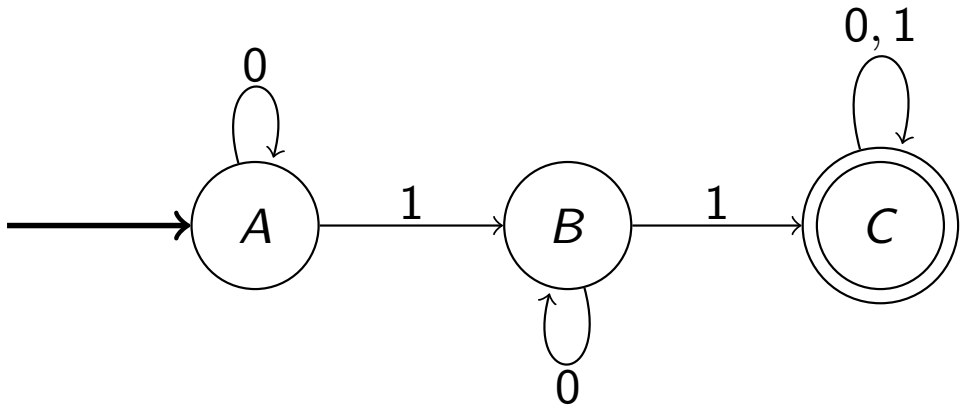
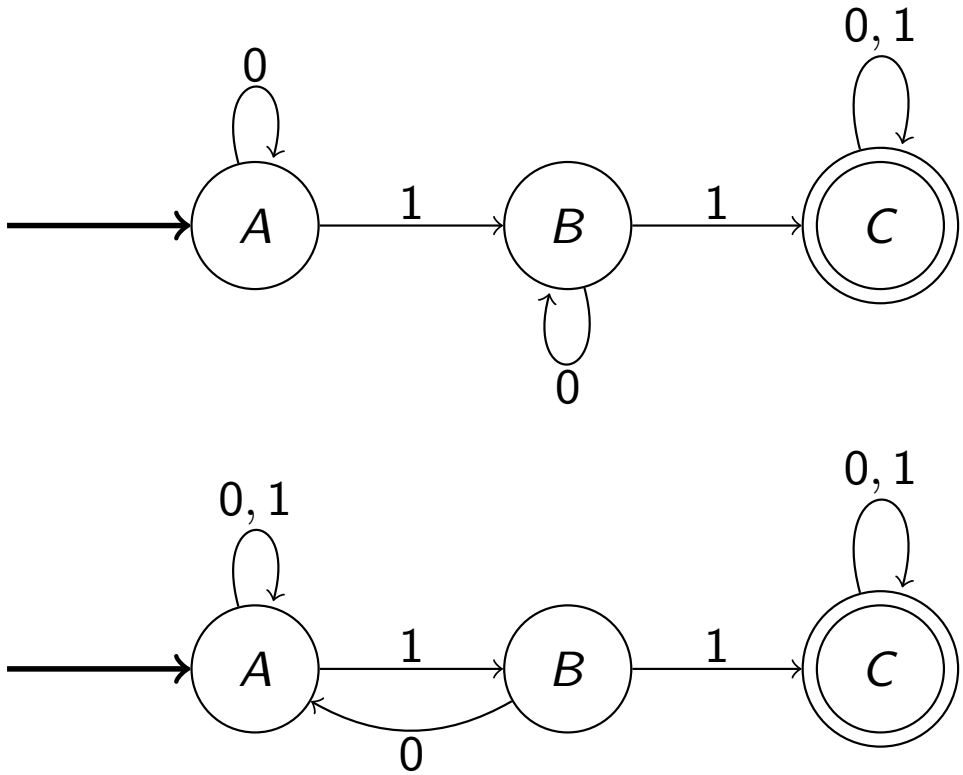
26. Prove that the following two FA are equivalent.



26. Prove that the following two FA are equivalent.



Solution: The second one is an NFA. The tabular representation of the FA is

	NextState	
PresentState	$i = 0$	$i = 1$
A	A	A, B
B	$-$	C
C	C	C

The DFA from the given NFA is

	NextState	
PresentState	$i = 0$	$i = 1$
$[A]$	$[A]$	$[A, B]$
$[A, B]$	$[A]$	$[A, B, C]$
$[A, B, C]$	$[A, C]$	$[B, C]$
$[B, C]$	$[B, C]$	$[B, C]$
$[B, C]$	$[A, C]$	$[C]$
$[C]$	$[C]$	$[C]$

Simplifying this, the DFA becomes

	NextState	
PresentState	$i = 0$	$i = 1$
S_1	S_1	S_2
S_2	S_1	S_3
S_3	S_4	S_5
S_4	S_5	S_5
S_5	S_4	S_6
S_6	S_6	S_6

Simplifying this, the DFA becomes

	NextState	
PresentState	$i = 0$	$i = 1$
S_1	S_1	S_2
S_2	S_1	S_3
S_3	S_4	S_5
S_4	S_5	S_5
S_5	S_4	S_6
S_6	S_6	S_6

Here, S_1 is the initial and S_3, S_4, S_5, and S_6 are the final states.

Now try to minimize the DFA.

$$P_0 = (S_1 S_2 S_3 S_4 S_5 S_6)$$

$$P_1 = (S_1 S_2)(S_3 S_4 S_5 S_6)$$

$$P_2 = (S_1)(S_2)(S_3 S_4 S_5 S_6)$$

Rename (S_1) as A, (S_2) as B, and $(S_3S_4S_5S_6)$ as C. The minimized FA is

	$NextState$	
$PresentState$	$i = 0$	$i = 1$
A	A	B
B	A	C
C	C	C

where A is the initial state and C is the final state.

It is proved that the two DFA are equivalent.

27. Draw the state transition of a deterministic finite state automaton which accepts all strings from the alphabet (a, b), such that no string has three consecutive occurrences of the letter b.

[GATE 1993]

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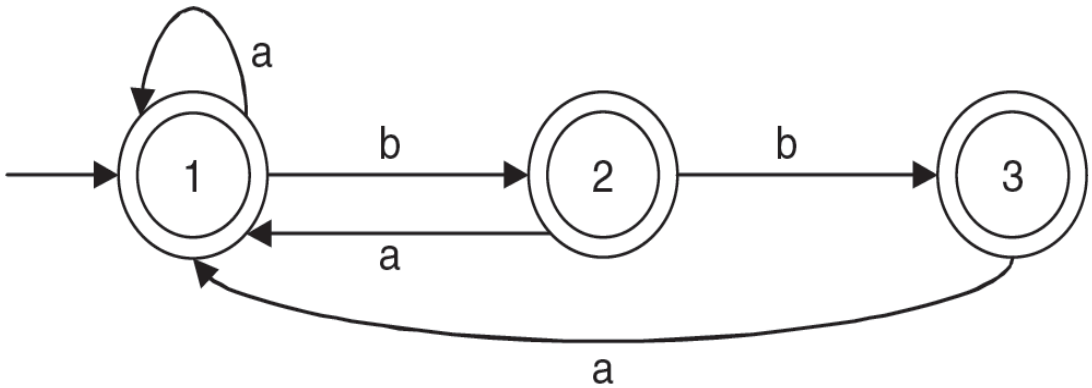
[GATE 1993]

Solution:



28. Construct a finite state machine with minimum number of states, accepting all strings over (a, b) such that the number of a' s is divisible by two and the number of b's is divisible by three.

[GATE 1997]

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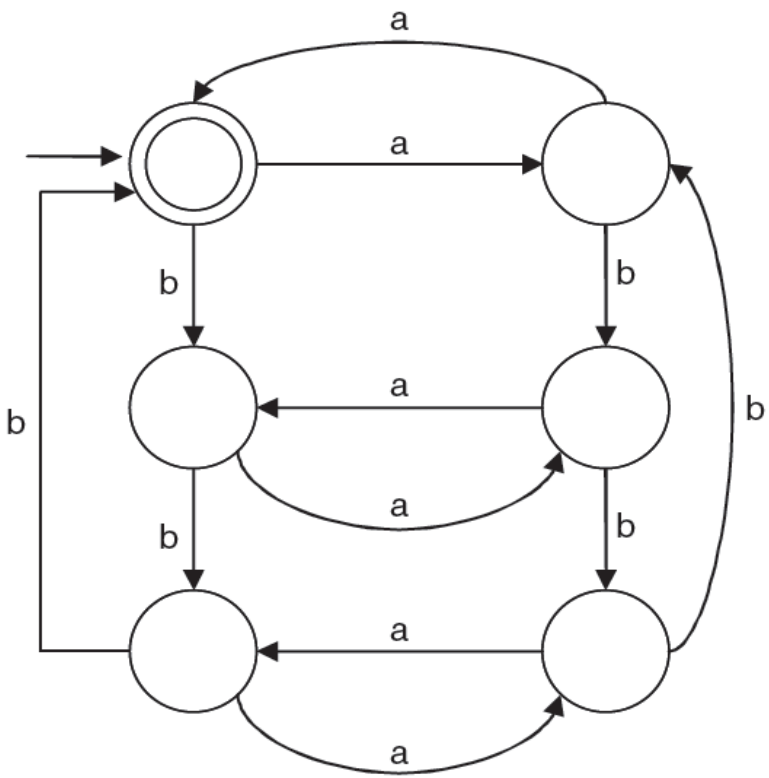
[GATE 1997]

Solution:



Multiple Choice Questions

Multiple Choice Questions

1. A language L from a grammar $G = \{V_N, \Sigma, P, S\}$ is
   a) Set of symbols over V_N
   b) Set of symbols over Σ
   c) Set of symbols over P
   d) Set of symbols over S

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   a) Set of symbols over V_N
   b) Set of symbols over Σ
   c) Set of symbols over P
   d) Set of symbols over S

2. Which is true for $\delta(q, ab)$
   a) $\delta(q, a) \cup \delta(q, b)$
   b) $\delta(\delta(q, a), b)$
   c) $\delta(q, a), b$
   d) $\delta(q, a) \cap \delta(q, b)$

3. The transitional function of a DFA is

   a) $Q \times \Sigma \to Q$ b) $Q \times \Sigma \to 2^Q$

   c) $Q \times \Sigma \to 2^n$ d) $Q \times \Sigma \to Q^n$

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4. The transitional function of an NFA is

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   a) $Q \times \Sigma \to Q$ b) $Q \times \Sigma \to 2^Q$

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5. The maximum number of states of a DFA converted from an NFA with n states is

   a) n b) n^2

   c) 2^n d) None of these

6. A string after full traversal is called not accepted by an NFA if it results in
   a) Some non-final states
   b) All non-final states
   c) A single non-final state
   d) Some final states

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7. An NFA with a set of states Q is converted to an equivalent DFA with a set of states Q'. Find which is true.
   a) $Q' = Q$ b) $Q' \subseteq Q$
   c) $Q \subseteq Q'$ d) None of these

8. The basic limitations of a finite state machine is

   a) It cannot remember arbitrarily large amount of information

   b) It cannot remember state transitions

   c) It cannot remember grammar for a language

   d) It cannot remember language generated from a grammar

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9. The string WW^R is not recognized by any FSM because
   a) An FSM cannot remember arbitrarily large amount of information
   b) An FSM cannot fix the mid-point
   c) An FSM cannot match W with W^R
   d) An FSM cannot remember the first and last inputs.

10. A finite automata recognizes
    a) Any language
    b) Context sensitive language
    c) Context-free language
    d) Regular language

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    a) Any language
    b) Context sensitive language
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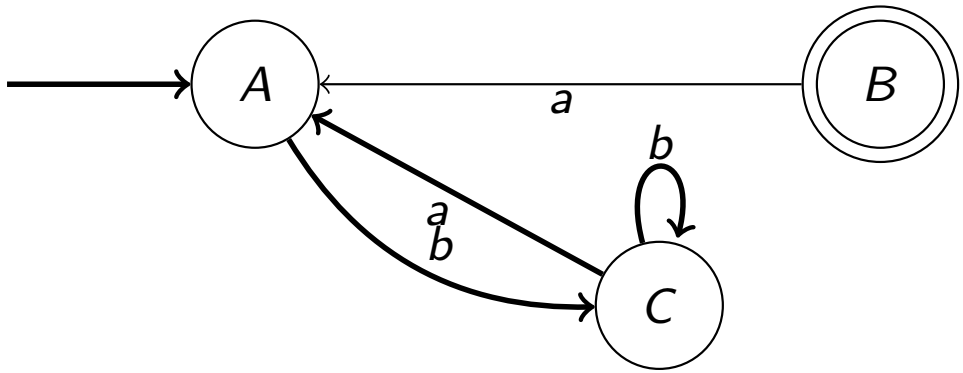
11. Which is true for a dead state?
    a) It cannot be reached anytime
    b) There is no necessity of the state
    c) If control enters, there is no way to come out from the state
    d) If control enters, FA is dead

12. The language accepted by the given FA is



a) $(ab)*$ b) $bb*a$

c) $b(ba)*a$ d) Null

13. In the previous FA, B is called

    a) Dead state

    b) Inaccessible state

    c) Both a and b

    d) None of these

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14. Which is true for a Moore machine?
    a) Output depends on the present state
    b) Output depends on the present input
    c) Output depends on the present state and the present input
    d) Output depends on the present state and the past input

15. Which is true for the Mealy machine?

a) Output depends on the present state

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c) Output depends on the present state and the present input

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15. Which is true for the Mealy machine?
    a) Output depends on the present state
    b) Output depends on the present input
    c) Output depends on the present state and the present input
    d) Output depends on the present state and the past input

16. Which is true for the inaccessible state?
    a) It cannot be reached anytime
    b) There is no necessity of the state
    c) If control enters, there is no way to come out from the state
    d) If control enters, FA is dead

17. In Mealy Machine, O/P is a function of

    a) Present state only

    b) Next state only

    c) Present state and Input

    d) Input only

17. In Mealy Machine, O/P is a function of
    a) Present state only
    b) Next state only
    c) Present state and Input
    d) Input only

18. In Moore Machine, O/P is associated with
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    b) Next state only
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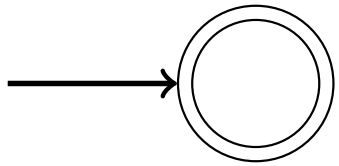
    d) Input only

19. Which type of string is accepted by the following finite automata?



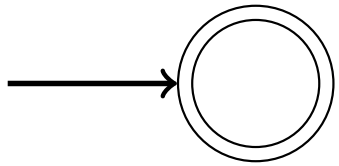
a) All string

b) Null string

c) No string

d) All of the above

19. Which type of string is accepted by the following finite automata?



a) All string

b) Null string

c) No string

d) All of the above

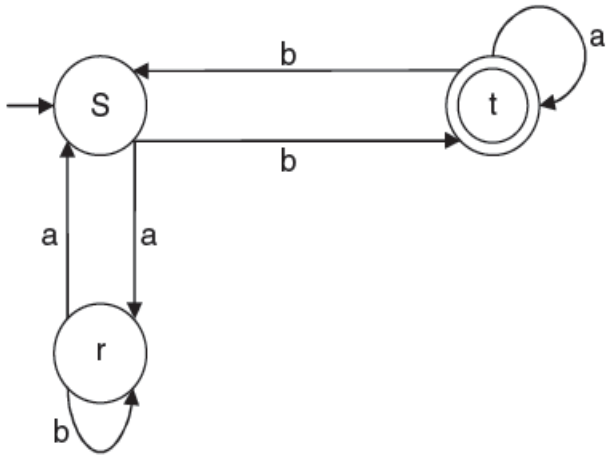
Answers :

1. b 2. b 3. a 4. b 5. c 6. b 7. d 8. a 9. b 10. d

11. c 12. d 13. b 14. a 15. c 16. a 17. b 18. a 19. b

GATE Questions

1. Consider the strings $u = abbaba$, $v = bab$, and $w = aabb$. Which of the following statement is true for the given transitional system?



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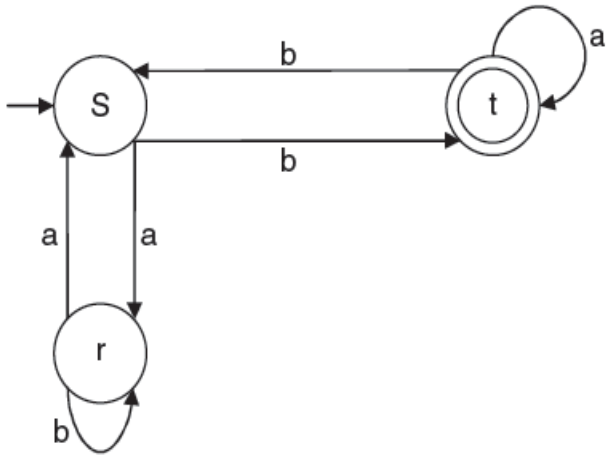

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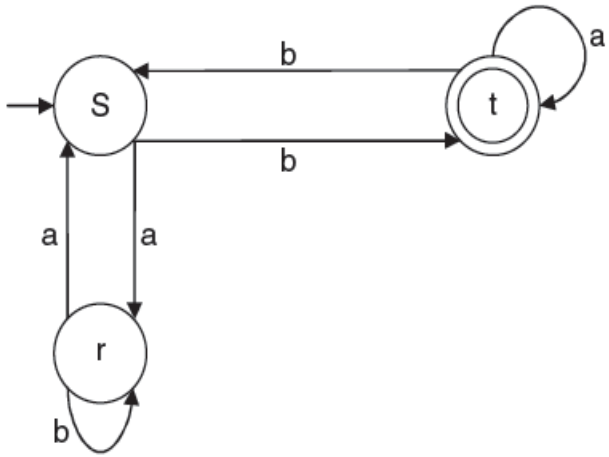

a) The automaton accepts u and v but not w.

b) The automaton accepts each of u, v, and w.

c) The automaton rejects each of u, v, and w.

d) The automaton accepts u but rejects v and w.