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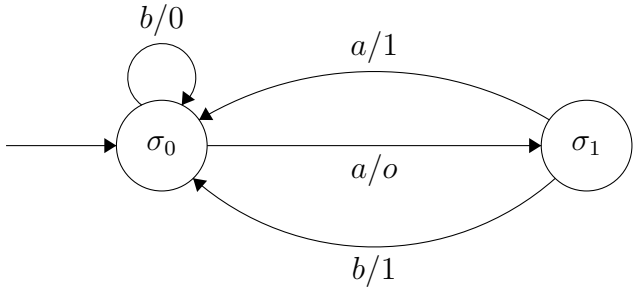
Homework 13

CISP440

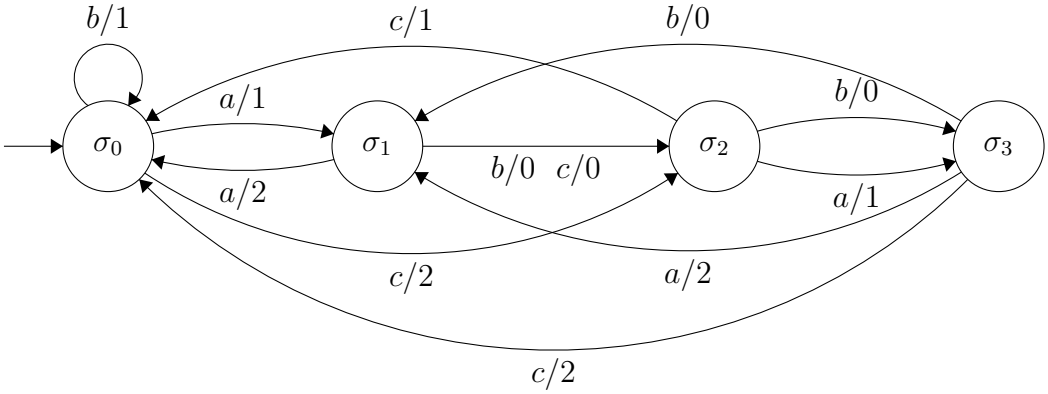
Section 10.1

Draw the transition diagram of the finite state machine (I, O, S, f, g, o_0)

2. $I = \{a, b\}, O = \{0, 1\}, S = \{o_0, o_1\}$



5. $I = \{a, b, c\}, O = \{0, 1, 2\}, S = \{o_0, o_1, o_2, o_3\}$



In Exercises 6-10, find the sets I, O, and S, the initial state, and the table defining the next state and output functions for each finite-state machine

7.

S	***f***		***g***	
	a	b	a	b
A	A	B	0	1
B	A	C	0	1
C	C	A	1	0

10.

S	f			g		
	a	b	c	a	b	c
B	A	D	D	2	0	0
A	B	A	C	1	0	2
C	A	C	D	0	1	2
D	D	C	A	2	2	0

In Exercises 11-20, find the output string for the given input string and finite-state machine.

12. *abba*; Exercise 1

Output is: 0111

16. *aaa*; Exercise 6

Output is: 011

17. *aabbabaab*; Exercise 7

Output is: 001110001

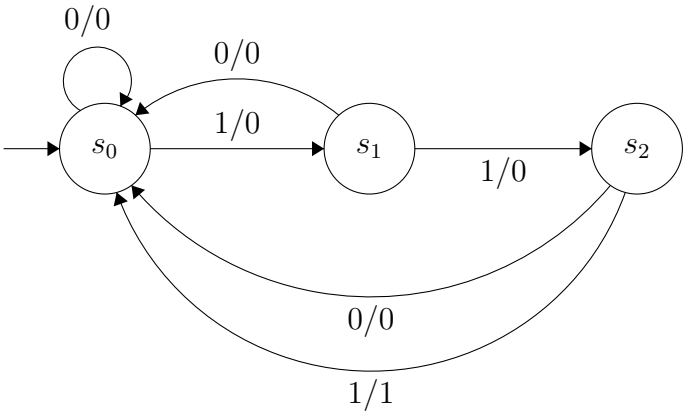
19. *bbababbabaaa*; Exercise 9

Output is: 010000000001

In Exercises 21-26, design a finite-state machine having the given properties. The input is always a bit string.

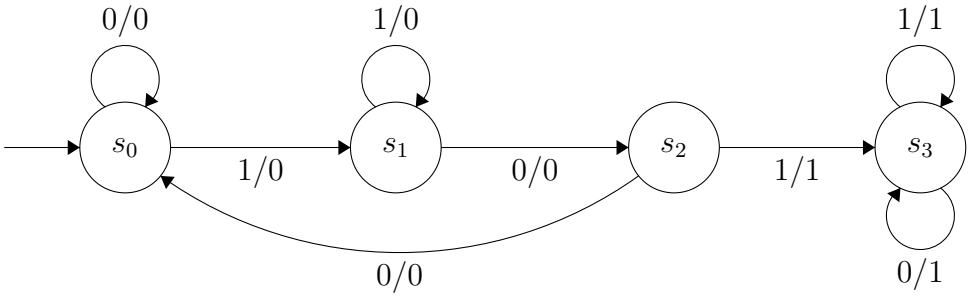
22. Outputs 1 if k 1's have been input, where k is a multiple of 3; otherwise, output 0.

S	f		g	
	0	1	0	1
s_0	s_0	s_1	0	0
s_1	s_0	s_2	0	0
s_2	s_0	s_0	0	1



25. Outputs 1 when it sees 101 and thereafter; otherwise, outputs 0.

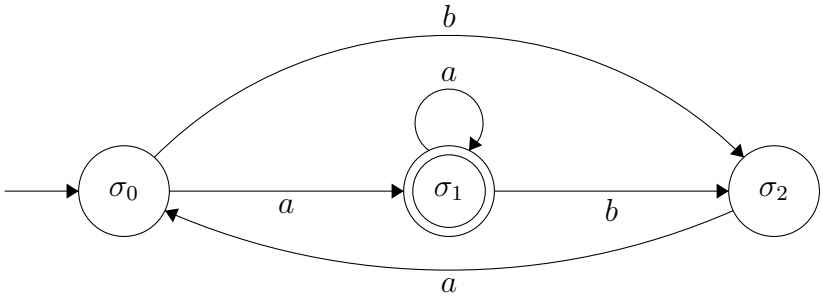
S	f		g	
	0	1	0	1
s_0	s_0	s_1	0	0
s_1	s_2	s_1	0	0
s_2	s_0	s_3	0	1
s_3	s_3	s_3	1	1



Section 10.2

In Exercises 1-3, show that each finite-state machine is a finite-state automaton and redraw the transition diagram as the diagram of a finate-state automaton.

2.



In Exercises 13-17, determine whether the givin string is accpeted by the given finite-state automaton.

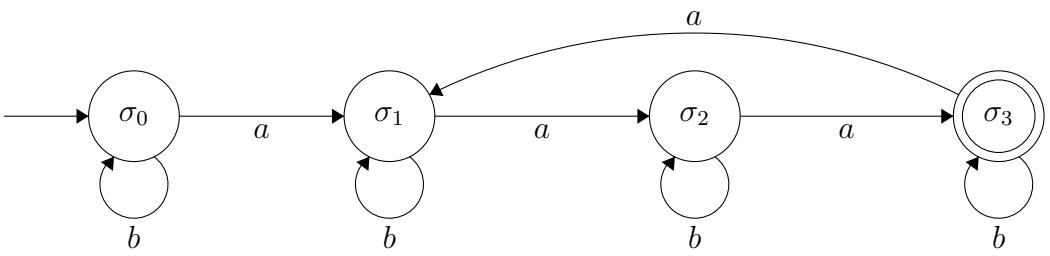
15. aabaabb; Figure 10.2.5

Yes, it would be accepted because the final state of the automaton is σ_2, which is an accepted state.

In Exercises 21-31, draw the transition diagram of a finite-state automaton that accepts the given set of strings over {a, b}

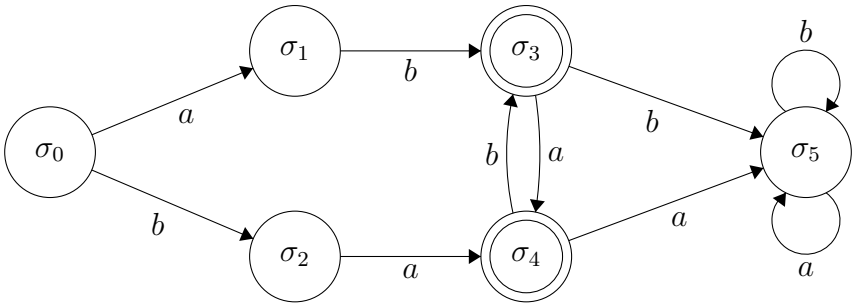
26. Contains m a's where m is a multiple of 3.

σ_0 = Nothing in input buffer.
σ_2 = Number of m's in input buffer modulus 3 equals 1.
σ_3 = Number of m's in input buffer modulus 3 equals 2.
σ_4 = Number of m's in input buffer modulus 3 equals 0.



29. Every b is followed by an a.

It ocurred to me that this one may be trickier than it looks at first glance. I may be wrong, but it seems like there needs to a state for (buffer contains exactly one a) and for (buffer contains exactly one b), as those are not accept states, but don't fall into the (buffer contains consecutive a's or b's) state.
σ_0 = Nothing in input buffer.
σ_1 = Input buffer contains a single a.
σ_2 = Input buffer contains a single b.
σ_3 = Input buffer contains alternating a's and b's, ending with an b.
σ_4 = Input buffer contains alternating a's and b's, ending with an a.
σ_5 = Input buffer contains consecutive a's or b's.



37.

Yikes.