Quiz 14C: The class P

CS 212 Nature of Computation

Habib University — Fall 2023

Total Marks: 10 | Date: November 22, 2023
Duration: 15 minutes | Time: 830–845h

Student ID: _____

Student Name: _____

1. (10 points) Show that the class P is closed under complement.

Solution: We prove the closure by constructing a polynomial time decider for the complement of a language in P.

Proof. Consider a language $L \in P$ and let R be its polynomial time decider.
Construct S to decide $\overline{L}$ as follows.
On input w:

- Simulate R on w.
- If R accepts, *reject*; if R, rejects, *accept*.

The first step runs in polynomial time, and the second in constant time.
Thus the total time taken is polynomial. □