

CS 301 Languages and Automata, UIC

Fall 2012, Midterm Practice Assignment

Instructions and Advice:

- Unless otherwise noted, the alphabet for all questions below is assumed to be $\Sigma = \{0, 1\}$.
- The midterm will cover Chapters 1 and 2 of the course text, i.e. Regular Languages and Context-Free Languages.
- In addition to reviewing all textbook material, don't forget to review assignments and their solutions!

The questions are as follows:

1. True or false: The set of regular languages is strictly contained within the set of context-free languages.
2. Sketch a proof showing that context-free languages are closed under the union operation. Repeat for the Concatenation and Star operations.
3. Draw the state diagram for a DFA recognizing the language

$$\{x \mid x \text{ contains substring } 001\}.$$

4. Give a regular expression describing the language

$$\{x \mid x \in \Sigma^* \text{ and } x \text{ does not contain substring } 00\}.$$

5. Use the Pumping Lemma to prove that the language $\{xx \mid x \in \Sigma^*\}$ is not regular.
6. Give a CFG generating the language $\{abxba \mid a, b \in \Sigma, x \in \Sigma^*\}$.
7. Give the state diagram for a PDA recognizing the set of strings over Σ with more 0's than 1's.
8. Use the construction of Lemma 1.60 to give a regular expression for the language from Question 3.