CS 154
Formal Languages and Computability

Spring 2016

Department of Computer Science
San Jose State University
Instructor: Ron Mak

Assignment #7

Assigned: Thursday, April 21
Due: Friday, April 29 at 11:59 pm
Individual assignment, 100 points max

Recursively enumerable and recursive languages

1. [10 points] Use Turing machines to show that the set of recursively enumerable languages is closed under union and intersection.

2. [10 points] Use Turing machines to show that the set of recursive languages is closed under union and intersection.

3. [10 points] Show that the set of recursive languages is closed under reversal. Closed under reversal means that if a language L is recursive, then the language L^R containing all the strings of L reversed is also recursive.

4. [10 points] Suppose language L is accepted by a nondeterministic Turing machine that always halts on any input string. Show that L is recursive.

5. [20 points] Suppose a language L has a function f such that $f(w) = 1$ if $w \in L$ and $f(w) = 0$ otherwise. Show that function f is Turing-computable if and only if the language L is recursive.

6. [20 points] Let D be a recursive language of string pairs $< x, y >$. Let C be the set of all strings x for which there exists some y such that $< x, y > \in D$. Show that C is recursively enumerable.

7. [20 points] Let C be a recursively enumerable language. Show that there exists a recursive language D of string pairs (see Problem 6) such that C contains exactly the strings x such that there exists some y such that $< x, y > \in D$.

What to submit to Canvas

Submit your answers in a Word document or PDF into Canvas: **Assignment #7**