CS & IT ENGINEERING

Theory of Computation

Finite Automata – Epsilon NFA

DPP 08 Discussion Notes

Mallesham Devasane Sir

01 Question

02 Discussion

Q.1

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

How many states are required in minimal DFA?

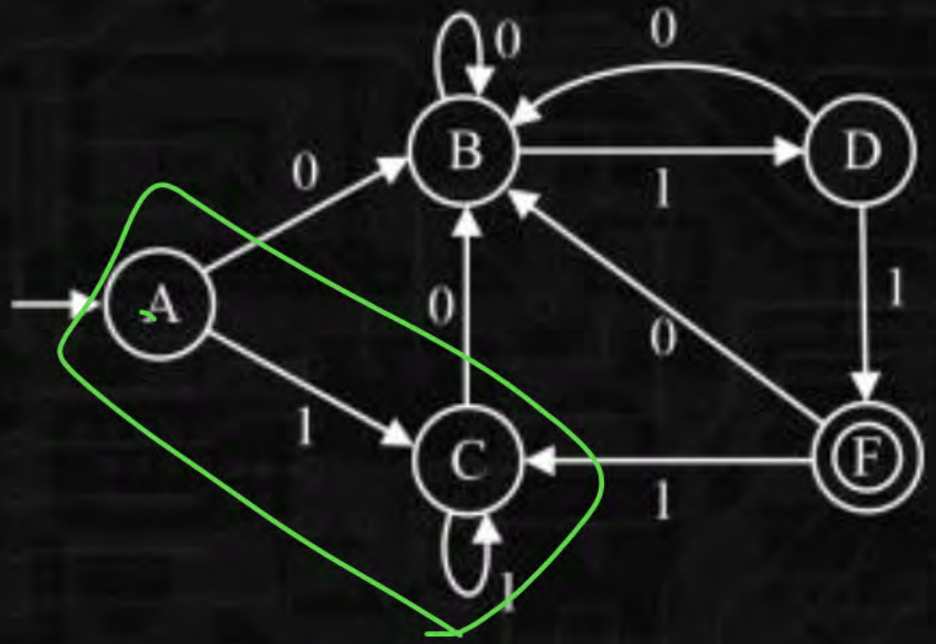
[MCQ]

A. 3

B. 2

C. 4

D. 5



$A \cong C$

ABCD | F

ABC | D | F

AC | B | D | F

AC | B | D | F

Q.2

Consider the following epsilon NFA:

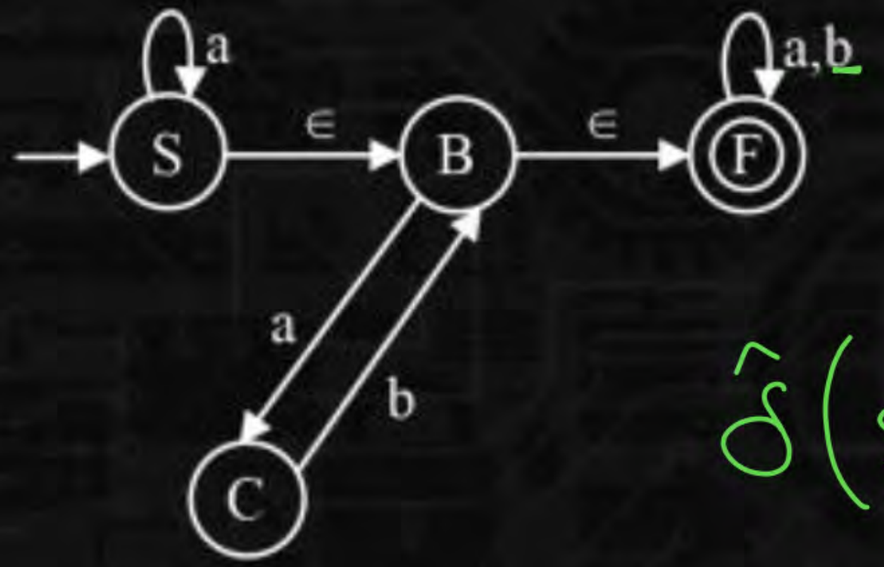
What is the set of reachable states for the input string ba? [MCQ]

A. {B, F}

B. {F}

C. {C, B, F}

D. {S, B, F}



$\hat{\delta}(S, ba) = ?$

{F}

$S \xrightarrow{\varepsilon} B \xrightarrow{\varepsilon} F \xrightarrow{b} F \xrightarrow{a} F$ (Hall)

$\varepsilon\varepsilon ba = ba$

Q.3

For language (L) = {Xw |X = {ab}, w = {a, b}*}

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

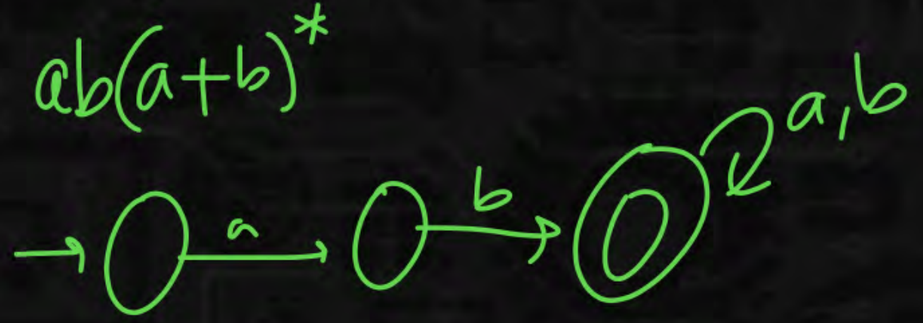
[MCQ]

A. 4

B. 3

C. 6

D. None



Q.4 Which of the following statement is/are correct? **[MSQ]**

A. Every DFA can be converted into equivalent NFA. ✓

B. Every DFA can be convert into equivalent $\in$-NFA. ✓

C. Every NFA can be converted into equivalent minimal DFA. ✓

NFA ⇒ DFA ⇒ min DFA

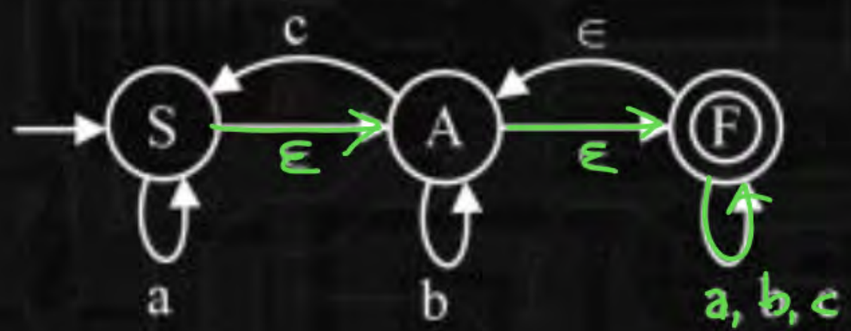
D. NFA with $\in$-moves is not equivalent to NFA without epsilon move. ✗

DFA ≅ NFA

DFA ≅ NFA with ε-moves ≅ NFA without ε-moves

Q.5

Consider the following $\in$-NFA:



Which of the following is/are correct regular expression for above $\in$-NFA?

[MSQ]

A. $a^*b^*(a+b)^*$ ✗ $(a+b+c)^*$

B. $(a+b+c)^*$ ✓

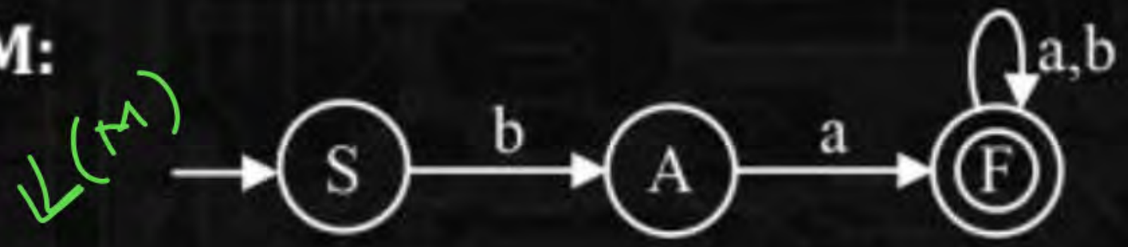
C. $a^*b^*c^*(a+b+c)^*$ ✗

D. $a^*b^*c^*(c+a+b)^*$ ✓

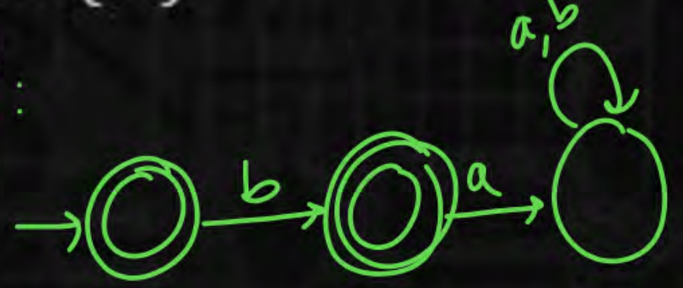
Q.6

Consider the following finite state automaton (M)

M:



$\bar{M}$:



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:

[MCQ]

A. $L(\bar{M}) = \{a(a+b)^*, (bb)(a+b)^*, \in\}$

B. $L(\bar{M}) = \{\in, b\}$

C. $L(\bar{M}) = \{\text{not starting with 'ba'}\}$

D. $L(\bar{M}) = \text{none of these}$

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

Note: Complement of $L(M) = ?$

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

$\overline{L(M)} = \varepsilon + a\cancel{X} + bb\cancel{X} + b$

Q.7

Given a language L, define L′ as follows:

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

$L^i = L^{i-1} \cdot L \quad \forall_{i>0}$

$L^0 = \epsilon$

$L^1 = \epsilon + 0(00)^* = L^0 \cdot L = L$

$L^2 = L^1 \cdot L = (\epsilon + 0(00)^*)\cdot(\epsilon + 0(00)^*) = 0^*$

$L^3 = L^2 \cdot L = 0^* \cdot L = 0^*$

$L^2 = L^3$ for $k = 2$ smallest

The order of a language L is defined as the smallest k such that

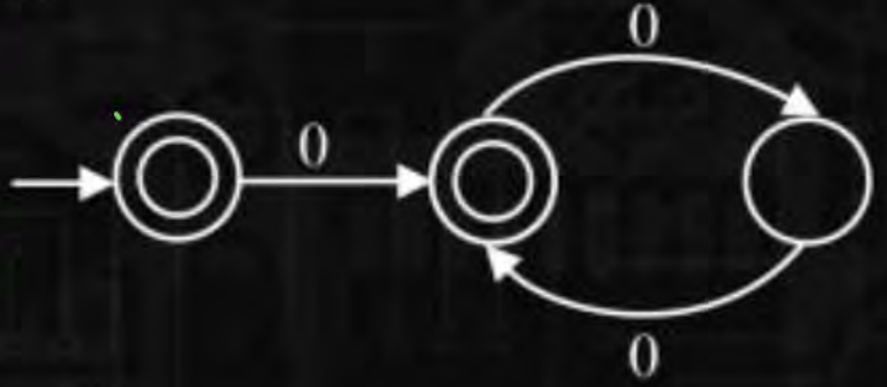
$L^k = L^{k+1}$

$O(L) = k$ if $L^k = L^{k+1}$ for smallest k

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

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

$L = \epsilon + 0(00)^*$



$O(L_1) = 2$

The order of L_1 is _____.

[NAT]


THANK YOU GW
SOLDIERS !