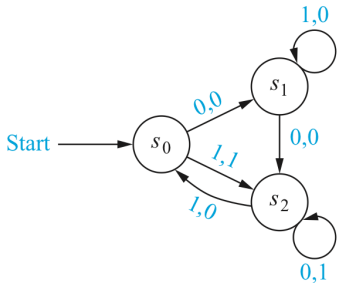
2. Give the state tables for the finite-state machines with these state diagrams.

b)



state	f Input 0	f Input 1	g Output 0	g Output 1
S_0	S_1	S_2	0	1
S_1	S_2	S_1	0	0
S_2	S_2	S_0	1	0

14. Construct a finite-state machine for entering a security code into an automatic teller machine (ATM) that implements these rules: A user enters a string of four digits, one digit at a time. If the user enters the correct four digits of the password, the ATM displays a welcome screen. When the user enters an incorrect string of four digits, the ATM displays a screen that informs the user that an incorrect password was entered. If a user enters the incorrect password three times, the account islocked.

Suppose 0 means an incorrect input, 1 means a correct input
Output 0 means asterisk on the screen 1 means the welcome page -1 means the page that prompts an incorrect input

S_{25} is not the end, which is the start of second attempt. S_{50} is the start of thirel attempt. When S_{75} is reached, the account will be locked.

	f Input 0	f Input 1	g Output 0	g Output 1
S_0	S_5	S_1	0	0
S_1	S_6	S_2	0	0
S_2	S_7	S_3	0	0
S_3	S_8	S_4	-1	-1
S_5	S_{13}	S_9	0	0
S_6	S_{14}	S_{10}	0	0
S_7	S_{15}	S_{11}	0	0
S_8	S_{16}	S_{12}	0	0
S_9	S_{21}	S_{17}	0	0
S_{10}	S_{22}	S_{18}	0	0
S_{11}	S_{23}	S_{19}	0	0
S_{12}	S_{24}	S_{20}	0	0
S_{24}	S_{25}	S_{25}	-1	-1

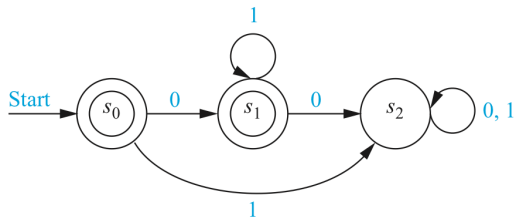
10. Determine whether the string 01001 is in each of these sets.

a) $\{0, 1\}^*$ **b)** $\{0\}^*\{10\}\{1\}^*$
c) $\{010\}^*\{0\}^*\{1\}$ **d)** $\{010, 011\}\{00, 01\}$
e) $\{00\}\{0\}^*\{01\}$ **f)** $\{01\}^*\{01\}^*$

a) vocabulary $\{0,1\}$, 01001 is in $\{0,1\}^*$
b) not in because 10 must be followed by 1
c) in the set
d) in the set first choose 010 then choose 01
e) not in the set because 01001 must be followed by 0
f) not in the set because not two consecutive 0

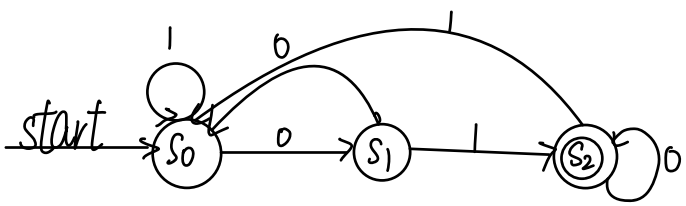
In Exercises 16–22 find the language recognized by the given deterministic finite-state automaton.

18.

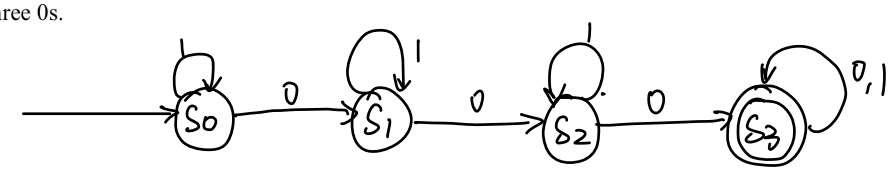


Since s_0 is a final state and nothing need to be input to reach the state, which means empty string is recognized. s_1 is a final state obtained by inputting 0, 01, 011.
The language recognized is $\{\lambda\} \cup \{01^n \mid n=0,1,2\cdots\}$

24. Construct a deterministic finite-state automaton that recognizes the set of all bit strings that end with 10.

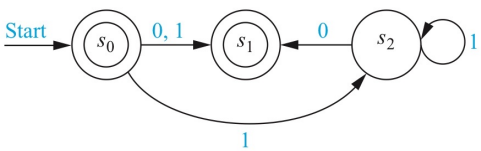


28. Construct a deterministic finite-state automaton that recognizes the set of all bit strings that contain at least three 0s.



In Exercises 43–49 find the language recognized by the given nondeterministic finite-state automaton.

44.



The language recognized is $\{\lambda, 0, 1\} \cup \{1^n 0 \mid n = 1, 2, 3 \cdots\}$

52. Find a deterministic finite-state automaton that recognizes the same language as the nondeterministic finite-state automaton in Exercise 45.

45.