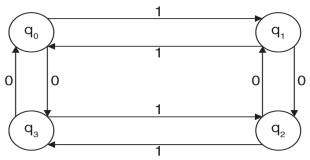
2. Consider the transitional system.

1 picture

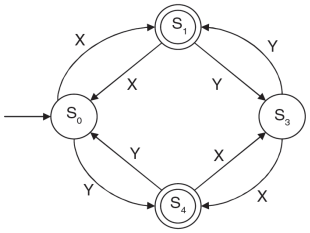


Which of the states are to be marked as starting state and fi nal state, respectively, so as to turn the above system into a DFA that accepts all strings having odd number of zeros and even number of 1's?

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?

2 picture



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

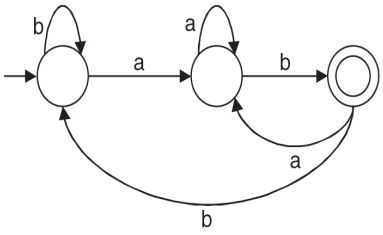
of y or an odd number of x and even number of y.

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?

3 picture



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?

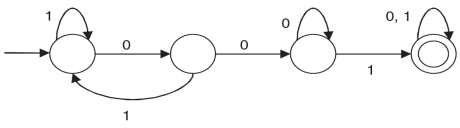
a) L must be $\{an|nisodd\}$ b) L must be $\{an|niseven\}$
c) L must be $\{an|n \geq 0\}$ d) Either L must be $\{an|nisodd\}$ or L must be $\{an|niseven\}$

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.

4 picture

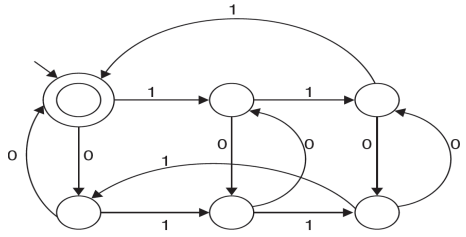


Let S denote the set of seven-bit binary strings in which the fi rst, fourth, and last bits are 1. The number of strings in S that are accepted by M is

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,

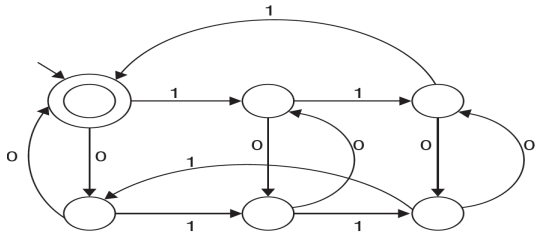
5 picture



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.

6 picture



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)

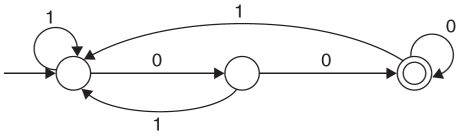
	a	b
→ P	Q	S
Q	R	S
R(F)	Q	P
S	Q	P

d)

	a	b
→ P	S	Q
Q	S	R
R(F)	Q	P
S	Q	P

16.

7 picture



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?

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

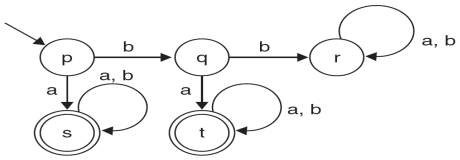
18. Definition of a language L with alphabet $\{a\}$ is given as following $\{a^{nk} | k > 0$ and n is a positive integer constant$\}$

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:

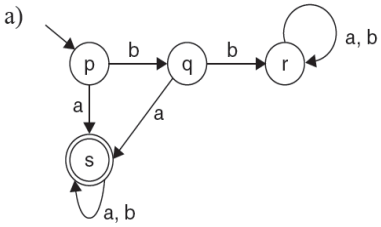
8 picture



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

9 picture

a)



b)