Quiz 7

The Art of Computer Programming

16 November 2026

Full name: .....

You have 10 minutes to answer this quiz, directly on this sheet of paper. No electronic devices or material of any kind is allowed. Do not forget to add your name above. Every question amounts to 2 points; the quiz is graded out of 10 points.

Questions

Q1. Consider this recursive function, without memoization:

```
def fib(n):
    if n < 2:
        return n
    return fib(n - 1) + fib(n - 2)
```

During the evaluation of `fib(5)`, how many times is `fib(3)` called?

.....

Q2. Circle the (only) correct answer. Compared with a memoized recursive function evaluating the same recurrence, the version that fills a table (dynamic programming):

a. has a better asymptotic time complexity.

b. uses no recursion, so it cannot exceed the limit on the depth of the call stack.

c. computes only the entries that the answer actually needs.

d. also works on problems without optimal substructure.

Q3. We make change for the sum $S = 8$ with coins of 1, 4, and 6, in unlimited supply, trying to use as few coins as possible. Circle the (only) correct answer.

a. The greedy rule (always the largest coin that fits) gives $4 + 4$, and this is optimal.

b. The greedy rule gives $6 + 1 + 1$, and this is optimal.

c. The greedy rule gives $6 + 1 + 1$, but there is a way to use fewer coins.

d. The greedy rule gives $4 + 4$, but there is a way to use fewer coins.

Q4. A divide-and-conquer algorithm cuts its input of size n into two halves, solves each half recursively, and combines the two results in time $\Theta(n)$:

$$T(n) = 2\,T\left(\frac{n}{2}\right) + \Theta(n).$$

Circle the (only) correct answer, given by the master theorem.

a. $T(n) = \Theta(\log n)$

b. $T(n) = \Theta(n)$

c. $T(n) = \Theta(n \log n)$

d. $T(n) = \Theta(n^2)$

Q5. What does this Python program print?

```
def check_age(age):
    if age < 0:
        raise ValueError("negative age")
    return age

try:
    check_age(-1)
    print("A")
except ValueError:
    print("B")
finally:
    print("C")
```

.....

.....

.....