University of Nevada, Las Vegas Computer Science 456/656 Spring 2026

Assignment 1: Due Saturday August 29, 2026, midnight

Name:_____

You are permitted to work in groups, get help from others, read books, and use the internet. Turn in the assignment as instruced by the Graduate Assistant, Sabrina Wellace, `wallace4@unlv.nevada.edu`

1. Work Exercises 1-6 on page 2 of the handout introduction.pdf.

   (1) _____

   (2) _____

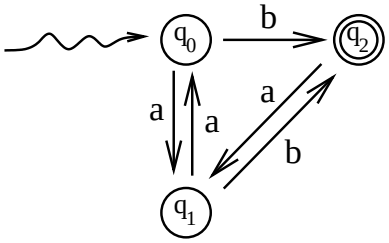
   (3) _____

   (4) _____

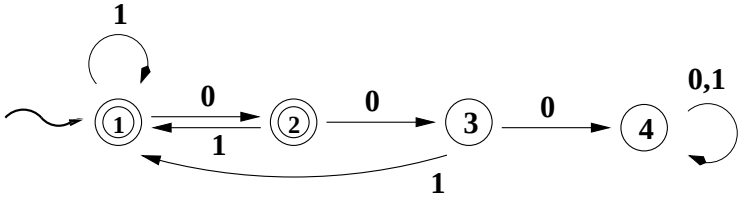
   (5) _____

   (6) _____

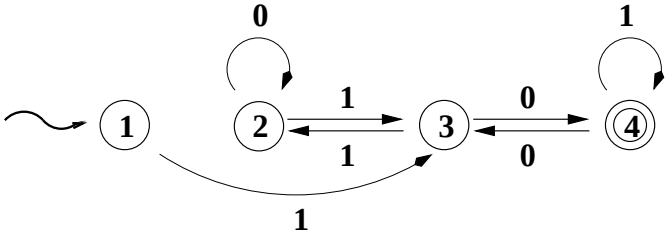
2. Let M_1 be the DFA shown below.



   Let M_2 be the DFA shown below.



   Let M_3 be the DFA shown below.



   Which of the following languages is accepted by M_1? By M_2? By M_3?

   (a) The language of all binary strings in which every substring 00 is followed by 1.

   (b) All strings over $\{a, b\}$ which end in b and which do not contain the substring bb.

(c) The language of all binary numerals for positive integers equivalent to 2 modulo 3.

(d) The language of all strings over $\{a, b\}$ in which every a is followed by b.

3. Construct a DFA which accepts the language $\{b^i a b^j : i, j \geq 0\}$, the language of all strings over $\{a, b\}$ which contain exactly one a. Your figure need not show the dead state.

4. Recall that $\emptyset$ is the empty language. If L is some language, what is the concatenation $\emptyset L$?

5. Let $L_1 = \{\lambda\}$. the language consisting of only the empty string. If L_2 is some other language, what is the concatenation $L_1 L_2$?

6. Is concatenation of languages commutative? That is, is the equation $L_1 L_2 = L_2 L_1$ always true?

7. Which of the following is true:

   (a) If L is any language, $L^0 = L$.

   (b) If L is any language, $L^0 = \emptyset$.

   (c) If L is any language, $L^0 = \{\lambda\}$.

   Hint: Think!

8. What is $\emptyset^*$, the Kleene closure of the empty language?

9. True(T) or False(F).

   i _____ Every subset of a regular language is a regular languge.

   ii _____ Every language is generated by a grammar.

   iii _____ Every language is finite.

   iv _____ 'Every language is infinite.

   v _____ Concatenation is commutative. That is, $L_1 L_2 = L_2 L_1$ for any languages L_1 and L_2.

   vi _____ Concatenation is associative. That is, $(L_1 L_2) L_3 = L_1 (L_2 L_3)$ for any languages L_1, L_2, and L_3.

   vii _____ The intersection of any two regular languages is regular.

   viii _____ The complement of any regular languages is regular.

   ix _____ The Kleene closure of any regular languages is regular.

   x _____ $\{\lambda\} + A = A$

   xi _____ Concatenation of languages distributes over union. That is, $L_1(L_2 + L_3) = L_1 L_2 + L_1 L_3$ for any languages L_1, L_2, L_3.

10. Construct a DFA equivalent to the following NFA.

