Islamic University – Gaza
Engineering Faculty
Department of Computer Engineering
ECOM 5060: Compiler Design Discussion

Chapter 3

Lexical Analysis

(Sections 3.6 and 3.7)

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Exercise 3.6.3: For the NFA of Fig. 3.29, indicate all the paths labeled *aabb*. Does the NFA accept *aabb*?

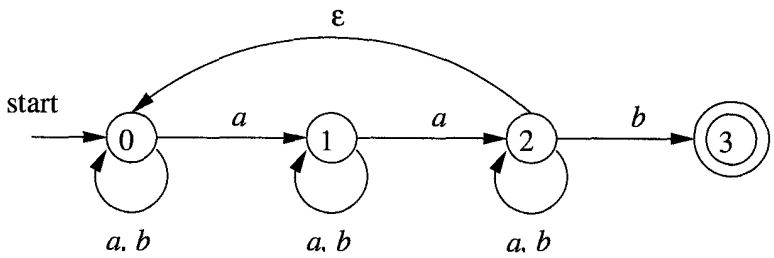


Figure 3.29: NFA for Exercise 3.6.3

0 —a→ 1 —a→ 2 —b→ 2 —b→ 3

0 —a→ 0 —a→ 0 —b→ 0 —b→ 0

0 —a→ 0 —a→ 1 —b→ 1 —b→ 1

0 —a→ 1 —a→ 2 —b→ 2 —b→ 2

Yes, accepted by the first path.

Exercise 3.6.4: Repeat Exercises 3.6.3 for the NFA of Fig. 3.30.

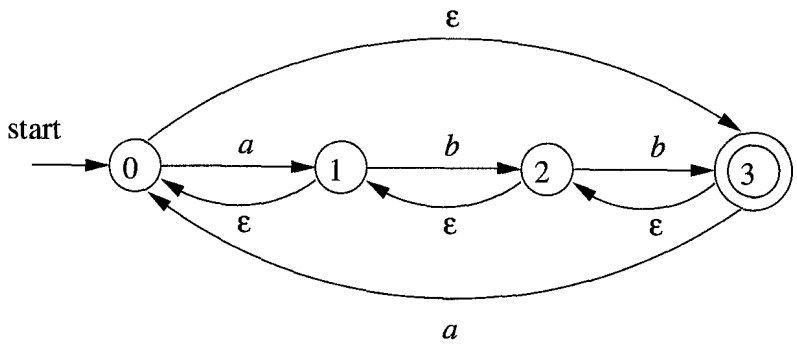


Figure 3.30: NFA for Exercise 3.6.4

0 —a→ 1 —ϵ→ 0 —a→ 1 —b→ 2 —b→ 3

0 —ϵ→ 3 —a→ 0 —a→ 1 —b→ 2 —b→ 3

0 —a→ 1 —ϵ→ 0 —a→ 1 —b→ 2 —ϵ→ 1 —b→ 2

0 —ϵ→ 3 —a→ 0 —a→ 1 —b→ 2 —ϵ→ 1 —b→ 2

Yes, accepted by the first or the second paths.

Exercise 3.6.5: Give the transition tables for the NFA of:

a) Exercise 3.6.3

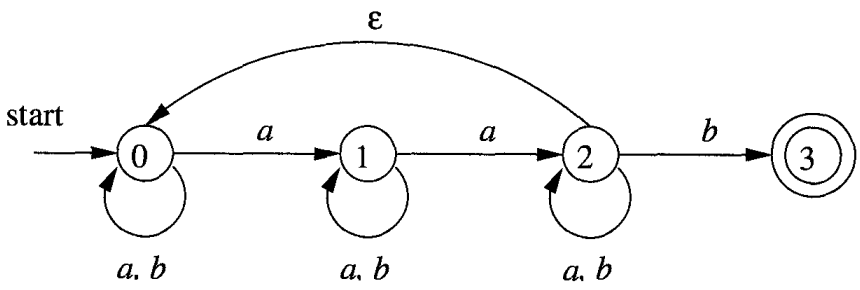


Figure 3.29: NFA for Exercise 3.6.3

state	a	b	ϵ
0	{0, 1}	{0}	Ø
1	{1, 2}	{1}	Ø
2	{2}	{2, 3}	{0}
3	Ø	Ø	Ø

b) Exercise 3.6.4

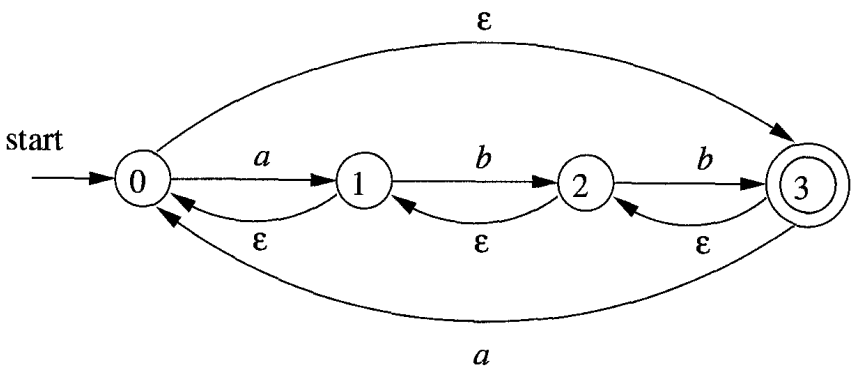


Figure 3.30: NFA for Exercise 3.6.4

state	a	b	ϵ
0	{1}	Ø	{3}
1	Ø	{2}	{0}
2	Ø	{3}	{1}
3	{0}	Ø	{2}

c) Figure 3.26

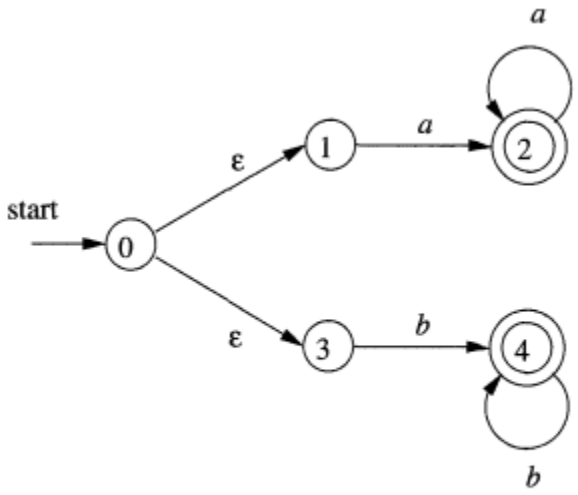


Figure 3.26: NFA accepting $\mathbf{aa^*|bb^*}$

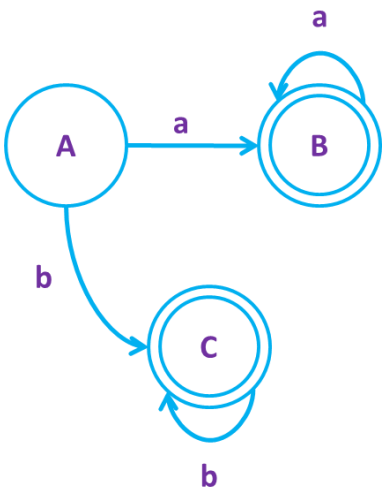
state	a	b	ϵ
0	Ø	Ø	{1, 3}
1	{2}	Ø	Ø
2	{2}	Ø	Ø
3	Ø	{4}	Ø
4	Ø	{4}	Ø

Exercise 3.7.1: Convert to DFA's the NFA's of:

a) Fig. 3.26

ϵ-closure(0) = {0, 1, 3} = A
move(A, a) = {2} → ϵ-closure(move(A, a)) = {2} = B
move(A, b) = {4} → ϵ-closure(move(A, b)) = {4} = C
move(B, a) = {2} → ϵ-closure(move(B, a)) = {2} = B
move(B, b) = Ø→ ϵ-closure(move(B, b)) = Ø
move(C, a) = Ø→ ϵ-closure(move(C, a)) = Ø
move(C, b) = {4} → ϵ-closure(move(C, b)) = {4} = C

NFA state	DFA state	a	b
{0, 1, 3}	A	B	C
{2}	B	B	Ø
{4}	C	Ø	C



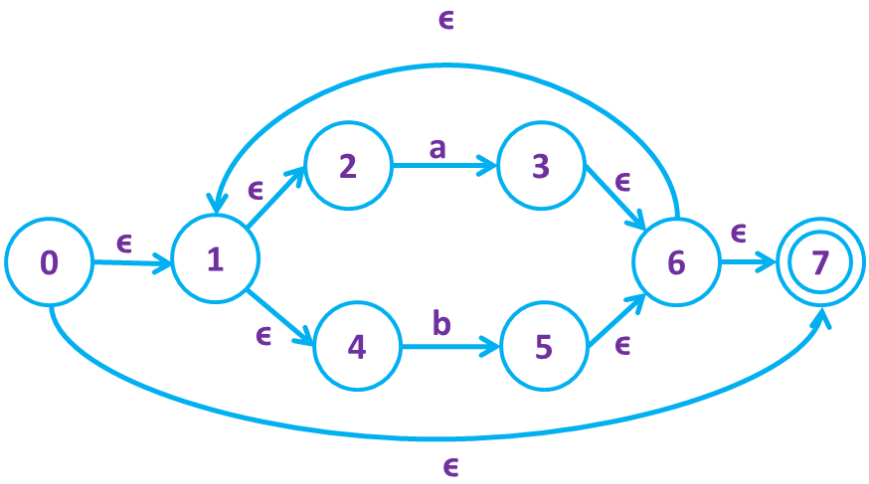
c) Fig. 3.30

ϵ-closure(0) = {0, 1, 2, 3} = A
move(A, a) = {0, 1} → ϵ-closure(move(A, a)) = {0, 1, 2, 3} = A
move(A, b) = {2, 3} → ϵ-closure(move(A, b)) = {0, 1, 2, 3} = A

NFA state	DFA state	a	b
{0, 1, 2, 3}	A	A	A

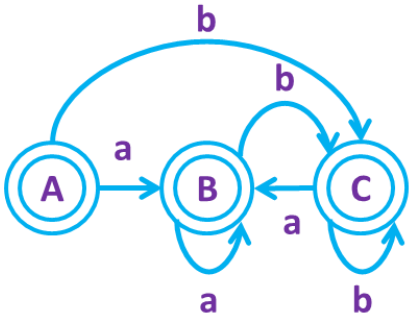
Exercise 3.7.3: Convert the following regular expressions to deterministic finite automata, using algorithms 3.23 and 3.20:

a) (a|b)*.

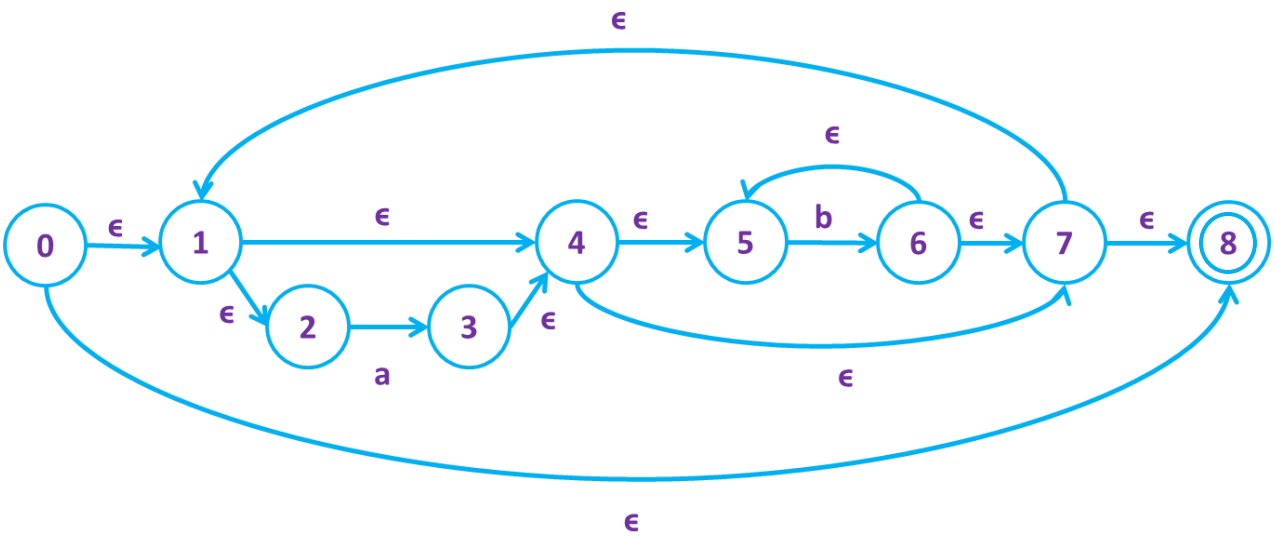


ϵ-closure(0) = {0, 1, 2, 4, 7} = A
move(A, a) = {3} → ϵ-closure(move(A, a)) = {1, 2, 3, 4, 6, 7} = B
move(A, b) = {5} → ϵ-closure(move(A, b)) = {1, 2, 4, 5, 6, 7} = C
move(B, a) = {3} → ϵ-closure(move(B, a)) = {1, 2, 3, 4, 6, 7} = B
move(B, b) = {5} → ϵ-closure(move(B, b)) = {1, 2, 4, 5, 6, 7} = C
move(C, a) = {3} → ϵ-closure(move(C, a)) = {1, 2, 3, 4, 6, 7} = B
move(C, b) = {5} → ϵ-closure(move(C, b)) = {1, 2, 4, 5, 6, 7} = C

NFA state	DFA state	a	b
{0, 1, 2, 4, 7}	A	B	C
{1, 2, 3, 4, 6, 7}	B	B	C
{1, 2, 4, 5, 6, 7}	C	B	C

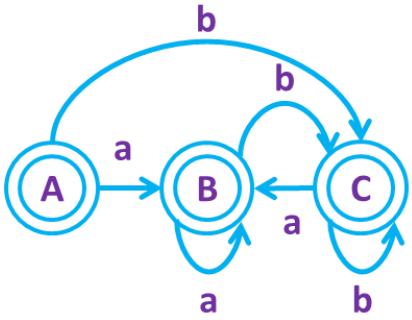


c) ((ϵ|a)b*)*.



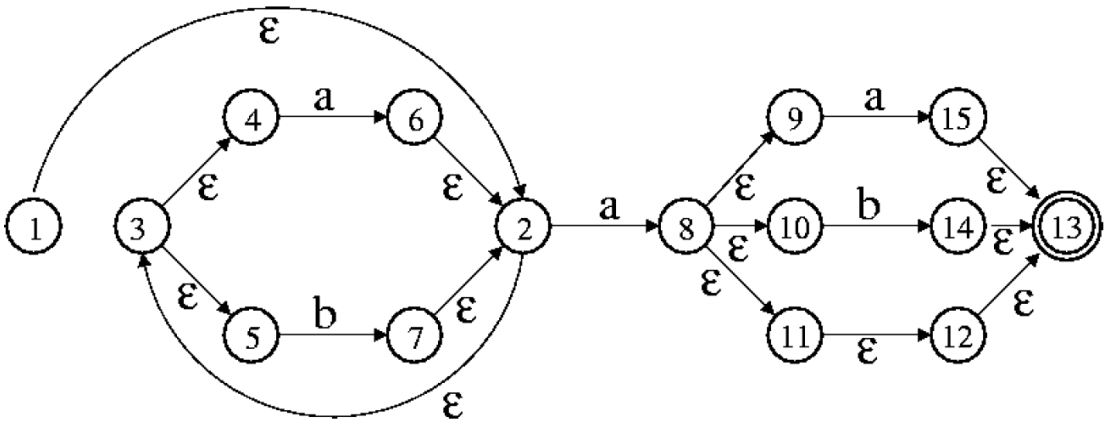
ϵ-closure(0) = {0, 1, 2, 4, 5, 7, 8} = A
move(A, a) = {3} → ϵ-closure(move(A, a)) = {1, 2, 3, 4, 5, 7, 8} = B
move(A, b) = {6} → ϵ-closure(move(A, b)) = {1, 2, 4, 5, 6, 7, 8} = C
move(B, a) = {3} → ϵ-closure(move(B, a)) = {1, 2, 3, 4, 5, 7, 8} = B
move(B, b) = {6} → ϵ-closure(move(B, b)) = {1, 2, 4, 5, 6, 7, 8} = C
move(C, a) = {3} → ϵ-closure(move(C, a)) = {1, 2, 3, 4, 5, 7, 8} = B
move(C, b) = {6} → ϵ-closure(move(C, b)) = {1, 2, 4, 5, 6, 7, 8} = C

NFA state	DFA state	a	b
{0, 1, 2, 4, 5, 7, 8}	A	B	C
{1, 2, 3, 4, 5, 7, 8}	B	B	C
{1, 2, 4, 5, 6, 7, 8}	C	B	C

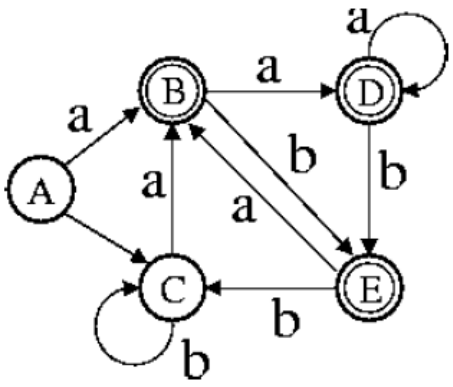


Midterm Exam 2011-2012 - Problem 4:

Construct the DFA from the following NFA



	a	b
A {1,2,3,4,5}	B	C
B {2,3,4,5,6,8,9,10,11,12,13}	D	E
C {2,3,4,5,7}	B	C
D {2,3,4,5,6,8,9,10,11,12,13,15}	D	E
E {2,3,4,5,7,13,14}	B	C



☺ *Best Wishes* ☺