

## COMP 314 Homework Assignment 6

1. (20 points) Download the dfa code provided for this assignment as `dfa.zip`. Read the JavaDoc first. Then read the code itself. Finally, complete the code of the `accepts()` method in the `Dfa` class. Submit a hard copy of your code for just the `accepts()` method as the solution to this question. Include sufficient comments in your code to explain your approach. Code will be graded on correctness, clarity, elegance, and efficiency.

2. (5 points) Construct a dfa that recognizes the language

$$L = \{\text{abc}, \text{abcde}\} \cup \{(\text{xy})^n : n \text{ is divisible by } 3\}$$

Submit your answer as a transition graph using notation similar to the lecture notes and/or JFLAP.

For the next two questions, assume the alphabet consists only of  $\{w, x, y, z\}$ .

3. (5 points) Prove that the language of all strings containing between 3 and 5  $w$ 's (inclusive) is regular.
4. (3 points) Find a regular expression for the language of all strings containing an even number of occurrences of substring "xyz".
5. (10 points) Read the documentation for the standard regular expression library in the programming language of your choice. (e.g. For Java, see <http://docs.oracle.com/javase/tutorial/essential/regex/index.html>; for Python, see <http://docs.python.org/2/library/re.html>; other programming languages have similar online tutorials.) Using this regular expression library, write a function or method in your chosen programming language that takes a single string parameter, and returns `true` if the string appears to be the signature of a Java method, and `false` otherwise. The precise definition of "appears to be the signature of a Java method" is left open to your interpretation, but you should try to achieve reasonable accuracy, and the following examples are provided as a guide:

<b>input</b>	<b>return value</b>
<code>public void numWombats(double foo, Circle circle)</code>	<code>true</code>
<code>private static Wombat getWombat2()</code>	<code>true</code>
<code>// protected Wombat getWombat2()</code>	<code>false</code>
<code>protected double 3getHeight()</code>	<code>false</code>
<code>public double getHeight()</code>	<code>false</code>
<code>public static double getHeight(x)</code>	<code>false</code>

Please submit the source code of your method as the solution for this question. Include sufficient comments in your code to explain your approach. Code will be graded on correctness, clarity, elegance, and efficiency.

6. (5 points) Use the Pumping Lemma to prove that the following language is not regular:  $\{a^n b b c^m : m > n + 5\}$ .
7. (10 points) Use the Pumping Lemma to prove that the following language is not regular: the set of all strings that mention US states more often than countries in the EU. For example, “Alabama Georgia Alabama Spain” is in the language (3 US states, 1 EU country), but “SpainAlabama 5GeorgiaAlabama23452cc Spain Portugal ItalyPennsylvania” is not in the language (4 US states, 4 EU countries). Important hint: you’ll probably need to use the fact that the intersection of two regular languages is also regular.