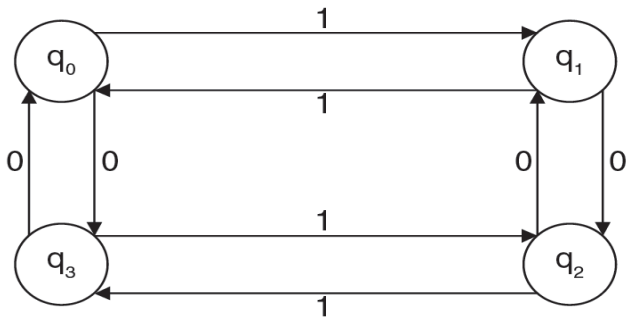
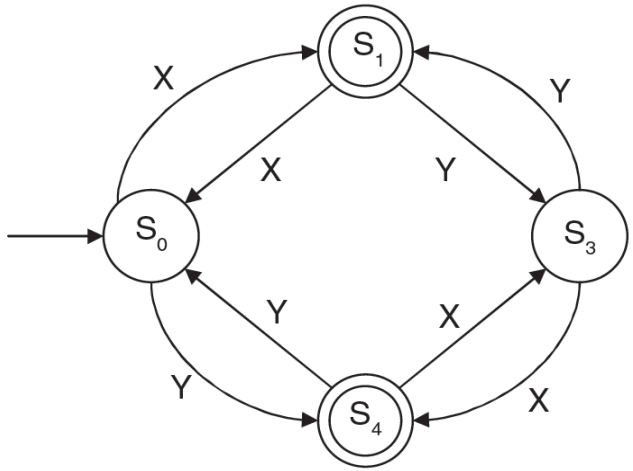
2. Consider the transitional system.



Which of the states are to be marked as starting state and fi nal state, respectively, so as to turn the above system into a DFA that accepts all strings having odd number of zeros and even number of 1's?

a) q_0, q_2 b) q_0, q_1 c) q_1, q_2 d) None of these

3. Consider the following DFA in which S_0 is the start state and S_1 and S_3 are the fi nal states. Which one is true?

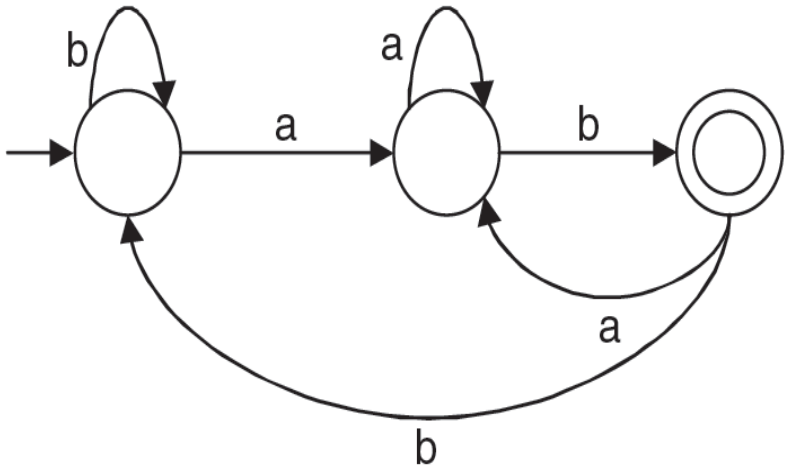


a) All strings of x and y.
b) All strings of x and y which have either an even number of x and even number of y or an odd number of x and odd number of y.
c) All strings of x and y which have an equal number of x and y.
d) All strings of x and y which have either an even number of x and odd number of y or an odd number of x and even number of y.

4. Let N be an NFA with n states and let M be the minimized DFA with m states recognizing the same language. Which of the following is NECESSARILY true?

$a) m \leq 2^n$ $b) n \leq m$ c) M has one accept state $d) m = 2^n$

5. If the final state and non-final states in the following DFA are interchanged, then which of the following languages over the alphabet (a, b) will be accepted by the new DFA?



a) Set of all strings that do not end with ab
b) Set of all strings that begin with either an a or a b.
c) Set of all strings that do not contain the substring ab.
d) The set described by the regular expression $b^*aa^*(ba)^*b^*$

6. A finite state machine with the following state table has a single input x and a single output z.

	Next State,z	
Present State	X=0	X=1
A	D, 0	B, 0
B	B, 1	C, 1
C	B, 0	D, 1
D	B, 1	C, 0

If the initial state is unknown, then the shortest input sequence to reach the final state C is:

$a)01$ $b)10$ c) 101 $d)110$

7. Which of the following sets can be recognized by a deterministic finite state automaton?

a) The numbers $1, 2, 4, 8, ...2^n$ written in binary.
b) The numbers $1, 2, 4, ...2^n$ written in unary.
c) The set of binary string in which the number of zeros is the same as the number of ones.
d) The set $\{1, 101, 11011, 1110111, ...\}$

8. Consider the regular expression $(0 + 1)(0 + 1).....N$ times. The minimum state FA that recognizes the language represented by this regular expression contains

a) n states $b)(n + 1)states$ c) $(n + 2)states$ d) None of the above

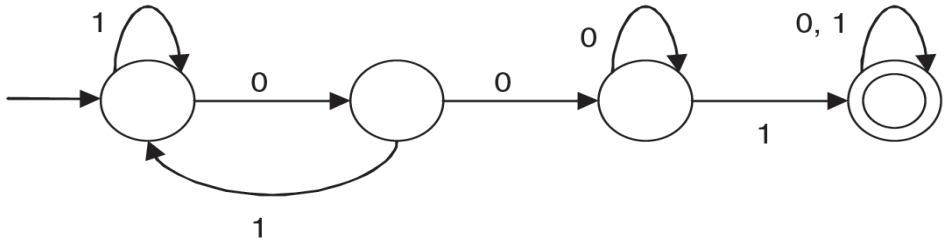
9. What can be said about a regular language L over $\{a\}$ whose minimal finite state automation has two states?

a) L must be $\{an|nisodd\}$ b) L must be $\{an|niseven\}$
c) L must be $\{an|n \geq 0\}$ d) Either L must be $\{an|nisodd\}$ or L must be $\{an|niseven\}$

10. The smallest FA which accepts the language $\{x|lengthofxisdivisibleby3\}$ has

a) 2 states b) 3 states c) 4 states d) 5 states

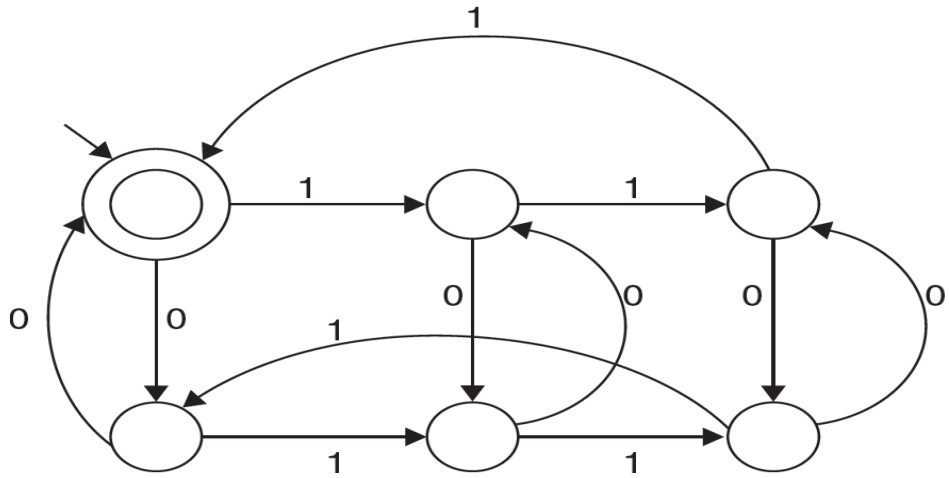
11. Consider the following deterministic fi nite state automaton M.



Let S denote the set of seven-bit binary strings in which the fi rst, fourth, and last bits are 1. The number of strings in S that are accepted by M is

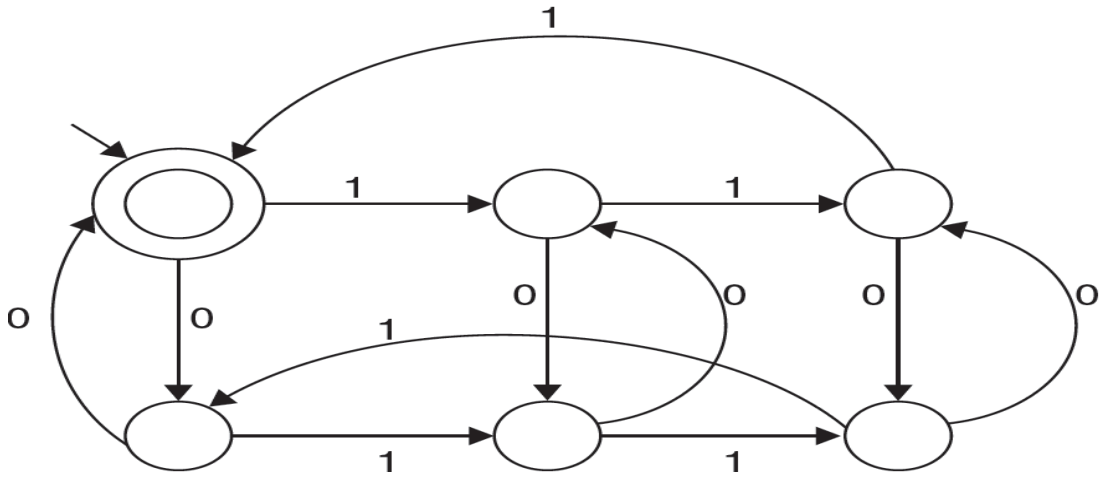
a) 1 b) 5 c) 7 d) 8

12. The following finite state machine accepts all those binary strings in which the number of 1's and 0's are, respectively,



a) divisible by 3 and 2 b) odd and even
c) even and odd d) divisible by 2 and 3

13. Consider the machine M.



The language recognized by M is:

a) $\{w\varepsilon\{a,b\}^*|everyainwisfollowedbyexactlytwob's\}$
b) $\{w\varepsilon\{a,b\}^*|everyainwisfollowedbyatleasttwob's\}$
c) $\{w\varepsilon\{a,b\}^*|wcontainsthesubstring`abb'\}$
d) $\{w\varepsilon\{a,b\}^*|wdoesnotcontain`aa'asasubstring\}$

14. A minimum state deterministic FA accepting the language $L = \{w | w \varepsilon \{0,1\}^*\}$ where number of 0's and 1's in w are divisible by 3 and 5, respectively, has

a) 15 states b) 11 states c) 10 states d) 9 states

Y:

	a	b
$\rightarrow$ 1	1	2
2(F)	2	1

Z:

	a	b
$\rightarrow$ 1	2	2
2(F)	1	1

Which of the following represents the product automaton $Z \times Y$?

a)

	a	b
→ P	S	R
Q	R	S
R(F)	Q	P
S	Q	P

b)

	a	b
→ P	S	Q
Z	R	S
R(F)	Q	P
S	P	Q

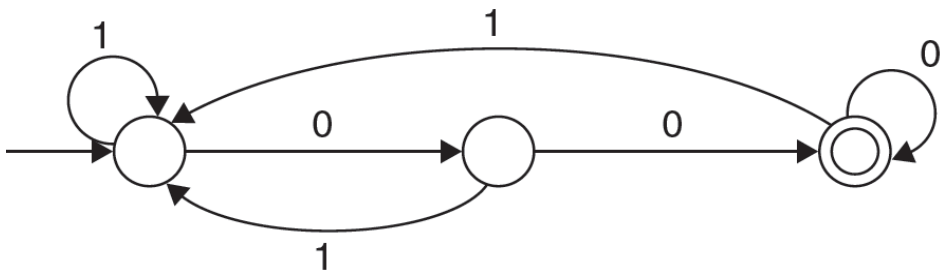
c)

	a	b
→ P	Q	S
Q	R	S
R(F)	Q	P
S	Q	P

d)

	a	b
→ P	S	Q
Q	S	R
R(F)	Q	P
S	Q	P

16.



The given DFA accepts the set of all strings over $\{0, 1\}$ that

a) begin either with 0 or 1. b) end with 0

c) end with 00. d) contain the substring 00.

17. Let w be any string of length n in $\{0, 1\}^*$. Let L be the set of all substrings of w. What is the minimum number of states in a non-deterministic FA that accepts L?

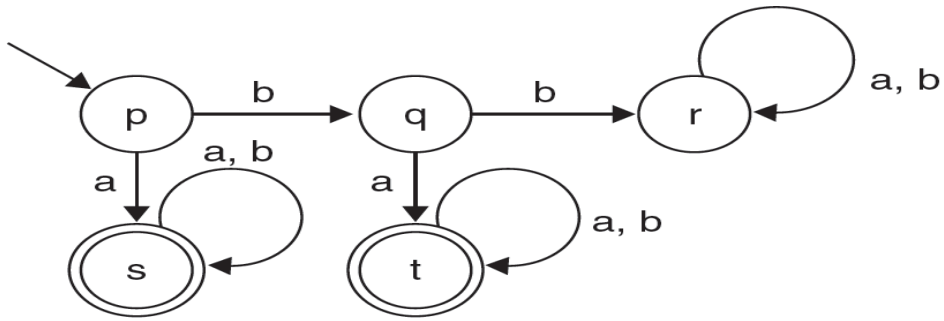
$a) n - 1 \quad b) n \quad c) n + 1 \quad d) 2^{n-1}$

18. Definition of a language L with alphabet $\{a\}$ is given as following $\{a^{nk} | k > 0$ and n is a positive integer constant$\}$

What is the minimum number of states needed in a DFA to recognize L?

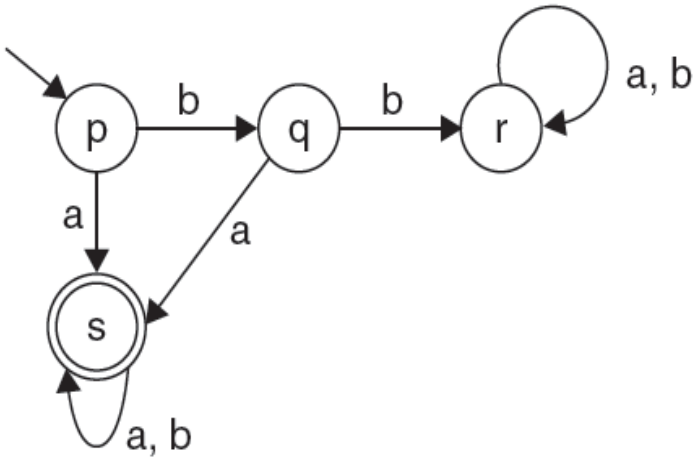
$a) k + 1 \quad b) n + 1 \quad c) 2^{n+1} \quad d) 2^{k+1}$

19. A deterministic finite automation (DFA) D with alphabet $\Sigma = \{a, b\}$ is given as follows:



Which of the following fi nite state machines is a valid minimal DFA which accepts the same language as D?

a)



b)