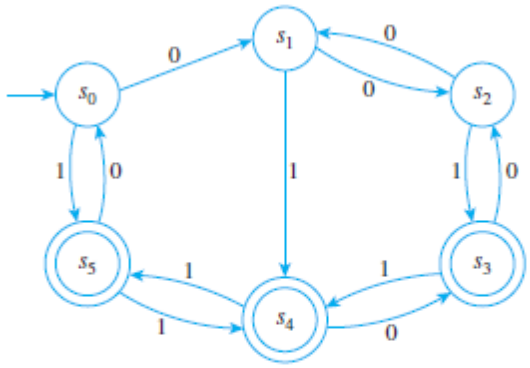
Final Exam.

1

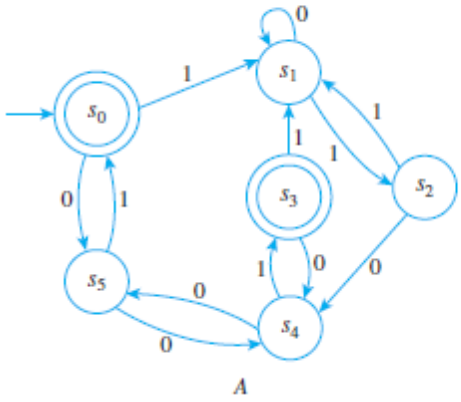
Consider the finite-state automaton given by the following transition diagram:



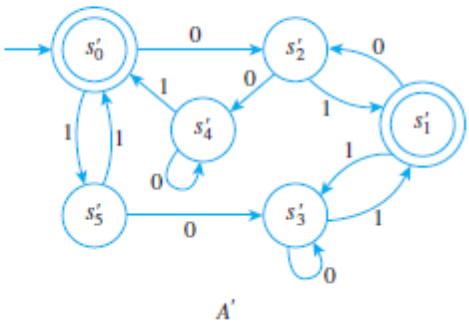
a. Find the 0-,1-, 2-, and 3-equivalence classes of states of A.
b. Draw the transition diagram for $\overline{A}$, the quotient automaton of A.

2.

Are the automata A and A' shown below equivalent?



A

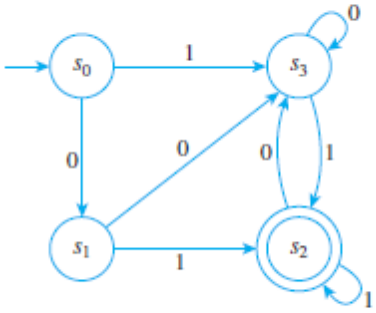


A'

3.

a.

A finite-state automaton A, given by the transition diagram below, has next-state function N and eventual-state function N^*.



a. Find $N(s_1, 1)$ and $N(s_0, 1)$.
b. Find $N(s_2, 0)$ and $N(s_1, 0)$.
c. Find $N^*(s_0, 10011)$ and $N^*(s_1, 01001)$.
d. Find $N^*(s_2, 11010)$ and $N^*(s_0, 01000)$.

4.

a

Next-State Table

State		Input 0	Input 1
s_0	→	s_1	s_2
s_1		s_1	s_2
s_2	◎	s_1	s_2

a. Find its states.
b. Find its input symbols.
c. Find its initial state.
d. Find its accepting states.
e. Draw its transition diagram.

5.

a

(a) design an automaton with the given input alphabet that accepts the given set of strings, and (b) find a regular expression that defines the language accepted by the automaton.

Input alphabet = {0, 1}; Accepts the set of all strings for which the final three input symbols are 1.

6.

a.

write a regular expression to define the given set of strings.

All words that are written in lower-case letters and contain at least one of the vowels a, e, i, o, or u.

7.

a

describe L_1L_2, $L_1 \cup L_2$, and $(L_1 \cup L_2)^*$ for the given languages L_1 and L_2.

L_1 is the set of all strings of a's and b's that start with an a and contain only that one a; L_2 is the set of all strings of a's and b's that contain an even number of a's.

8.

A Regular Expression That Defines a Language

Let $\Sigma = \{0, 1\}$. Find regular expressions over Σ that define that following languages.

a. The language consisting of all strings of 0's and 1's that have even length and in which the 0's and 1's alternate.

b. The language consisting of all strings of 0's and 1's with an even number of 1's. Such strings are said to have *even parity*.

c. The language consisting of all strings of 0's and 1's that do not contain two consecutive 1's.