11.04.2013

BLG311E – FORMAL LANGUAGES AND AUTOMATA

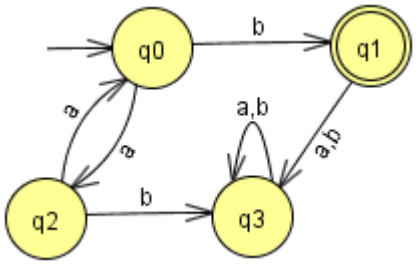
2013 SPRING

RECITEMENT 5

1) Design a DFA that recognizes words in the form {$a^{2m}b$}, m≥0 and defined over alphabet {a,b}.

Solution:

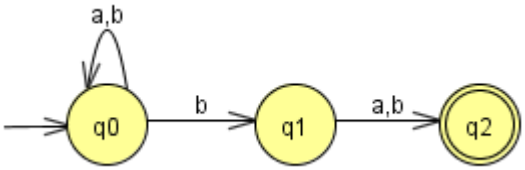
m=0 → b
m=1→a^2b
m=2→a^4b
…
Even number of 'a' followed by a single 'b'



2) Design a NFA that recognizes words defined over alphabet {a, b} where the second-to-last letter is 'b'.

Solution:

$$L(M) = (a \vee b)^* b(a \vee b)$$



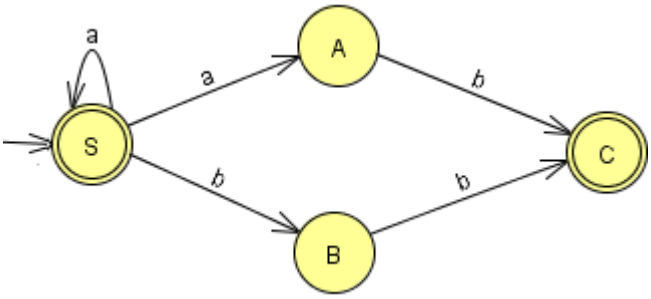
3) <S> ::= Λ|a|a<S>|a<A>|b<B>
<A> ::= b
<B> ::= b

Consider the grammar rules in BNF notation given on the left.

a) Heuristically, draw the NFA diagram of the automata with this grammar.
b) Heuristically, find its regular expression.
c) Construct the DFA for this NFA.

Solution:

a)



b) L(G) = a* v a*ab v a*bb

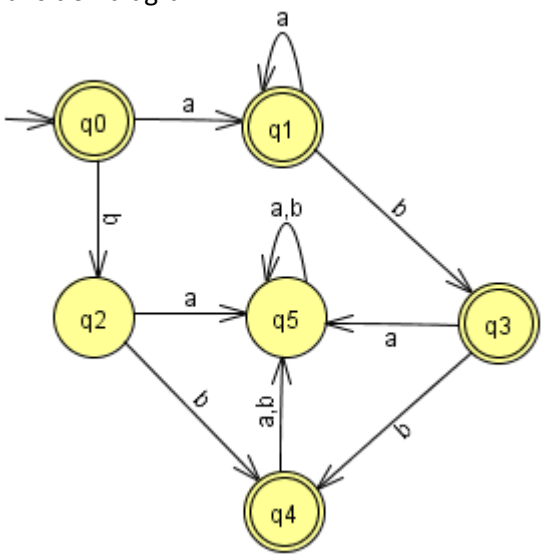
c) $S = q_0$

$\delta(q_0,a) = \delta(S,a) = \{S,A\} = q_1$
$\delta(q_0,b) = \delta(S,b) = \{B\} = q_2$
$\delta(q_1,a) = \delta(\{S,A\},a) = \{S,A\} = q_1$
$\delta(q_1,b) = \delta(\{S,A\},b) = \{B,C\} = q_3$
$\delta(q_2,a) = \delta(\{B\},a) = \emptyset$
$\delta(q_2,b) = \delta(\{B\},b) = \{C\} = q_4$
$\delta(q_3,a) = \delta(\{B,C\},a) = \emptyset$
$\delta(q_3,b) = \delta(\{B,C\},b) = \{C\} = q_4$
$\delta(q_4,a) = \delta(\{C\},a) = \emptyset$
$\delta(q_4,b) = \delta(\{C\},b) = \emptyset$
$\delta(\emptyset,a) = \delta(\emptyset,b) = \emptyset = q_5$

State transition table:

	a	**b**
q_0	q_1	q_2
q_1	q_1	q_3
q_2	q_5	q_4
q_3	q_5	q_4
q_4	q_5	q_5
q_5	q_5	q_5

State transition diagram:



$s_0 = q_0$ and $F = \{ q_0, q_1, q_3, q_4\}$