Guide to Exam 1

Time and Place
Exam 1 will be held during the regular class time on February 7th, 2013. We will take 15 minutes for questions and review, before starting the exam at 6:15 pm, ending the exam at 7:55 pm. We will then continue with a one hour lecture.

The exam is open book and notes, but no electronics. You may use your notes, homeworks, a printed copy of the textbook, and any other paper-based references.

General Things to Know

• Strings
• Languages: union, intersection, complement, concatenation, star
• Finite automate: DFAs NFAs (both formal descriptions and state transition diagrams)
• Regular languages
• Closure properties of regular languages: closed under union, intersection, complement, concatenation, star, reverse
• Regular expressions
• Equivalence of DFAs, NFAs, regular expressions, regular languages
• Pumping lemma

Specific Things You Should Know How to Do

• Given a formal description of a simple DFA or NFA, construct the corresponding state transition diagram and vice-versa
• Given a simple DFA or NFA, be able to identify what language it recognizes.
• Given a simple regular expression, be able to identify what language it describes
• Given a description of simple regular language, be able to construct
– a DFA or NFA that recognizes it
– a regular expression that describes it

• Given DFAs, be able to construct a DFA for their union, intersection, and complement

• Given NFAs, be able to construct an NFA for their union, concatenation, and star

• Understand the main steps in the proof of Kleene’s theorem (the equivalence of regular expressions, NFAs, and DFAs) and be able to carry out these constructions in simple examples:
  – Given an NFA, construct an equivalent DFA
  – Given a DFA, convert it to an equivalent regular expression
  – Given a regular expression, construct an equivalent NFA

• Be able to apply the Pumping Lemma for regular languages to prove a language is non-regular

• Be able to apply the closure properties of regular languages to prove a language is or is not regular

In addition you should understand the basic idea behind the proof of the Pumping Lemma for regular languages: when a DFA processes a sufficiently long string, the computation path it follows must have a loop.