

University of Nevada, Las Vegas Computer Science 456/656 Spring 2025

Assignment 3: Due Saturday February 8, 2025, 11:59 PM

Name: _____

You are permitted to work in groups, get help from others, read books, and use the internet. You will receive a message from the graduate assistant, Sepideh Farivar, telling you how to turn in the assignment.

1. Identify which machine accepts the language defined by each regular expression.

(a) $a^* + b^*$

(e) $a(aa + b)^*$

(b) λ

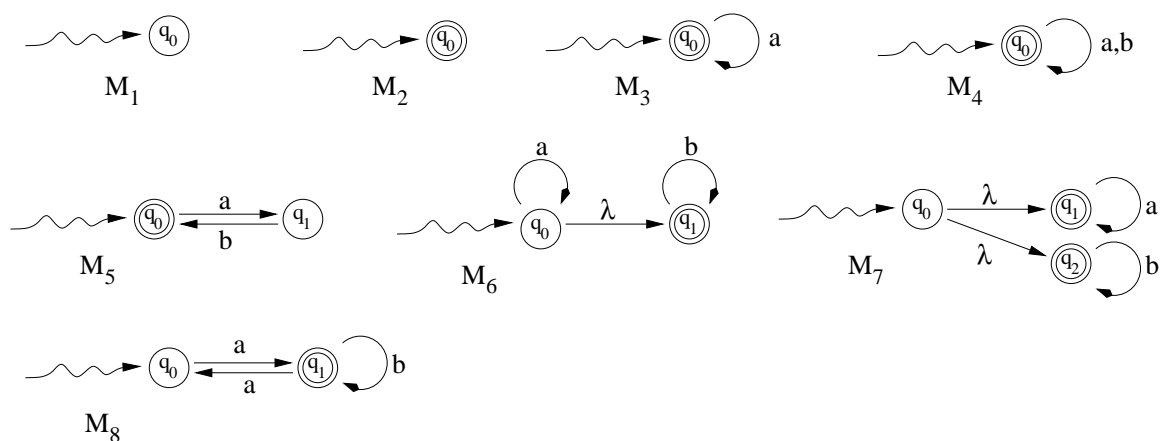
(f) a^*b^*

(c) a^*

(g) $(a + b)^*$

(d) \emptyset

(h) $(ab)^*$



2. True or False. If the answer is unknown to science at this time, write **O** for Open.

(a) _____ If L is any language, $L + L = L$

(b) _____ If L is any language, $L \cap L = L$

(c) _____ If L is any language, $\{\lambda\} \in L^*$.

(d) _____ If L is any language, $L + L = L$

(e) _____ If L is any language, $L \cap L = L$

(f) _____ If L is any language, $\{\lambda\} \in L^*$.

(g) _____ Any language consisting of all decimal numerals of an arithmetic sequence is regular.

(h) _____ Let L be a regular binary language. Let L' be the language of all strings obtained from members of L by substituting ab for 0 and c for 1. Then L' must be regular. For example, if $L = \{0, 10, 10011\}$ then $L' = \{ab, cab, cababcc\}$.

(i) _____ $\mathcal{P}\text{-TIME} = \mathcal{NP}$.

3. Let $L_1 = \{a, ab\}$ and $L_2 = \{a, ba\}$. How many strings are there in the language L_1L_2 ?

4. The following program decides whether a given integer n is prime.

```
Read n
  For all i from 2 to n-1
    If (n%i = 0) return False.
Return True.
```

At first glance you would say it is a polynomial time algorithm. But it isn't. In fact, it takes exponential time. Explain.

5. Any NFA with n states is equivalent to some DFA with at most 2^n states, counting the dead state.

Draw a DFA equivalent to the following three state NFA.

