

Name: Shu-Ting Wang

Student ID: TA

Quiz #6 (5% + 1% Bonus)

CS2336 Discrete Mathematics, Instructor: Cheng-Hsin Hsu

Department of Computing Science, National Tsing Hua University, Taiwan

3:30 - 3:50 p.m., April 28st, 2014

This is a closed book test. Any academic dishonesty will automatically lead to zero point.

1) (2%) For alphabet $\Sigma = \{0, 1\}$, let $A, B, C \subseteq \Sigma^*$ be the following language:

- $A = \{0, 1, 00, 11, 000, 111, 0000, 1111\}$
- $B = \{w \in \Sigma^* \mid 2 \leq \|w\|\}$
- $C = \{w \in \Sigma^* \mid 2 \geq \|w\|\}$

Give the following subsets (languages) of Σ^*

a) $A \cap C$

Solution: $\{0, 1, 00, 11\}$

b) $B \cup C$

Solution: Σ^*

c) $A \cap B$

Solution: $\{00, 11, 000, 111, 0000, 1111\}$

d) $\overline{(A \cap C)}$

Solution: $\Sigma^* - \{0, 1, 00, 11\} = \{\lambda, 01, 10\} \cup \{w \mid \|w\| \geq 3\}$

2) (2%) For a finite state machine with input and output alphabet $\{0, 1\}$ and the following state diagram, answer the following questions:

- a) Determine the output string for the input string 110111, if the state machine starts from s_0

Solution: 010000 : s_2

- b) Which state should we start so that the input string 10010 produces the output 10000?

Solution: s_1

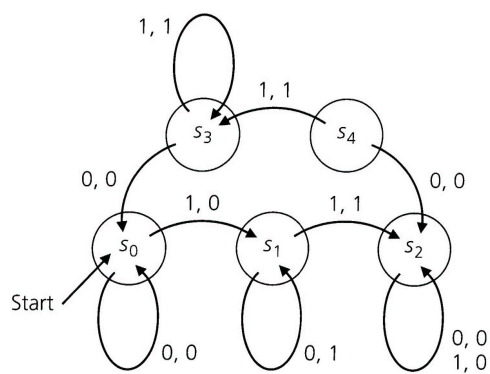


Figure 6.5

Fig. 1.

3) (2%) The following table defines ν and ω for a finite state machine M where $\mathcal{I} = \mathcal{O} = \{0, 1\}$.

a) Draw a state diagram of this table.

Solution: see 2(b)

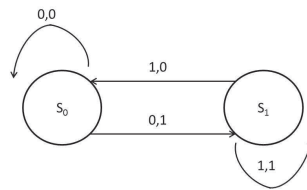
b) Describe in words what machine M does.

Solution: The machine outputs a 0 followed by the first $n - 1$ symbols of the n symbol input string x . Hence the machine is a unit delay.

Table 6.12

	ν		ω	
	0	1	0	1
s_0	s_0	s_1	0	0
s_1	s_0	s_1	1	1

(a) Table 1



(b) Solution of part (a)

Fig. 2.