

Computer Science 423
Fall 2024
Homework 1
My name

Due: beginning of class, Thursday, 9/12/2024

Answer the following questions and submit typeset solutions by the due date. As stated on the syllabus, any collaborators or outside sources must be listed under the corresponding problem. Further, your final submission must be completely your own work.

1. [3 points each] True or False. No explanation necessary.
 - (a) A regular language can be recognized by multiple deterministic finite automata.
 - (b) The language recognized by a DFA with zero accept states is $\{\emptyset\}$.
 - (c) For any language A , where $|A| > 0$, $A \circ A$ is a proper subset of A^* .

Collaborators:

2. [5 points each] Draw DFA state diagrams (with four states and no crossing arcs) that accept the following languages with alphabet $\Sigma = \{0, 1\}$:
 - (a) The set of strings with 011 as a substring
 - (b) The set of strings with 101 as a substring
 - (c) The set of strings with 111 as a substring

Collaborators:

3. [6 points each] Draw a DFA state diagram with three states that accepts language:

$$L = \{w \in \{0, 1\}^* \mid w = 0(10)^*\}$$

Collaborators:

4. [10 points each] For each the following DFAs given in transition table format,
 - i draw the corresponding state diagram
 - ii write the 5-tuple formal definition (if any of the components represents a set, list the entire set; you do not have to expand δ)
 - iii give a precise description of the language accepted.

| | | | |
|-----|-------------------|-------|-------|
| | | 0 | 1 |
| (a) | $\rightarrow q_0$ | q_1 | q_0 |
| | q_1 | q_2 | q_1 |
| | $*q_2$ | q_2 | q_2 |
| | | 0 | 1 |
| | $\rightarrow q_0$ | q_1 | q_3 |
| (b) | q_1 | q_1 | q_2 |
| | $*q_2$ | q_4 | q_3 |
| | q_3 | q_4 | q_3 |
| | $*q_4$ | q_1 | q_2 |

Collaborators: