

Name:

1

Note: No textbook or notes to be used during the exam.

**Problem 1. Finite Automaton.** [10 points] No explanation necessary.

Give a single finite automaton (DFA or NFA) that accepts the language consisting of all strings of the form  $(0101)^*(1010)^*$  or  $(1010)^*(0101)^*$ .

Name:

2

**Problem 2. Not Regular.** [10 points]

Prove that the set of strings  $\{1^{n^2} \mid n \text{ is a positive integer}\}$  is not a regular language.

*Name:*

3

**Problem 3. Count Able.** [10 points]

Prove that the set of finite python programs is countable.

**Problem 4. True or False.** [10 points] No explanation necessary.

Indicate whether each of the following is True (T) or False (F).

- ☐ Nondeterministic TMs are more powerful, i.e., can accept more languages, than Deterministic TMs
- ☐ Nondeterministic Finite Automata are more powerful, i.e., can accept more languages, than Deterministic Finite Automata
- ☐ For any set of strings  $L$ , there is a TM that can correctly determine whether a given string  $x$  belongs to  $L$
- ☐ Every TM with the binary input alphabet will eventually halt on the input string consisting of a single zero.
- ☐ The Pumping Lemma can be used to show that a language is not decidable.