Student Information

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Answer 1

a)

(a\*b\*)\* aa (a\*b\*)\* bb (a\*b\*)\* (a\*b\*)\* bb (a\*b\*)\* aa (a\*b\*)\*

b)

a,b

q1

q2

q3

b

a

b

a,b

a

a,b

q4

q0

q7

q6

q5

b

a

b

a

a,b

c)

|  |  |  |
| --- | --- | --- |
| State / Alphabet | a | b |
| -> q0 | q0, q1 | q0 , q5 |
| q1 | q2 | - |
| q2 | q2 | q2 , q3 |
| q3 | - | q4 |
| \*q4 | q4 | q4 |
| q5 | - | q6 |
| q6 | q6 , q7 | q6 |
| q7 | q8 | - |

|  |  |  |
| --- | --- | --- |
| State / Alphabet | a | b |
| -> q0 | { q0 , q1 } | { q0 , q5 } |
| { q0, q1 } | { q0 , q1 , q2 } | { q0 , q5 } |
| { q0 , q5 } | { q0, q1 } | { q0 , q5 , q6 } |
| { q0 , q1 , q2 } | { q0 , q1 , q2 } | { q0 , q2 , q3 , q5 } |
| { q0 , q5 , q6 } | { q0 , q1 , q6 , q7 } | { q0 , q5 , q6 } |
| { q0 , q2 , q3 , q5 } | { q0 , q1 , q2 } | { q0 , q2 , q3 , q4, q5 , q6 } |
| { q0 , q1 , q6 , q7 } | { q0 , q1 , q2 , q4, q6 , q7 } | { q0 , q5 , q6 } |
| { q0 , q2 , q3 , q4, q5 , q6 } | { q0 , q1 , q2 , q4, q6 , q7 } | { q0 , q2 , q3 , q4, q5 , q6 } |
| { q0 , q1 , q2 , q4, q6 , q7 } | { q0 , q1 , q2 , q4, q6 , q7 } | { q0 , q2 , q3 , q4, q5 , q6 } |

Equivalent DFA

a

b

a

{ q0 , q2 , q3 , q5 }

{ q0 , q1 , q2 }

b

b

a

a

{ q0, q1 }

{ q0 , q2 , q3 , q4, q5 , q6 }

b

a

b

a

q0

{ q0 , q1 , q2 , q4, q6 , q7 }

b

a

a

b

{ q0 , q1 , q6 , q7 }

{ q0 , q5 }

b

a

{ q0 , q5 , q6 }

b

d)

For Deterministic Finite Automata

( q0 , bbabb ) M ( { q0 , q5 }, babb )

M ( { q0 , q5 , q6 }, abb )

M ( { q0 , q1 , q6 , q7 }, bb )

M ( { q0 , q5 , q6 }, b )

M ( { q0 , q5 , q6 }, )

Since ( q0 , bbabb ) M\* ( { q0 , q5 , q6 }, ) , and so there is no acceptance state in last step “bbabb” is not accepted by DFA.

For Non-Deterministic Finite Automata

( q0 , bbabb ) M ( q0 , babb )

M ( q0 , abb )

M ( q0 , bb )

M ( q0 , b )

M ( q0 , )

( q0 , bbabb ) M ( q5 , babb )

M ( q6 , abb )

M ( q6 , bb )

M ( q6 , b )

M ( q6 , )

( q0 , bbabb ) M ( q0 , babb )

M ( q0 , abb )

M ( q0 , bb )

M ( q5 , b )

M ( q6 , )

( q0 , bbabb ) M ( q0 , babb )

M ( q0 , abb )

M ( q0 , bb )

M ( q0 , b )

M ( q5 , )

( q0 , bbabb ) M ( q0 , babb )

M ( q0 , abb )

M ( q1 , bb )

( q0 , bbabb ) M ( q5 , babb )

M ( q6 , abb )

M ( q7 , bb )

Since a string is not accepted by a nondeterministic finite automaton, there is no one sequence of moves leading to a final state, it follows that “ bbabb” L( M ).

Answer 2

1. Assume that L1 is regular and let ‘p’ be the pumping length such that any string w L where w = am bn when m > n and |w| p should satisfy these conditions :
   * 1. w = L for every 0
     2. |y| > 0
     3. |xy| p

aa........aaab.........bb where x = ai, y = aj , z = ak bp

xy

such that i +j + k = p+1, and j > 0. We pump with = 0 and get the word xz = aiz = aiakbp. Since i + j + k = p+1 and j > 0, then i + k ≤ p.

So there is a contradiction. xy0z L1

aa........ab.........bb where x = ai , y = am-i bj , z = bn-j

x y z

xy2z = a… am-i bj am-i bj bn-j L1

Therefore, L1 is not a regular language.

Assume L2 is A regular language, if , then should be a regular language.

By Complementation Theorem, complement of regular language must be regular.

So, should be regular. Since = , cannot be regular.

As a result, there is a contradiction. is not a regular language.

b)

L4 = { an bn | n } L5 = { am bn | m, n } L6 = b\* a (ab\*a)\*

When we look at the L5 m and n valus can take all the natural number values, but for the L4 n can take only the positive natural numbers. When we set the both m and n values to n in L5, we can observe L4 is a subset of L5.

Since L4  is the subset of L5 , let L = L4  L5 = L5. Then, we can say that L should be regular because L5 is regular.

As we already know, if we can write language in the form of a regular expression, this language is a regular language. So, L6 is a regular language.

According to the theorem , for any regular languages A and B, then A ∪ B should be regular.

As a result L L6 = L4  L5 L6 should be regular.