

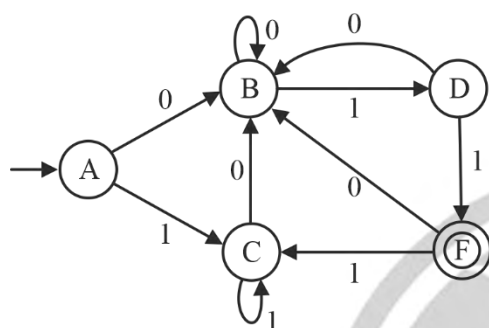
Theory of Computation

Finite Automata

DPP-08

[MCQ]

1. Consider the following DFA over $\Sigma = \{0, 1\}$

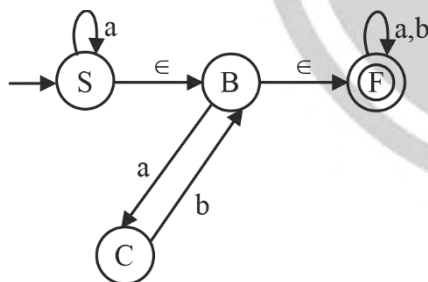


How many states are required in minimal DFA?

- (a) 3 (b) 2
(c) 4 (d) 5

[MCQ]

2. Consider the following epsilon NFA:



What is the set of reachable states for the input string ba?

- (a) {B, F}
(b) {F}
(c) {C, B, F}
(d) {S, B, F}

[MCQ]

3. For language $(L) = \{Xw \mid X = \{ab\}, w = \{a, b\}^*\}$

How many states are required in NFA for above language (L)?

- (a) 4
(b) 3
(c) 6
(d) None

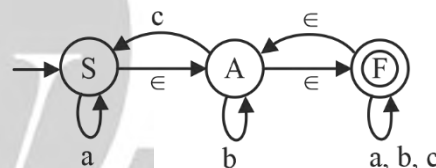
[MSQ]

4. Which of the following statement is/are correct?

- (a) Every DFA can be converted into equivalent NFA.
(b) Every DFA can be convert into equivalent ϵ -NFA.
(c) Every NFA can be converted into equivalent minimal DFA.
(d) NFA with ϵ -moves is not equivalent to NFA without epsilon move.

[MSQ]

5. Consider the following ϵ -NFA:

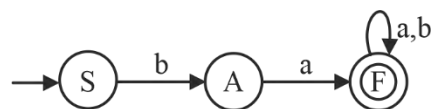


Which of the following is/are correct regular expression for above ϵ -NFA?

- (a) $a^*b^*(a+b)^*$
(b) $(a+b+c)^*$
(c) $a^*b^+c^+(a+b+c)^*$
(d) $a^*b^*c^*(c+a+b)^*$

[MCQ]

6. Consider the following finite state automaton (M)
M:



Let \bar{M} be the modified automaton obtained from M by interchanging finals and non-finals. If language accepted by above automaton is $L(M)$, then the language accepted by $L(\bar{M})$ will be:

- (a) $L(\bar{M}) = \{a(a+b)^*, (bb)(a+b)^*, \epsilon\}$
(b) $L(\bar{M}) = \{\epsilon, b\}$
(c) $L(\bar{M}) = \{\text{not starting with 'ba'}\}$
(d) $L(\bar{M}) = \text{none of these}$

[NAT]

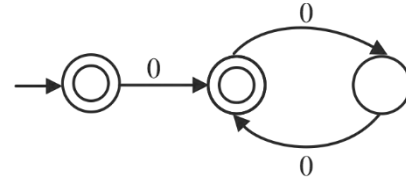
7. Given a language L , define L' as follows:

$$L^0 = \{\epsilon\}$$

$$L^i = L^{i-1}, \forall i > 0$$

The order of a language L is defined as the smallest k such that $L^k = L^{k+1}$.

Consider the language L_1 (over alphabet 0) accepted by the following automaton.



The order of L_1 is _____.



Answer Key

- | | |
|--------------|-----------|
| 1. (c) | 5. (b, d) |
| 2. (b) | 6. (b) |
| 3. (b) | 7. (2) |
| 4. (a, b, c) | |



Hints and Solutions

1. (c)

0 equivalent:

{A, B, C, D} {F}

Non-final states Final state

1 equivalent:

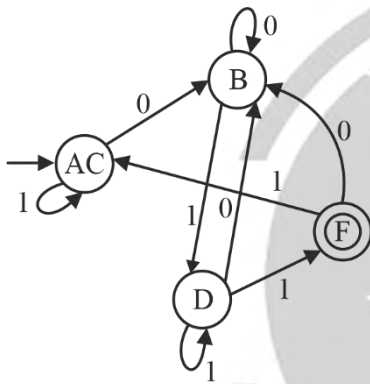
{A, C} {B} {D} {F}

2 equivalent:

{A, C} {B} {D} {F}

Number of states = 4

Minimized DFA



2. (b)

$\delta^*(S, ba) = \{F\}$

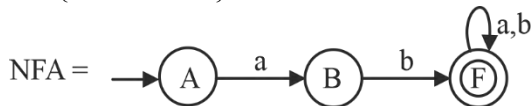
Hence, option (b) is correct.

3. (b)

$L = \{Xw \mid X = \{ab\}, w = \{a, b\}^*\}$

$L = ab(a + b)^*$

= {start with ab}



Number of states = 3

4. (a, b, c)

$DFA \cong NFA \in \cong\text{-NFA}$

Hence, option (a, b, c) are correct.

5. (b,d)

$L = \{\epsilon, a^*, b^*c^*, (a + b + c)^* \dots\}$

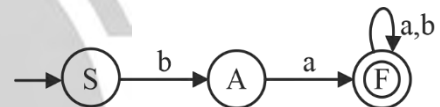
$= (a + b + c)^*$

$a^*b^*(a + b + c) = \epsilon \cdot \epsilon \cdot (a + b + c)^*$

$= (a + b + c)^*$ Hence, option (b, d) are correct.

6. (b)

M:



$L(M) = ba(a + b)^*$

M̄:



$L(\bar{M}) = \{b, \epsilon\}$

Hence, option (b) is correct.

7. (2)

Smallest value of $k = 2$



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