

CS 201: Data Structures & Algorithms

Quiz 1 — Complexity & Sorting

Duration: 30 minutes Maximum marks: 13

SET A

Name: _____ Roll No.: _____

Instructions

- Write your name and roll number before starting.
- This paper has 7 questions in 3 parts, for a total of 13 marks.
- Record your final MCQ answers in the answer grid below — the grid is what gets graded.

MCQ Answer Grid

Q	1	2	3	4
Ans				

Part A — Multiple Choice

7 marks

Q1. What is the worst-case running time of binary search on a sorted array of n elements? [2 marks]

- (A) $\Theta(\log n)$
- (B) $\Theta(1)$
- (C) $\Theta(n)$
- (D) $\Theta(n \log n)$

Q2. Dijkstra's algorithm produces correct shortest paths on graphs with negative edge weights. [1 mark]

- (A) False
- (B) True

Q3. What does this function print for $n = 6$? [2 marks]

```
def f(n):  
    c = 0  
    while n > 1:  
        n = n // 2  
        c += 1  
    print(c)
```

- (A) 2
- (B) 1
- (C) 6
- (D) 3

Q4. By the master theorem, $T(n) = 2T(n/2) + n$ solves to: [2 marks]

- (A) $\Theta(n \log n)$
- (B) $\Theta(n)$
- (C) $\Theta(n^2)$
- (D) $\Theta(\log n)$

Part B — Fill in the Blanks

2 marks

- Q5.** The average-case running time of quicksort with uniformly random pivots is *[1 mark]*
 $\Theta(\text{_____})$.
- Q6.** A sorting algorithm is **stable** if it preserves the relative order of _____ keys. *[1 mark]*

Part C — Short Answer*4 marks*

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- Q7.** Sketch the decision-tree argument that any comparison-based sorting algorithm needs *[4 marks]*
 $\Omega(n \log n)$ comparisons in the worst case.

— *End of paper* —