

University of Nevada, Las Vegas Computer Science 456/656 Spring 2026

Assignment 5: Due Saturday April 11, 2026, 11:59:59 PM

Name: _____

You are permitted to work in groups, get help from others, read books, and use the internet. Turn in the assignment as instructed by the Graduate Assistant, Shubhashish Kar, shubhashish.kar@unlv.nevada.edu

1. True, False, or Open.

- (i) _____ If L is a \mathcal{P} -TIME language, there is an \mathcal{NC} reduction of L to CVP.
- (ii) _____ $\mathcal{P} = \mathcal{NC}$.
- (iii) _____ Every \mathcal{NC} language is decided by some polynomial time program.
- (iv) _____ In modern computers, addition is done in parallel using a built-in \mathcal{NC} algorithm.
- (v) _____ The set of all binary languages is countable.
- (vi) _____ The limit of every convergent recursive sequence of rational numbers is a recursive real number. (A sequence of rational numbers is *recursive* if it can be printed by a program, which runs forever, of course.)

2. Explain why the $\mathcal{P} = \mathcal{NC}$ problem is of such practical importance today.

3. State the pumping lemma for regular languages.

4. Use the pumping lemma for regular languages to prove that $L = \{a^n b^n : n \geq 0\}$ is not a regular language.

