

COMP3506: Quiz 1

Name:

Student ID:

This is the quiz paper for **COMP3506**. If you are registered for COMP7505, turn overleaf.

Each of the following problems bears 10 marks.

Problem 1. Which of the following is *not* an atomic operation of the RAM model?

Answer: []

A. Calculate $a + b$ where a and b are stored in two registers.

B. Sort an array of n integers for an arbitrary value of n .

Problem 2. Which of the following is true? Answer: []

A. $n \log_2 n = O(n)$. B. $n = O(n \log n)$.

Problem 3. Which of the following is true? Answer: []

A. $n^2 = \Omega(n)$. B. $n = \Omega(n^2)$.

Problem 4. Which of the following is true? Answer: []

A. $100n + \sqrt{n} + (\log_2 n)^5 = \Theta(n)$. B. $100n + \sqrt{n} + (\log_2 n)^5 \neq \Theta(n)$.

Problem 5. Which of the following functions of n is *not* $O(n^2)$. Answer: []

A. $n^2 / \log^2 n$ B. $(\log_2 n)^{35}$ C. 100000 D. $\frac{n^{2.001}}{3583}$ E. $\frac{n^3}{2^n}$

Problem 6. Which of the following functions of n is $O(n)$. Answer: []

A. 100000 B. $n^2 / \log^2 n$ C. $\frac{n^{2.001}}{3583}$ D. $(1.01)^n$ E. $n \log_2 n$

Problem 7. Which of the following functions of n is $\Omega(n)$. Answer: []

A. 100000 B. $n / \log^2 n$ C. $n^{0.999}$ D. $(1.01)^n$ E. $(\log_2 n)^{35}$

Problem 8. Which of the following functions of n is *not* $\Theta(n \log n)$. Answer: []

A. $35n \log_2 n + \sqrt{n}$ B. $n \log_{35} n$ C. $n^{1.81} + n \log_2 n$ D. $n^{0.99} + 87n \log_{200} n$.

Problem 9. Which of the following statements is true? Answer: []

A. The running time of binary search (performed on a sorted array of n integers) is $O(\log^2 n)$.

B. The running time of binary search (performed on a sorted array of n integers) is $O(1)$.

C. $35n + \sqrt{n} = \Theta(n^2)$.

D. In the RAM model, the time complexity of an algorithm depends on how fast a CPU is (the complexity on a 2 GHz CPU may be different from that on a 1 GHz one).

Problem 10. Prove $10n + n^{1/3} = O(n)$.

COMP7505: Quiz 1

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Problems 1-8 bear 10 marks each. Problem 9 bears 20 marks.

Problem 1. Which of the following is true? Answer: []

A. $n \log_2 n = O(n)$. B. $n = O(n \log n)$.

Problem 2. Which of the following is true? Answer: []

A. $100n + \sqrt{n} + (\log_2 n)^5 = \Theta(n)$. B. $100n + \sqrt{n} + (\log_2 n)^5 \neq \Theta(n)$.

Problem 3. Which of the following functions of n is *not* $O(n^2)$. Answer: []

A. $n^2 / \log^2 n$ B. $(\log_2 n)^{35}$ C. 100000 D. $\frac{n^{2.001}}{3583}$ E. $\frac{n^3}{2^n}$

Problem 4. Which of the following functions of n is $O(n)$. Answer: []

A. 100000 B. $n^2 / \log^2 n$ C. $\frac{n^{2.001}}{3583}$ D. $(1.01)^n$ E. $n \log_2 n$

Problem 5. Which of the following functions of n is $\Omega(n)$. Answer: []

A. 100000 B. $n / \log^2 n$ C. $n^{0.999}$ D. $(1.01)^n$ E. $(\log_2 n)^{35}$

Problem 6. Which of the following functions of n is *not* $\Theta(n \log n)$. Answer: []

A. $35n \log_2 n + \sqrt{n}$ B. $n \log_{35} n$ C. $n^{1.81} + n \log_2 n$ D. $n^{0.99} + 87n \log_{200} n$.

Problem 7. Which of the following statements is true? Answer: []

A. The running time of binary search (performed on an array of n integers) is $O(\log^2 n)$.

B. The running time of binary search (performed on an array of n integers) is $O(1)$.

C. $35n + \sqrt{n} = \Theta(n^2)$.

D. In the RAM model, the time complexity of an algorithm depends on how fast a CPU is (the complexity on a 2 GHz CPU may be different from that on a 1 GHz one).

Problem 8. Prove $10n + n^{1/3} = O(n)$.

Problem 9. Let $f(n)$ and $g(n)$ be two functions of integer n . Prove: if $f(n) = O(g(n))$, then $\frac{f(n)}{g(n)} = O(1)$.