

//return 0 to indicate that x is increasingly sorted

//return 1 to indicate that x is decreasingly sorted

//return -1 to indicate that x is not sorted at all.

}