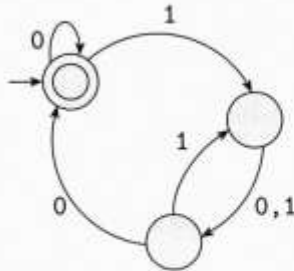


Theory of Computation, CSCI 438 spring 2022

Decidability: Problems Concerning Finite Automaton, pg. 193-197, April 4

1.

<sup>A</sup>4.1 Answer all parts for the following DFA  $M$  and give reasons for your answ



a. Is  $\langle M, 0100 \rangle \in A_{DFA}$ ?

b. Is  $\langle M, 011 \rangle \in A_{DFA}$ ?

c. Is  $\langle M \rangle \in A_{DFA}$ ?

d. Is  $\langle M, 0100 \rangle \in A_{REX}$ ?

e. Is  $\langle M \rangle \in E_{DFA}$ ?

f. Is  $\langle M, M \rangle \in EQ_{DFA}$ ?

2. The following is called the acceptance problem for DFAs.

$A_{DFA} = \{ \langle D, w \rangle \mid D \text{ is a DFA, } w \text{ is a string in the language of } D, \text{ and } D \text{ accepts } w \}$

(page 194)

Is there an algorithm that decides  $A_{DFA}$ ? If so, give it and tell if it is an a decider or a recognizer.

3. Consider the acceptance problem for NFAs,

$$A_{\text{NFA}} = \{ \langle D, w \rangle \mid D \text{ is an NFA, } w \text{ is a string in the language of NFA and } w \in \mathcal{L}(D) \}$$

Is  $A_{\text{NFA}}$  decidable.

4. Empty DFA.

$$E_{\text{DFA}} = \{ \langle D \rangle \mid D \text{ is a DFA whose language is empty} \}$$

Is  $E_{\text{DFA}}$  decidable?

5. Equivalent DFAs.

$EQ_{DFA} = \{ \langle D, E \rangle \mid D \text{ and } E \text{ are DFAs and they both recognize the same language} \}$

Is  $EQ_{DFA}$  decidable?