

Assignment #1 Part 2
(Course: CS 301, 1 problem, Total points: 25)

For regular students, the deadline is September 24, 2024, in class. For special needs students, the deadline is October 1, 2024, in class. No late assignments will normally be accepted.

Special note: Any answer that is not sufficiently clear even after a reasonably careful reading will not be considered a correct answer, and only what is written in the answer will be used to verify accuracy. No hand waiving, vague descriptions or sufficiently ambiguous statements that can be interpreted in multiple ways will be considered as a correct answer, nor will the student be allowed to add any explanations to his/her answer after it has been submitted.

Problem 1 (25 points): Let $M=(Q, \Sigma, \delta, q_0, F)$ a *deterministic finite automata* (DFA) that accepts the following language L over the alphabet $\Sigma = \{0, 1\}$:

$$L = \{w \in \Sigma^* \mid w \text{ has an equal number of 0's and 1's such that each prefix of } w \text{ has at most one more 1 than 0's and at most one more 0 than 1's}\}$$

For example:

- The DFA accepts 0110, 01011001 and ϵ .
- The DFA does not accept 0011 and 011011.

(a) [15 points] Provide a state transition diagram of the DFA. **Provide a brief explanation as to why your DFA is correct.**

(b) [10 points] What are $Q, \Sigma, \delta, q_0, F$ for your machine? Write them down.