CS375 Homework Assignment 2 (40 points)

Due Date: January 28, 2025

(The red boxes are text boxes. You can put your answers into the boxes directly)

1. For each of the following regular expressions find a language (i.e., a set of strings) over A = {a,b,c} that can be represented/described by that expression. (8 points)

a. b.

a.

b.

1. Find a regular expression to describe the following language. If it has no regular expression, say so and explain why.

(2 points)

1. A regular expression for the language over the alphabet {a, b} with each string containing exactly one ‘ab’ substring is b\*a\*abb\*a\*. Use this result to find regular expressions for the following languages
2. a language over the same alphabet with each string containing two ‘ab’ substrings. (2 points)
3. a language over the alphabet {a, b, c} with each string containing exactly one ‘abc’ substring. (6 points)
4. If a regular expression for the language over the alphabet {a, b} with no string containing the substring aa is (b+ab)\*(Ʌ+a), then what is the regular expression for the language over the alphabet {a, b, c} with no string containing the substring aaa? (4 points)
5. The following proof shows that

b(a + b)\* + bb(a + b)\* + bbb(a + b)\* = b(a + b)\*

Put the reason for each step in the blank on the right-hand side of that step. If an example in the notes can be used for a step, quote that example. (5 points)

b(a+b)\* + bb(a+b)\* + bbb(a+b)\*

= b(a+b)\* + (bb+bbb)(a+b)\*

= b(a+b)\* + b(b+bb)(a+b)\*

= b(a+b)\* + bb(a+b)\*

= (b+bb)(a+b)\*

= b(a+b)\*

6. Fill out the blanks in the following figure to make it a DFA that recognizes the expression ab + bb\*a. (5 points)

A diagram of a network

Description automatically generated

7. Fill out the blanks in the following figure to make it a DFA for the expression b\*ac\* + bbc + bc (4 points)

A diagram of a network

Description automatically generated

8. Fill out the blanks in the following figure to make it an NFA for the expression

a\* + b\*a\* + b(a+b)\*

If it is possible, simplify the given expression first. (4 points)

Diagram

Description automatically generated

* Solutions must be typed (word processed) and submitted to Canvas both as a pdf file and a

word doc (or docx) file before 23:59 on 01/28/2025.

* Please name your files the following way:

CS375\_2025s\_HW2\_LastName.docx / CS375\_2025s\_HW2\_LastName.pdf