CLEMSON UNIVERSITY, SCHOOL OF COMPUTING
CPSC 3500 FOUNDATIONS OF COMPUTER SCIENCE

Assignment 3: Finite Automata

Return by 11:59pm, 9/25/2018

Problem 1 60%

Choose any 4 items out of a-h: For each of the following languages, draw an FA accepting it.

(a) $\{a, b\}^*\{a\}$

(b) $\{bb, ba\}^*$

(c) $\{a, b\}^*\{b, aa\}\{a, b\}^*$

(d) $\{bbb, baa\}^*\{a\}$

(e) $\{a\} \cup \{b\}\{a\}^* \cup \{a\}\{b\}^*\{a\}$

(f) $\{a, b\}^*\{ab, bba\}$

(g) $\{b, bba\}^*\{a\}$

(h) $\{aba, aa\}^*\{ba\}^*$

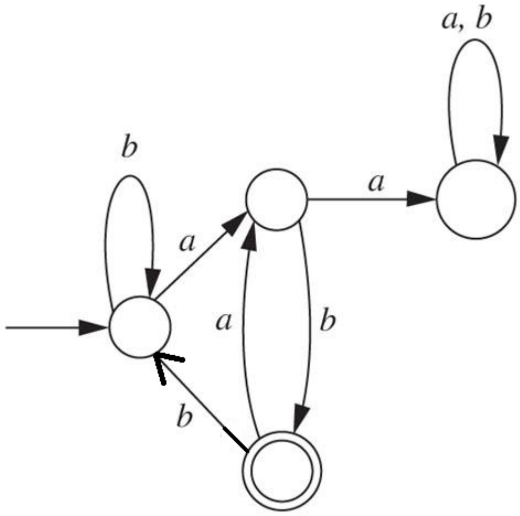


Figure 2.1: FA for $L_1 \cap L_2$

Problem 2 20%

$$L_1 = \{x \in \{a,b\}^* | aa \text{ is not a substring of } x\}; \quad L_2 = \{x \in \{a,b\}^* | x \text{ ends with } ab\}.$$

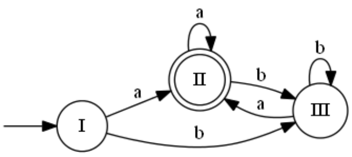
For the FA (Figure 2.1) that accepts $L_1 \cap L_2$, prove that there cannot be any other FA with fewer states accepting the same language.

Problem 3 20%

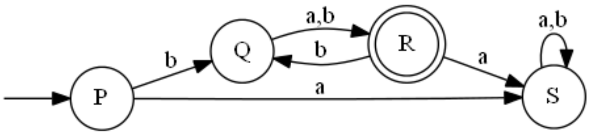
Suppose L is a subset of $\{a,b\}^*$. If $x_0, x_1, \ldots$ is a sequence of distinct strings in $\{a,b\}^*$ such that for every $n \geq 0$, x_n and x_{n+1} are L-distinguishable, does it follow that the strings $x_0, x_1, \ldots$ are pairwise L-distinguishable? Either give a proof that it does follow, or find an example of a language L and strings $x_0, x_1, \ldots$ that represent a counterexample.

Solutions to Assignment 3

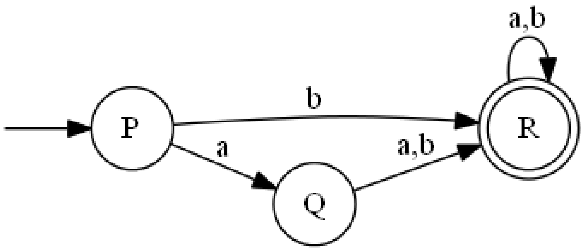
Solution to Problem 5



a)

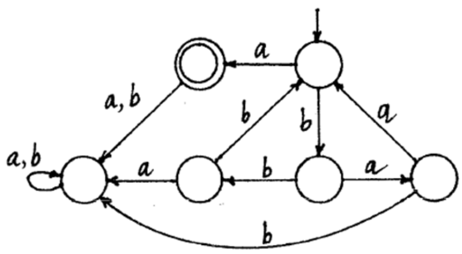


b)

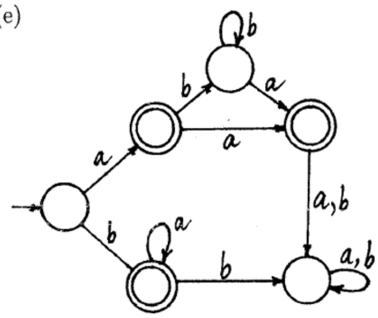


c)

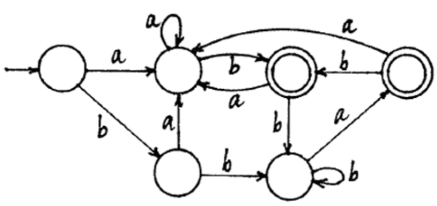
(d)



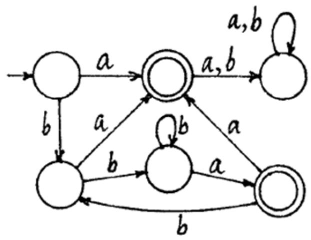
(e)



(f)



(g)



h) see textbook

Solution to Problem 6

One way to solve it is to demonstrate that strings Λ, a, ab, aa are L-distinguishable, and then use the theorem about n pairwise L-distinguishable strings, and the number of states in the FA.

Solution to Problem 7

The language is all even-length strings a^{2k}, and the sequence is all a^k. Two strings are distinguished by Λ. The corresponding FA has 2 states.