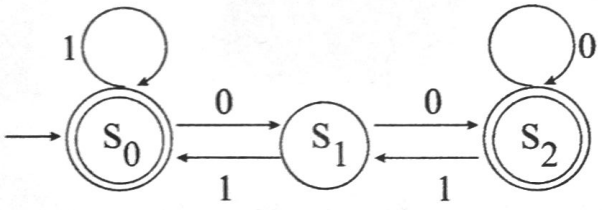
| 1 | 2 | 3 | 4 | grade |
|---|---|---|---|---|
| | | | | |

**Discrete Systems** **Exer. 11.** Student name Yuta Nemoto Student ID s1240234

1. Which of the following words are accepted by the automaton?

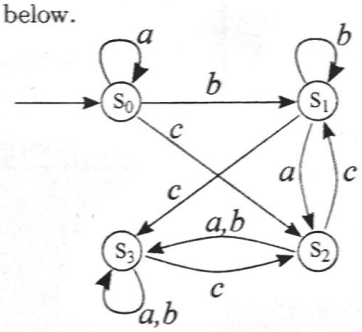
   a) 0110; b) 00111; c) 10101; d) 000111; e) 11001




a: $S_1 S_2 S_0 S_1$
b: $S_1 S_2 S_1 S_0 (S_0)$
c: $S_0 S_1 S_0 S_1 (S_2)$
d: $S_1 S_2 S_2 S_1 S_0 (S_0)$
e: $S_0 S_0 S_1 S_2 S_1$

then, b, c, and d are accepted.

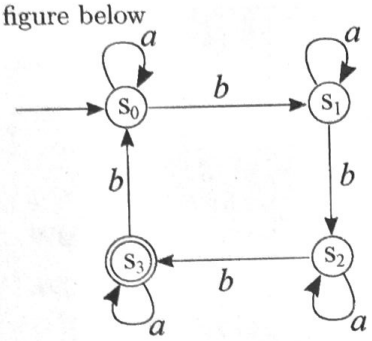
2. Construct the state transition table of the finite-state automaton whose diagram is shown below.




State Table

| State | next state f: Input a | b | c |
|---|---|---|---|
| $S_0$ | $S_0$ | $S_1$ | $S_2$ |
| $S_1$ | $S_2$ | $S_1$ | $S_3$ |
| $S_2$ | $S_3$ | $S_3$ | $S_1$ |
| $S_3$ | $S_3$ | $S_3$ | $S_2$ |

3. Describe the words $w$ made of the alphabet $\{a, b\}$ accepted by the automaton shown in the figure below




For example,
- bbb
- ababab
- aaabbaab
- bbbbbbb
- abbabaaabbbb

are acceptable.

~~$w = \{a^l b a^m b a^n b a^o : l, m, n, o \text{ is integer, and } l, m, n, o \geq 0\}$~~

$w = \{a^n b^{3+4m} : n, m \text{ is integer and } n, m \geq 0\}$

4. Draw the state diagram for the finite-state machine with the following state table:

| State Table | | | | |
|---|---|---|---|---|
| | next state $f$ | | output $g$ | |
| | Input | | Input | |
| State | 0 | 1 | 0 | 1 |
| $s_0$ | $s_1$ | $s_0$ | 0 | 0 |
| $s_1$ | $s_2$ | $s_0$ | 1 | 1 |
| $s_2$ | $s_0$ | $s_3$ | 0 | 1 |
| $s_3$ | $s_1$ | $s_2$ | 1 | 0 |