CSC 220

11/17/2020

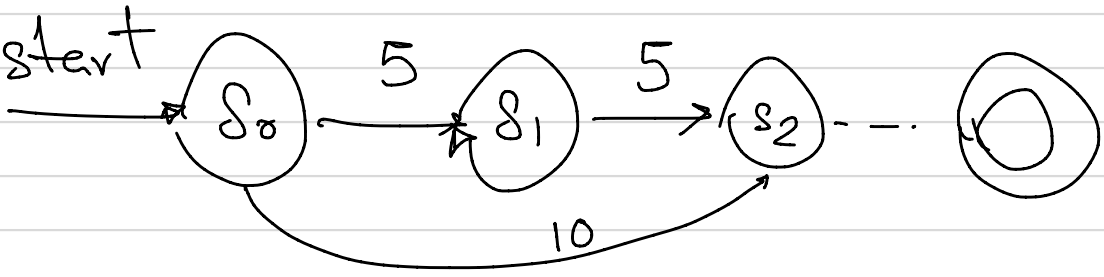
FA

Vending machine:

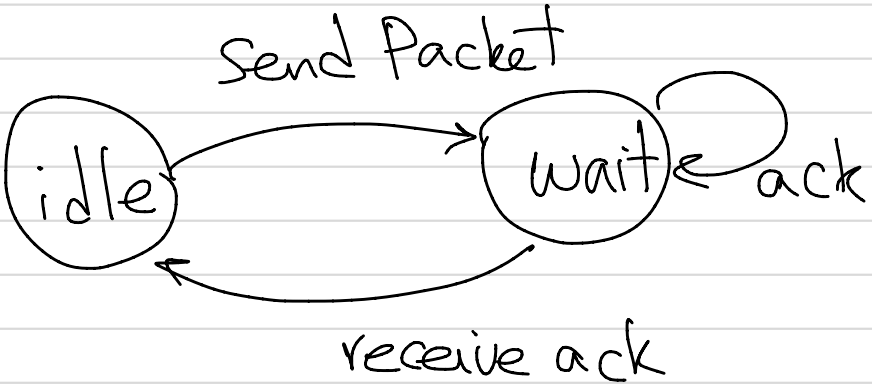
0.D. 30¢

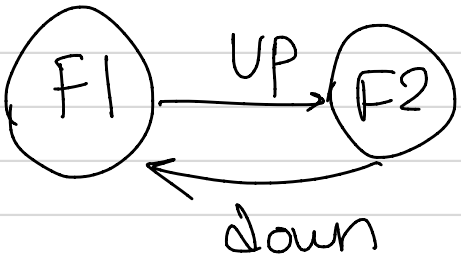
S_i: i is the state where the machine has collected $5i$ cents.

- A state is represented by a circle.
- Arrows for input/output
- final state double circle



. A finite state machine includes a finite set of states, designated starting state input alphabet, Transition function.





$$M = (S, I, f, S_0, F)$$

- S → states
- I → Alphabet
- f → Transition function (2)
- S_0 → starting state
- F → final state(s)

$$f: S \times I \longrightarrow S$$

- Finite state machine or finite State Automaton (FSA)

- A string x is said to be recognized or accepted by machine M, if it takes the initial state S_0 to a final state that is $f(S_0, x)$ is a state in F.

- The language recognized or accepted by M, denoted by $L(M)$ is the set of all strings that are recognized by M.

Construct the state digram for the finite state automaton (FSA), where

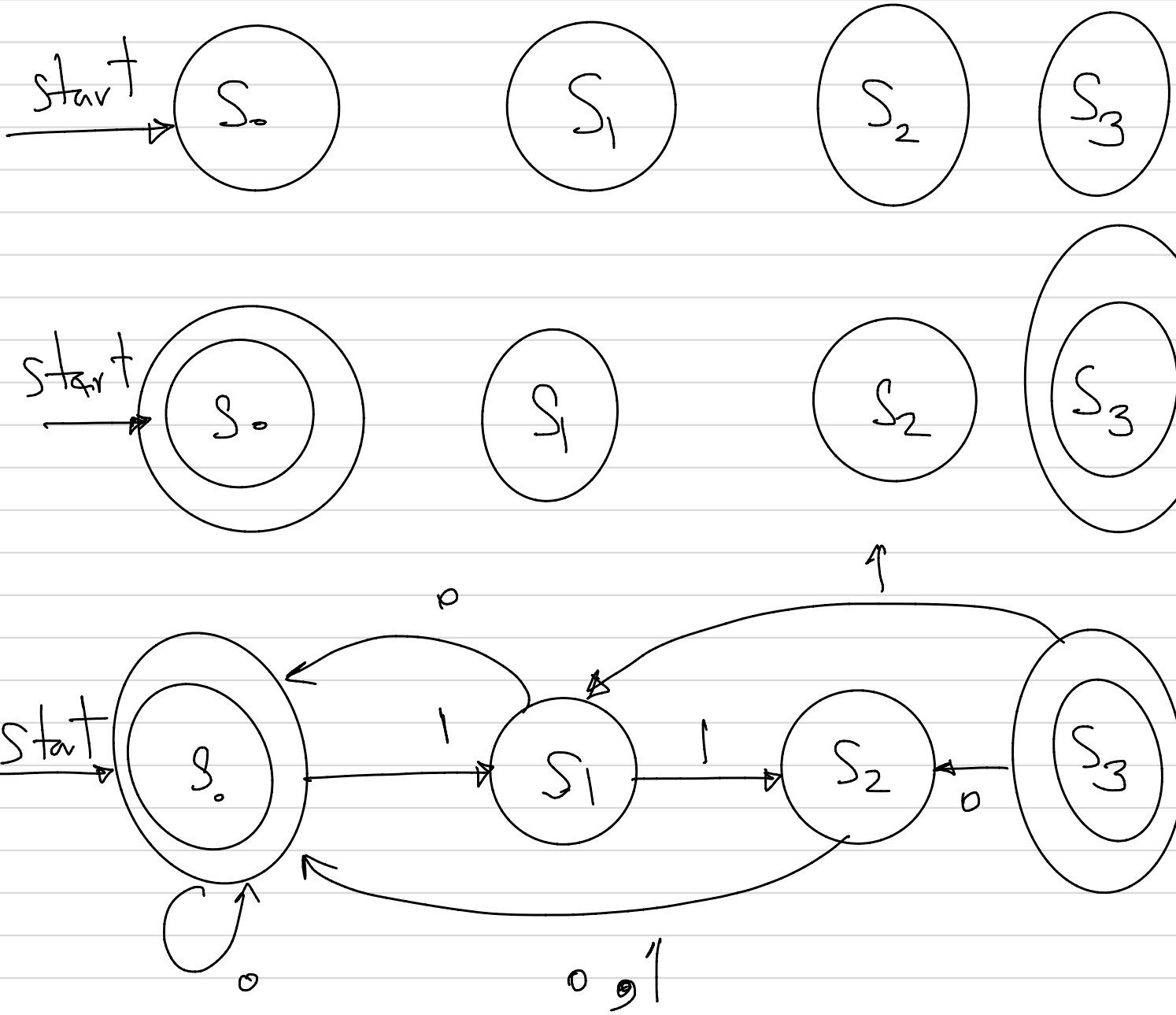
$S = \{ S_0, S_1, S_2, S_3 \}$

$I = \{ 0, 1 \}$

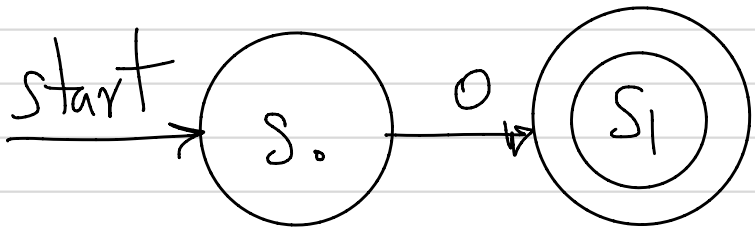
$F = \{ S_0, S_3 \}$

state table:

	Input	
state	0	1
S_0	S_0	S_1
S_1	S_0	S_2
S_2	S_0	S_0
S_3	S_2	S_1

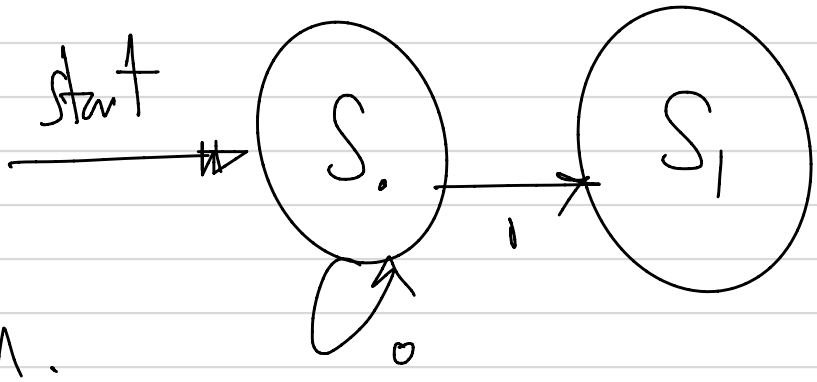

start
S_0
S_1
S_2
S_3
start
S_0
S_1
S_2
S_3
start
S_0
S_1
S_2
S_3
0
1
1
0
0
0, 1

. A movement along an edge from one state to another is a state Transition.



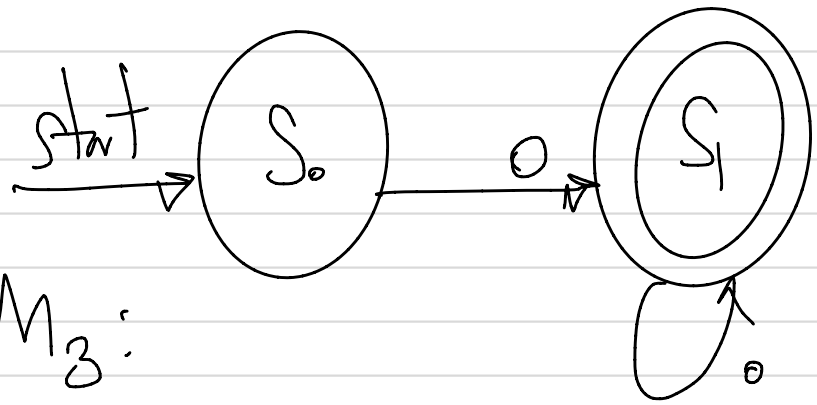
: M_1

$L(M) = \{0\}$



M_2:

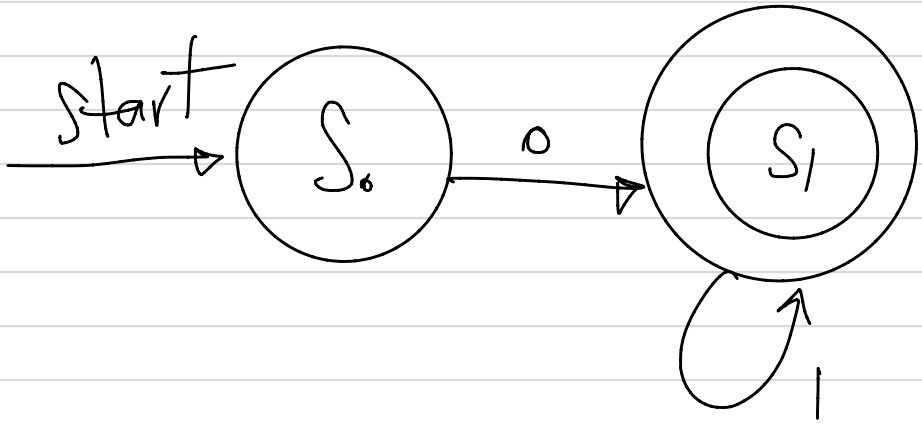
$L(M_2) = \emptyset$



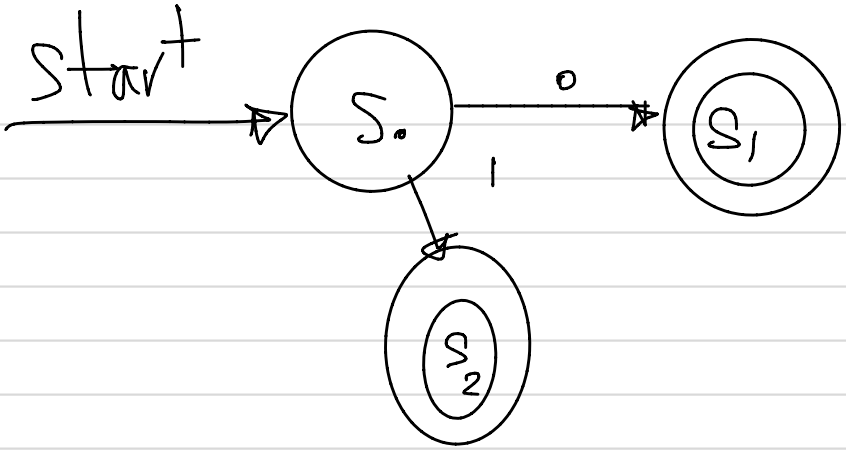
M_3:

$$L(M_3) = \{ 0^n \mid n \in \mathbb{N}, n \geq 1 \}$$

M_4:



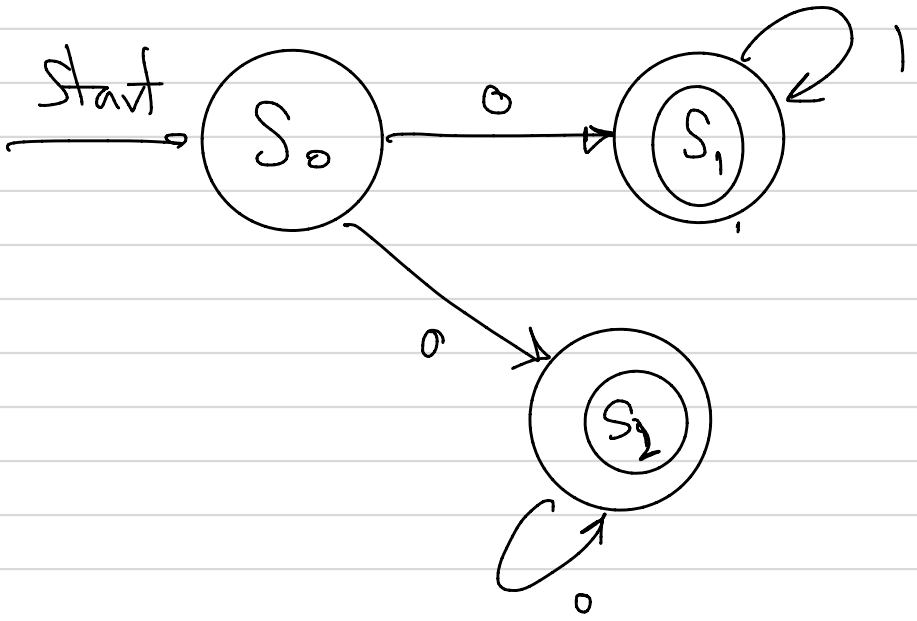
$$L(M_4) = \{ 0^n 1^n \mid n \in \mathbb{N}, n \geq 0 \}$$



M_5

$$L(M_5) = \{0, 1\}$$

M_6:



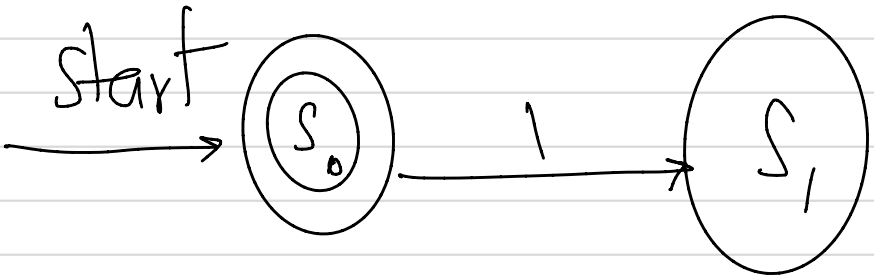
$$L(M_6) = \{0 0^n \mid n \in \mathbb{N}\} \cup \{0 1^m \mid m \in \mathbb{N}\}$$

or

8

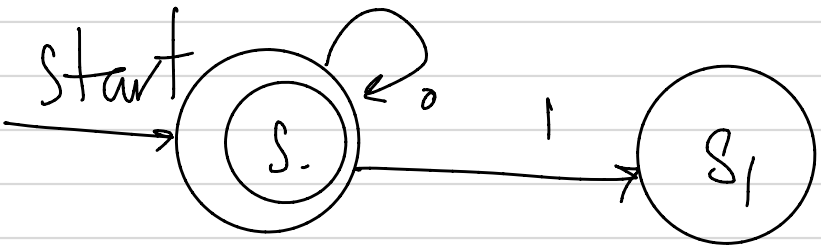
$$L(M_6) = \{ 0^n \mid n \geq 1, n \in \mathbb{N} \} \cup \{ 0 1^n \mid n \in \mathbb{N} \}$$

M_7:



$$L(M_7) = \{ \lambda \}$$

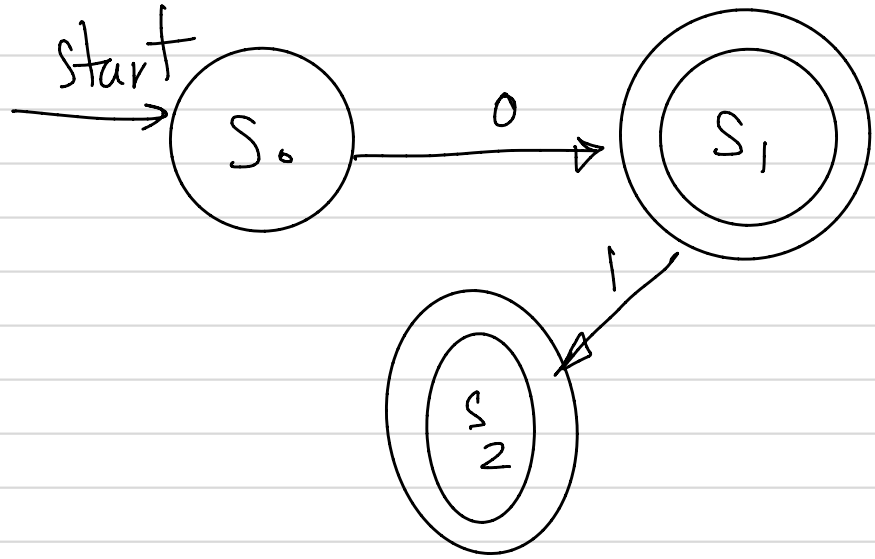
M_8:



$\lambda, 0, 01, 001, \ldots$

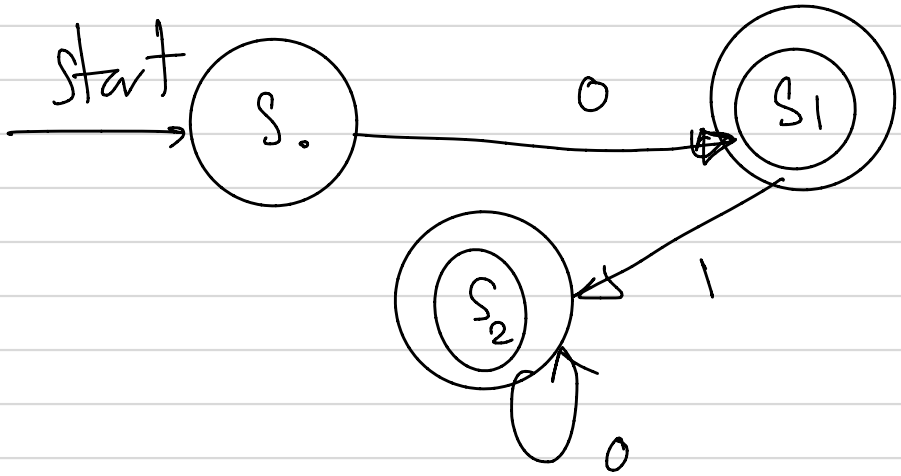
$$L(M_8) = \{ \lambda \} \cup \{ 0^n \} = \{ 0^n \mid n \in \mathbb{N} \}$$

M_9:



$$L(M_9) = \{01\} \cup \{0\}$$

M_{10}:



$$L(M_{10}) = \{0 1.0^n \mid n \in \mathbb{N}\} \cup \{0\}$$