

DISCRETE MATHEMATICS – CH6 Homework6

6.1

12. For $\Sigma = \{0,1\}$ determine whether the string 00010 is in each of the following languages (taken from Σ^*). (10 pts)

- | | | |
|-----------------------------|------------------------------|-----------------------------|
| (a) $\{0, 1\}^*$ | (b) $\{000, 101\}\{10, 11\}$ | (c) $\{00\}\{0\}^*\{10\}$ |
| (d) $\{000\}^*\{1\}^*\{0\}$ | (e) $\{00\}^*\{10\}$ | (f) $\{0\}^*\{1\}^*\{0\}^*$ |

- | | |
|-------------------------------------|-----|
| a. yes | |
| b. $\{00010, 00011, 10110, 10111\}$ | yes |
| c. $\{00010, 000010, \dots\}$ | yes |
| d. $\{00010, 000000110, \dots\}$ | yes |
| e. $\{000010, 00000010, \dots\}$ | no |
| f. $\{010, 0010, 00010, \dots\}$ | yes |

14. For $\Sigma = \{0,1\}$ determine all possible languages $A, B \subseteq \Sigma^*$ where $AB = \{01, 000, 0101, 0111, 01000, 010111\}$. (10 pts)

$$A = \{\lambda\}, B = \{01, 000, 0101, 0111, 01000, 010111\}$$

$$A = \{01, 000, 0101, 0111, 01000, 010111\}, B = \{\lambda\}$$

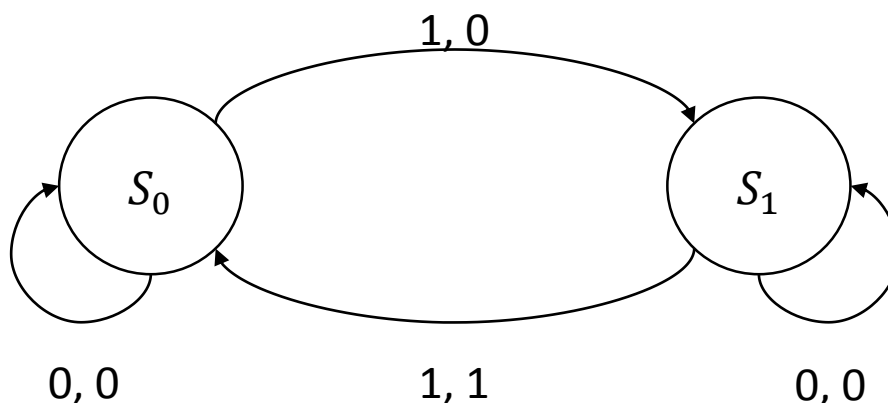
$$A = \{0\}, B = \{1, 00, 101, 111, 1000, 10111\}$$

$$A = \{0, 010\}, B = \{1, 00, 111\}$$

$$A = \{\lambda, 01\}, B = \{01, 000, 0111\}$$

6.3

4. For $\mathcal{I} = \mathcal{O} = \{0, 1\}$ a string $x \in \mathcal{I}^*$ is said to have *even parity* if it contains an even number of 1's. Construct a state diagram for a finite state machine that recognizes all nonempty strings of even parity. (10 pts)



6.2

8. Let $M = (S, \mathcal{I}, \mathcal{O}, v, \omega)$ be a finite state machine with $\mathcal{I} = \mathcal{O} = \{0, 1\}$ and S, v , and ω determined by the state diagram shown in Fig. 6.7.

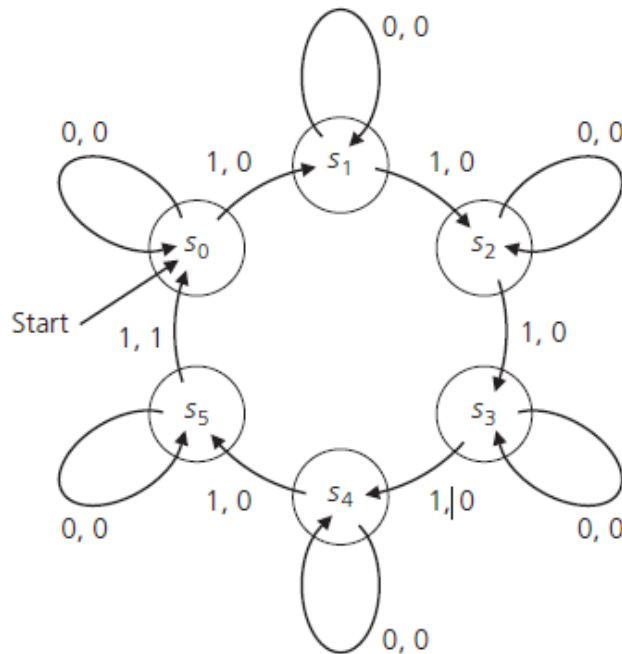


Figure 6.7

- Find the output for the input string $x = 0110111011$.
- Give the transition table for this finite state machine.
- Starting in state s_0 , if the output for an input string x is 0000001, determine all possibilities for x .
- Describe in words what this finite state machine does. (10 pts)

a) output 0000000010

b)

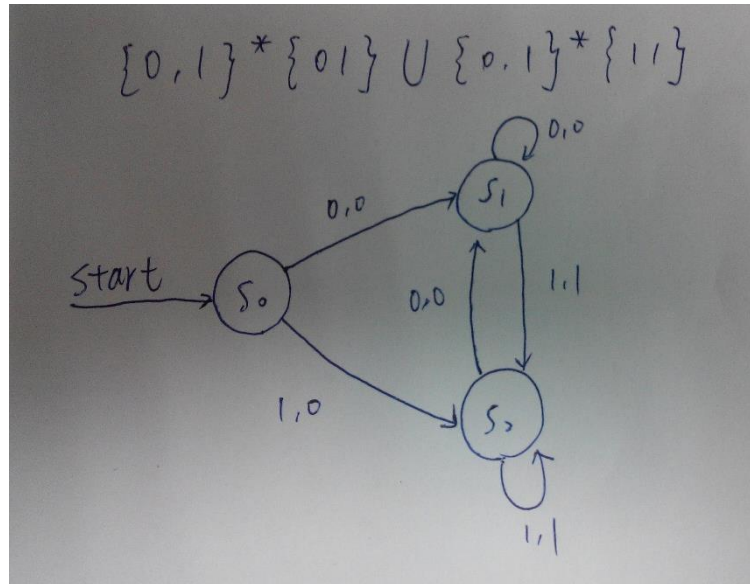
	v		ω	
	0	1	0	1
s_0	s_0	s_1	0	0
s_1	s_1	s_2	0	0
s_2	s_2	s_3	0	0
s_3	s_3	s_4	0	0
s_4	s_4	s_5	0	0
s_5	s_5	s_0	0	1

c) $\omega(x, s_0) = 0000001$ for $x = (1)1111101$; (2)1111011; (3)1110111; (4)1101111; (5)1011111; and (6)0111111

d) The machine recognizes the occurrence of a sixth 1, a 12th 1, in an input x

Others

Construct a state diagram for a finite state machine with $I = O = \{0, 1\}$ that recognizes all strings in the language $\{0, 1\}^* \{01\} \cup \{0, 1\}^* \{11\}$ (10 pts)



Advanced assignment (20 pts)

Design a FSM that can recognize some special pattern.

- Let your FSM as hard as possible (自行作答)
- Let the string you recognize as hard as possible (自行作答)