Compsci 334 **Homework 2** **Spring 2026**

Due: Thursday, Jan. 22, 11:59pm
51 points

On homework, you may discuss with other students in the course about how to solve a problem, but the write-up should be your own. You **must include the names** of any students you consulted with. Give credit where credit is due. You will use JFLAP for some of the problems.

All the problems listed below refering to a book are from the JFLAP book.

SUBMISSION:

1. Submit all written parts on Gradescope under homework 2. For the written parts, you should submit one .pdf file.
2. For the parts that specify to create a JFLAP file, you should submit all the JFLAP files in one .zip file under homework 2 in Canvas.

Name your .zip file YOURNETID-hw2-jflap.zip For example, if your netid was abc12, your file name would be abc12-hw2-jflap.zip

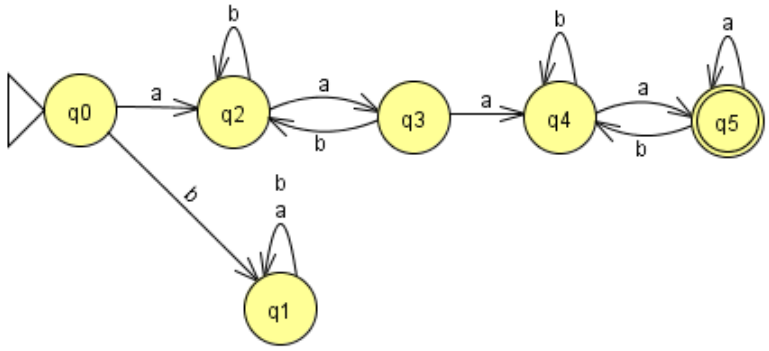
The files refered to in this homework can be copied from the www.jflap.org site, under the JFLAP book.

READ the JFLAP User manual Chapters 1-2.1 before doing this assignment.

PART 1:

Note: For problems 2-4, you need to build an equivalent DFA or NFA to show the property is regular. You should give a picture of the new DFA/NFA based on a generic DFA M. Then you need to explain the picture and describe the changes you made, what you deleted, what you have added, etc. We will work problems similar to Problems 2-4 in lecture. We did one on 1/15 and will do another one on 1/20. There is also an example of how to write these up on the course calendar page on 1/15 lecture.

1. (3 pts) For the following figure, list all the parts of the 5-tuple. You may give the δ part in the tabular format.



2. (4 pts) Consider the following property, truncate, which removes the rightmost symbol from any string. For example, truncate(abab) = aba, and truncate(bbbaaa) = bbbaa. For language L, truncate applied to L is defined as:

   truncate(L) = {truncate(w) | $w \in L$}.

   Prove that if L is regular, then truncate(L) is regular.

3. (4 pts) Consider the following property, doublefirst$_a$.

   $\Sigma = \{a, b, c, d\}$ doublefirst$_a$(L)=$\{waav | wav \in$L, $v \in \Sigma^*$, and $w \in (\Sigma - \{a\})^*\}$

   The property doublefirst$_a$ applied to a language L replaces the *first* occurence of a in each string by aa. For example, if the string *babbab* is in L, then *baabbab* is in doublefirst$_a$(L).

   Prove that if L is regular, then doublefirst$_a$(L) is regular.

4. (4 pts) Consider the following property, Replace_Last_bs_With_as (RLbsWas). If L is a regular language, then

   RLbsWas(L)=$\{w = uy \mid uv \in L, u \in \Sigma^*, v, y \in \Sigma^+$, v has at least one b, y is the same as v but with every b replaced with an $a\}$, $\Sigma = \{a, b\}$

   In other words, RLbsWas(L) accepts those words from L with one or more b's each replaced with an a, and for any b that is replaced, all b's to its right in the string must also be replaced. Note that if a string $w \in L$ does not have a b, then the string is not in RLbsWas(L).

   For example, consider the simple language L with just one string, $L = \{ababbb\}$. Then the corresponding strings in RLbsWas(L) are *ababba* (rightmost b replaced) , *ababaa* (rightmost 2 b's replaced), *abaaaa* (rightmost 3 b's replaced) and *aaaaaa* (all b's replaced). Note that *ababab* is not in RLbsWas since a b was replaced by an a, but there is a b to its right that was not replaced by an a.

Prove that the regular languages are closed under the RLbsWas(L) property. (This just means to show that if L is regular, then RLbsWas(L) is regular)(Show all steps! A picture may be helpful but you must explain it.)

PART 2:

These problems are all from the JFLAP book. JFLAP is available www.jflap.org

For written parts, be sure to include them in your .pdf file. For JFLAP files you create, submit those in one .zip file. (see comment earlier on naming that .zip file).

1. (4 pts) Problem 1(d) in JFLAPbook Chapter 1. Name this JFLAP file: ch1prob1d (the .jff extension will be automatically added)
2. (4 pts) Problem 1(e) in JFLAPbook Chapter 1. Name this JFLAP file: ch1prob1e
3. (4 pts) Problem 2(c) in JFLAPbook Chapter 1. Name this JFLAP file: ch1prob2c
4. (4 pts) Problem 3(c) in JFLAPbook Chapter 1. Name this JFLAP file: ch1prob3c
5. (4 pts) Problem 1(d) in JFLAPbook Chapter 2. Name this JFLAP file: ch2prob1d
6. (4 pts) Problem 1(e) in JFLAPbook Chapter 2. Name this JFLAP file: ch2prob1e
7. (4 pts) Problem 2 in JFLAPbook Chapter 2. Give an input string.
8. (4 pts) Problem 3 in JFLAPbook Chapter 2. Name this JFLAP file: ch2prob3

Part 3

Be sure to include these in your .pdf file.

(4 pts)

1. Was JFLAP easy to use? What parts did you have difficulty with?
2. Did you look at the help at all? If so, what part did you look at and was it helpful?
3. Suggestions for improvement of the tool?
4. Do you prefer creating FA using JFLAP or drawing them on paper?