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FORMAL LANGUAGES & AUTOMATA

Page 60 and 63 ;

2.1.2. Describe informally the languages accepted by the deterministic finite automata shown in the next page.

ANSWER:

(a) a(ba)*. Strings with the prefix “a” followed by “ba” or “empty”.

(b) a*b. Strings that can be with prefix “a” or “empty” and contain “b” as “a” substring.

(c) (a(ab)*b)*. Empty or strings that can contain sequentially infinite “ab”.

(d) (ab U ba)* . Strings containing ab or ba but not more than 1 consecutive same expression.

(e) (aUb)*(aabUbba)(aUb)* All strings containing aab and bba as substrings.

2.1.3. Construct deterministic finite automata accepting each of the following languages.

(a) $\{w \in \{a,b\}^* : \text{each } a \text{ in } w \text{ is immediately preceded by a } b\}$.
(b) $\{w \in \{a,b\}^* : w \text{ has } abab \text{ as a substring}\}$.
(c) $\{w \in \{a,b\}^* : w \text{ has neither } aa \text{ nor } bb \text{ as a substring}\}$.
(d) $\{w \in \{a,b\}^* : w \text{ has an odd number of } a\text{'s and an even number of } b\text{'s}\}$.
(e) $\{w \in \{a,b\}^* : w \text{ has both } ab \text{ and } ba \text{ as substrings}\}$.

ANSWER:

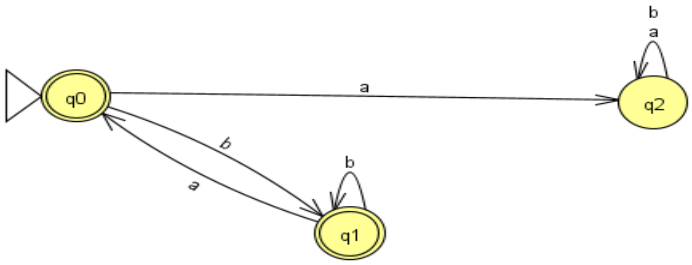
(a)

$K = \{q_0, q_1, q_2\}$

$\Sigma = \{a, b\}$

$s = q_0$

q	a	δ(q,a)
q_0	a	q_2
q_0	b	q_1
q_1	a	q_0
q_1	b	q_1
q_2	a	q_2
q_2	b	q_2

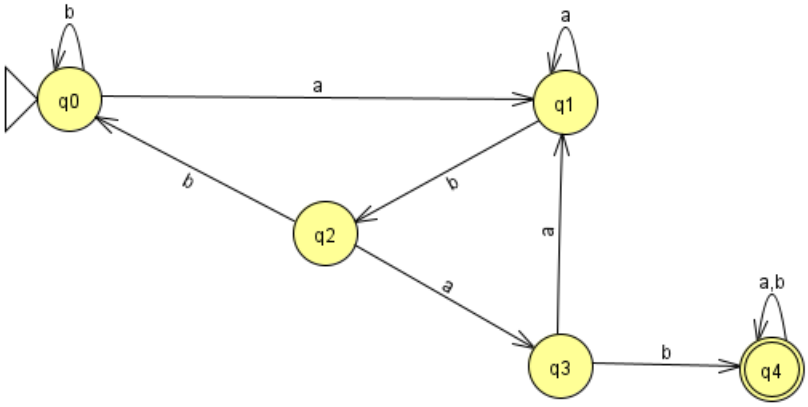


F = {q_0, q_1}

(b)

K = {q_0, q_1, q_2, q_3, q_4}

Σ = {a, b} s = q_0 F = q_4



q	a	δ(q,a)
q_0	a	q_1
q_0	b	q_0
q_1	a	q_1
q_1	b	q_2
q_2	a	q_3
q_2	b	q_0
q_3	a	q_1
q_3	b	q_4
q_4	a	q_4
q_4	b	q_4

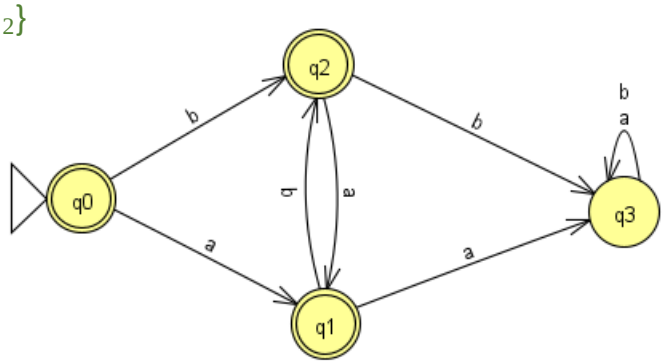
(c)

K = {q_0, q_1, q_2, q_3}

Σ = {a, b}

s = q_0

F = {q_0, q_1, q_2}



q	a	δ(q,a)
q_0	a	q_1
q_0	b	q_2
q_1	a	q_3
q_1	b	q_2
q_2	a	q_1
q_2	b	q_3
q_3	a	q_3
q_3	b	q_3

q	a	δ(q,a)
q_0	a	q_1
q_0	b	q_2

(d)

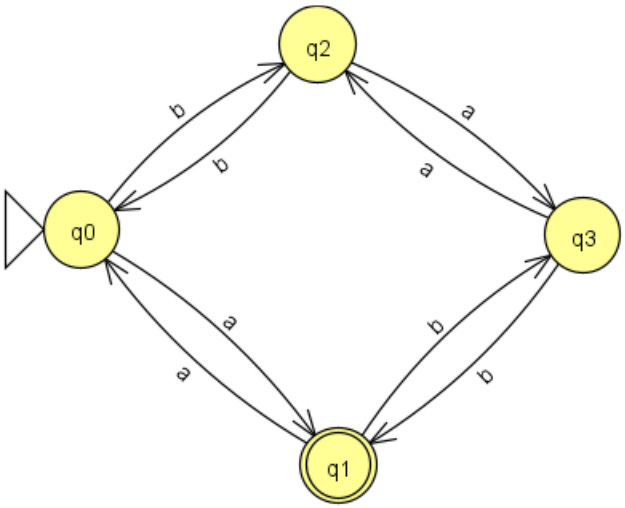
K = {q_0, q_1, q_2, q_3}

Σ = {a, b}

s = q_0

F = q_1

q_1	a	q_0
q_1	b	q_3
q_2	a	q_3
q_2	b	q_0
q_3	a	q_2
q_3	b	q_1



(e)

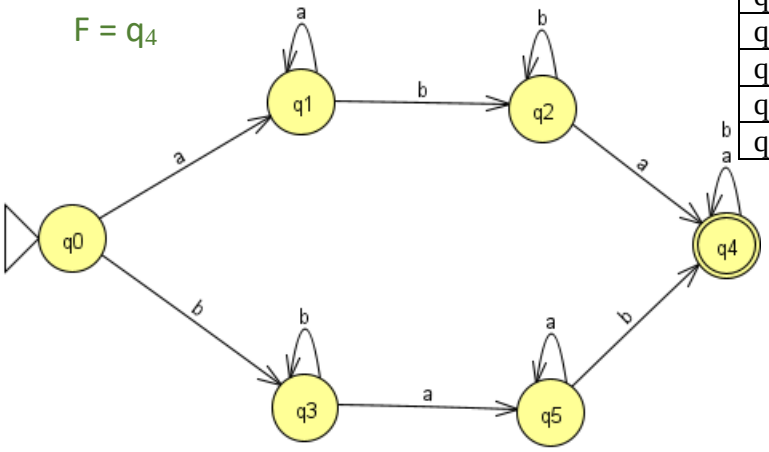
K = {q_0, q_1, q_2, q_3, q_4, q_5}

Σ = {a, b}

s = q_0

F = q_4

q	a	δ(q,a)
q_0	a	q_1
q_0	b	q_2
q_1	a	q_1
q_1	b	q_3
q_2	a	q_4
q_2	b	q_2
q_3	a	q_5
q_3	b	q_3
q_4	a	q_4
q_4	b	q_5
q_5	a	q_5
q_5	b	q_5

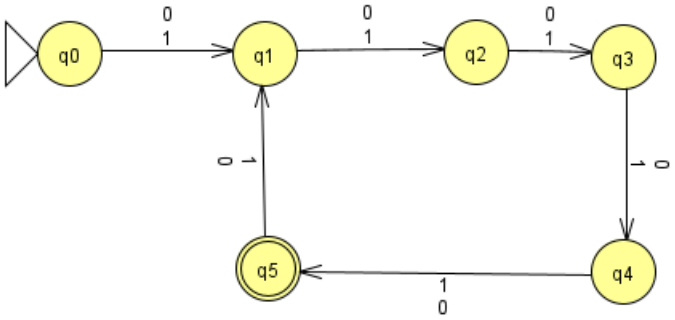


EXTRA:

Create a DFA that meets the rule “in {0,1} alphabet, for L(M) w | is 5 multiple of |w|.” by using JFLAP.

Add a short description that explains why each condition is included and why you accept each determining whether not. (in Turkish)

ANSWER:



Regular expression : [(0∪1)(0∪1)(0∪1)(0∪1)(0∪1)[(0∪1)(0∪1)(0∪1)(0∪1)(0∪1)]*]

İstenilen katara eklenen elemanın ne olduğu önemli olmadığı için elimizdeki alfabeden herhangi bir eleman eklenmesi gerekmektedir. 5’e kadar olan sayıları (0 da dahil) ayrı bir durumda tutmalıyız, 5 durumda yapmaya çalışırsak boş katar inputu alındığında veya 4 elemanlı bir katarda true output verir. Bu yüzden katarımızda 5’in katı kadar elemanımızın olduğunu temsil eden q_5 durumu final state olur.