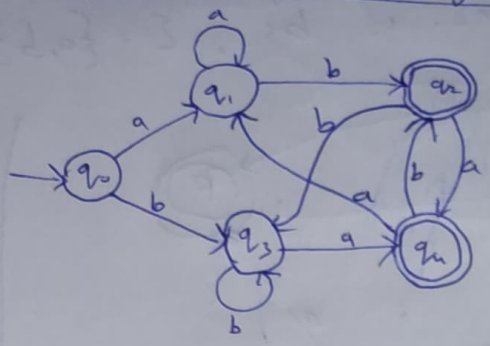
Tutorial - 1

1. Recognize the languages in the DFAs

a)



Final states

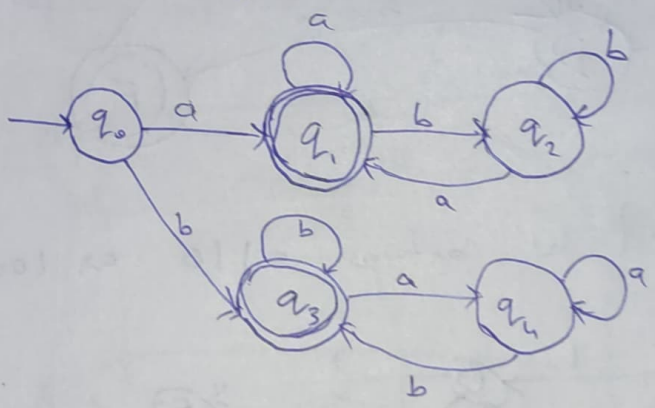
q_2 - ends in 'ab'

q_4 - ends in 'ba'

L = Set of all strings that ends with either 'ab' or 'ba'.

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

b)



Final states

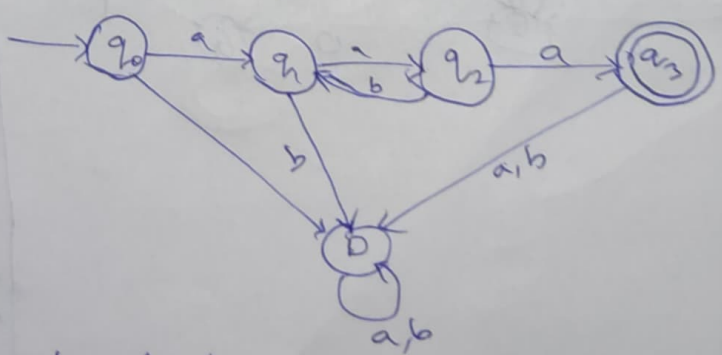
q_1 - Starts & ends with 'a'

q_3 - starts & ends with 'b'

L = Set of all strings that starts & ends with the same character

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

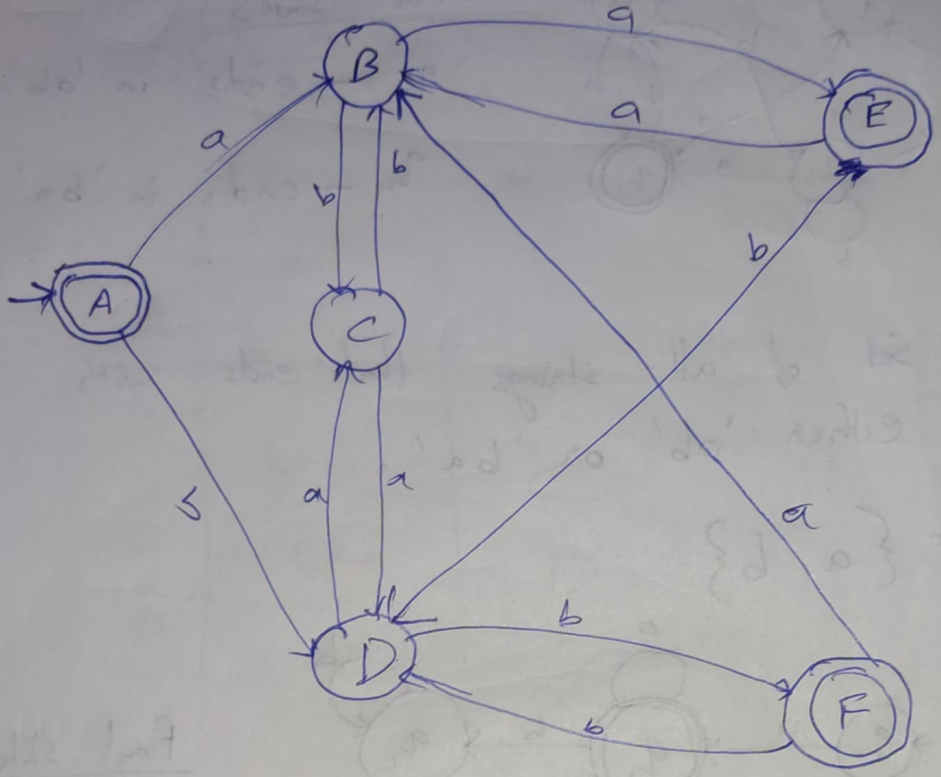
c)



L = Set of all strings that starts & ends with 'aa' and no consecutive 'b's.

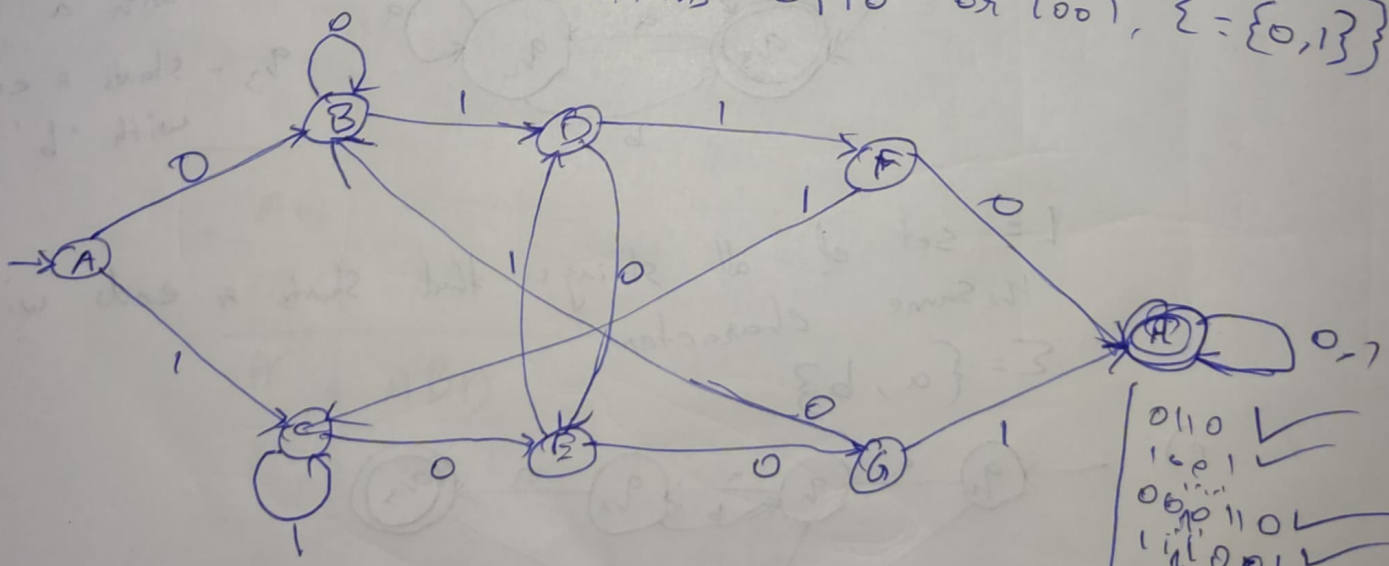
$\Sigma = \{a, b\}$

a) $L_1 = \{w \mid w$ contains even no of a's and even no. of b's, $\Sigma = \{a,b\}\}$



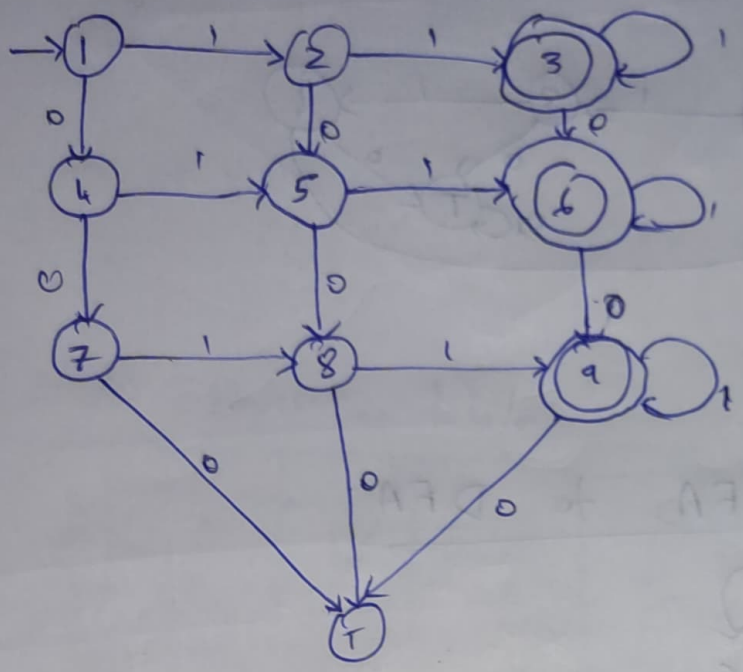
ε ✓
aa ✓
bb ✓
abab ✓
aabb ✓
bbaa ✓
abba ✓
baab ✓
bbababab ✓
aaabab ✓
ab ✗
aab ✗
aaaba ✗

b) $L_2 = \{w \mid w$ contains 010 or 1001, $\Sigma = \{0,1\}\}$

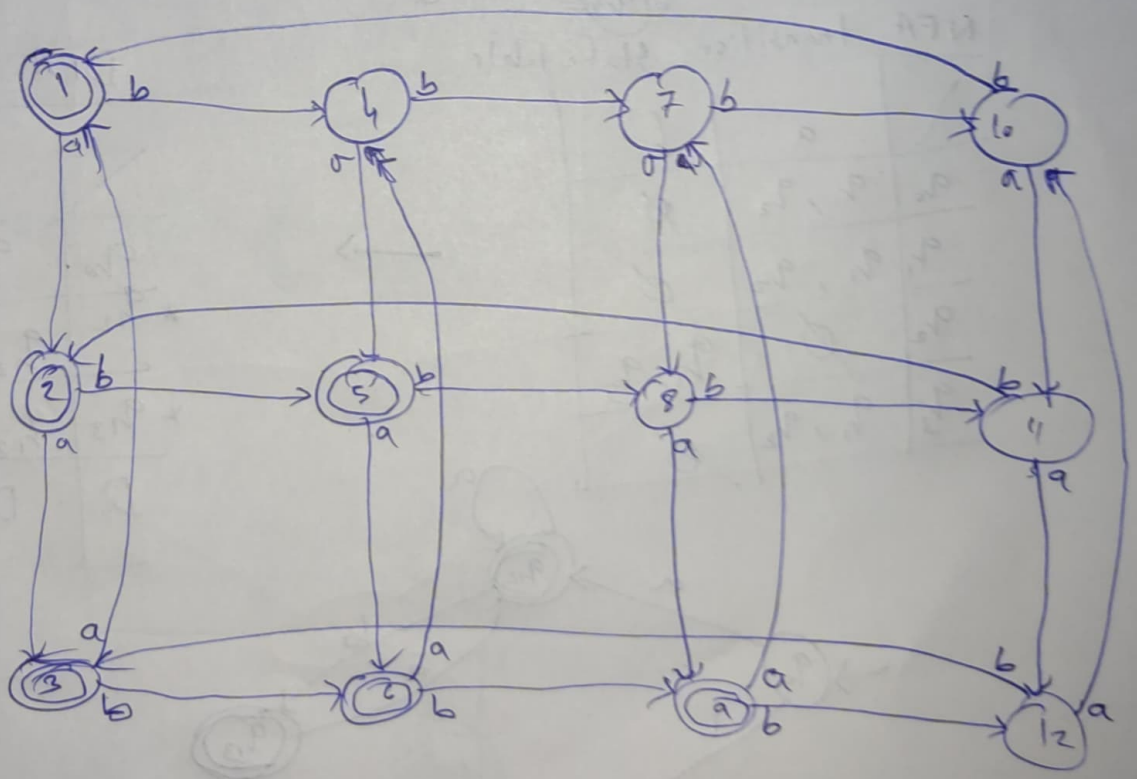


0110 ✓
1001 ✓
00110 ✓
11001 ✓
0110% ✓
1001% ✓
%0110 ✓
%1001 ✓
1100 ✗
10001 ✗

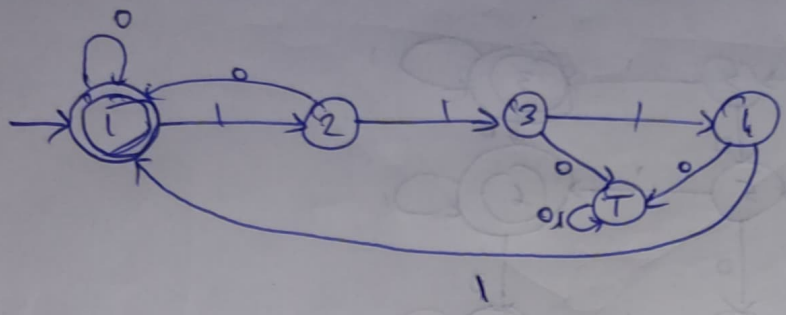
c) $L_3 = \{w \mid w$ is a binary str with atleast 2 ones and atmost 2 0s, $\Sigma = \{0,1\}\}$



d) $L_4 = \{w \mid w$ has $n_a(w) \% 3 >= n_b(w) \% 4, \Sigma = \{a,b\}\}$



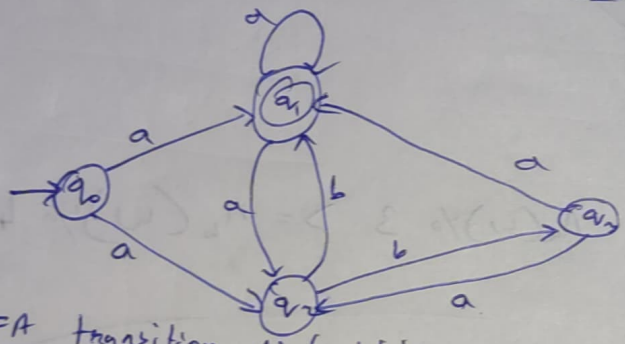
e) $L_5 = \{w \mid$ no of Consecutive 1 in w is 0 or multiple of 4 , $\Sigma = \{0,1\}\}$



III

Convert NFA to DFA

a)



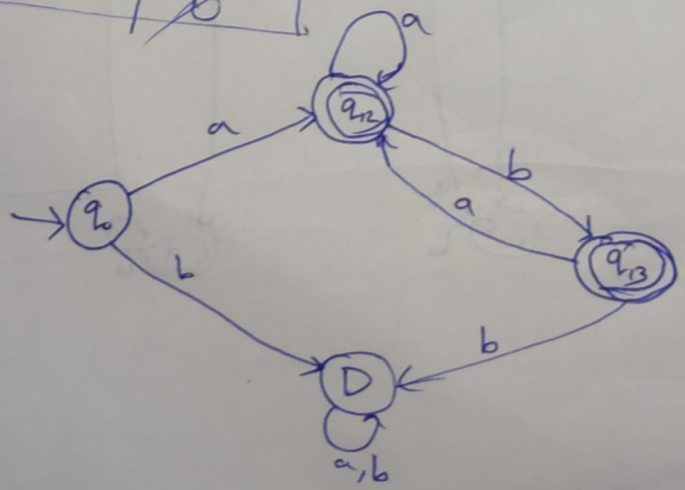
NFA transition state table

	a	b
q_0	q_1, q_2	$\emptyset$
q_1	q_1, q_2	$\emptyset$
q_2	$\emptyset$	q_1, q_3
q_3	q_1, q_2	$\emptyset$

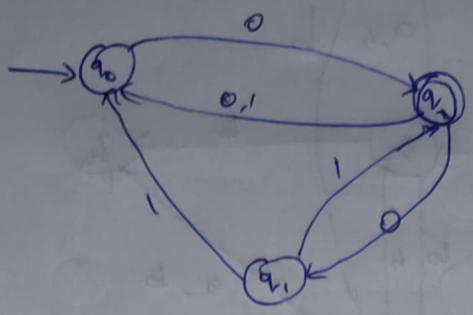
→

DFA transition table

	a	b
q_0	q_{12}	D
* q_{12}	q_{12}	q_{13}
* q_{13}	q_{12}	D
D	D	D



b)



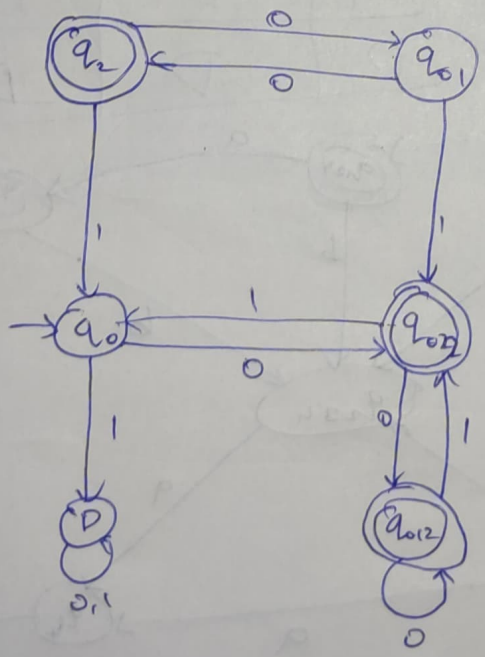
NFA transition table

	0	1
→ q_0	q_2	$\emptyset$
q_1	$\emptyset$ ~~q_0, q_2~~	q_0, q_2
* q_2	q_0, q_1	q_0

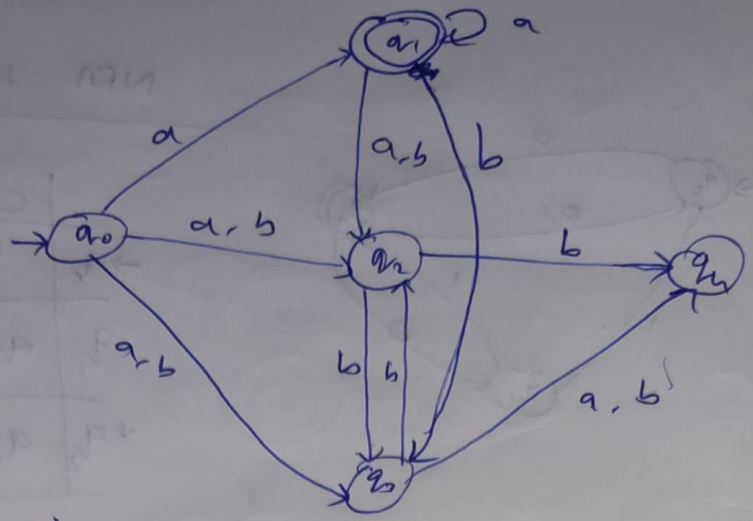
DFA transition table

	0	1
q_0	q_2	D
q_2	D	q_{02}
q_{02}	q_{012}	q_0
q_{012}	q_{012}	q_{02}
D	D	D

	0	1
→ q_0	q_2	D
* q_2	q_{01}	q_0
q_{01}	q_2	q_{02}
* q_{02}	q_{012}	q_0
* q_{012}	q_{012}	q_{02}
D	D	D



c)

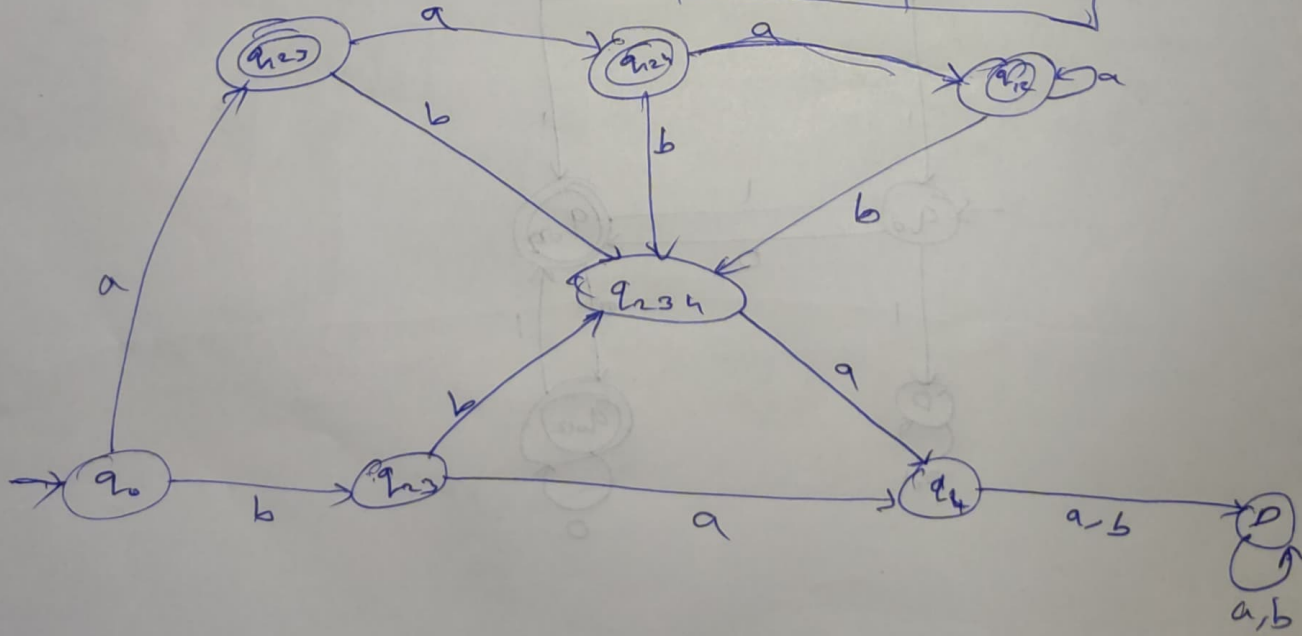


NFA transition table

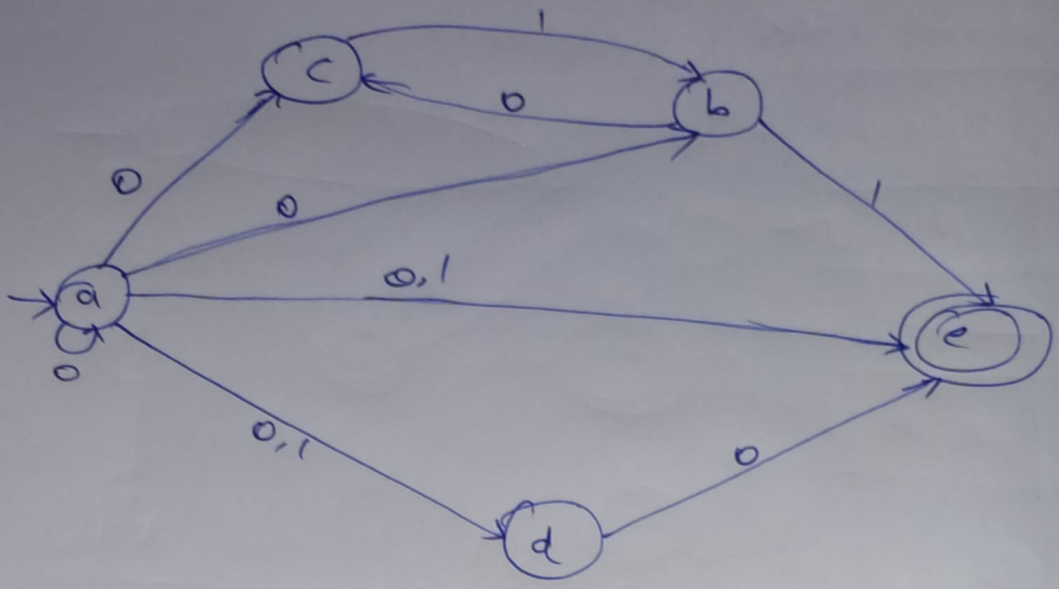
	a	b
$\rightarrow q_0$	q_1, q_2, q_3	q_2, q_3
$*q_1$	q_1, q_2	q_2, q_3
q_2	$\emptyset$	q_3, q_4
q_3	q_4	q_2, q_4
q_4	$\emptyset$	$\emptyset$

DFA transition table

	a	b
$\rightarrow q_0$	q_{123}	q_{23}
$*q_{123}$	q_{124}	q_{234}
q_{23}	q_4	q_{34}
$*q_{124}$	q_{12}	q_{234}
q_{234}	q_4	q_{234}
$*q_{12}$	q_{12}	q_{234}
q_4	D	D
D	D	D



d)



NFA transition table

	0	1
→ a	a,b,c,d,e	d, e
b	c	e
c	∅	b
d	e	∅
* e	∅	∅

⇒

DFA transition table

	0	1
→ a	abcde	de
* abcde	abcde	bde
* de	e	D
* bde	ce	e
* e	D	D
* ce	D	b
b	c	e
c	D	b
D	D	D