CMPSC 465 Fall 2025 | Data Structures & Algorithms Ke Chen and Yana Safonova | Quiz 1

Lecture Section: **Monday, Sep 08, 2025**

Student Name: **PSU Email ID:**

1. (2 pts.) While performing InsertionSort on the array {8, 2, 6, 2, 3, 1}, which of the following is NOT a transition state of the array:

(a) 2 6 8 2 3 1
(b) 2 2 3 6 8 1
(c) 2 2 8 6 3 1
(d) 2 8 6 2 3 1
(e) None of the above

Answer

2. (2 pts.) When analyzing an algorithm's running time, we use big-O to denote its worst-case performance and use big-Omega to denote its best-case performance.

(a) True
(b) False

Answer

3. (2 pts.) Let $f(n) = 10n^2$ and $g(n) = n^3 + 5n$. Which of the following is correct?

I. $f(n) = O(g(n))$
II. $g(n) = O(f(n))$

(a) I is correct
(b) II is correct
(c) Both I and II are correct

Answer

4. (2 pts.) In order to show $2(n+1)^2 = \Omega(n^2)$ by definition, which of the following choices of c and n_0 is NOT valid?

(a) $c = 1.11$ and $n_0 = 111$
(b) $c = 2.42$ and $n_0 = 10$
(c) $c = 0.5$ and $n_0 = 16$
(d) $c = 1$ and $n_0 = 1$
(e) $c = 2$ and $n_0 = 3$

Answer

5. (2 pts.) Which of the following statement regarding MergeSort is correct?

(a) MergeSort always divides the input array into two equal halves
(b) MergeSort does not allow duplicate elements in the input
(c) MergeSort always runs in $O(n \log n)$ time even if the input array is split arbitrarily at each step
(d) MergeSort is a divide-and-conquer algorithm where all the sorting happens at the merge step
(e) None of the above

Answer