Exercise 1.
Let E = abb*c | d b* g.

(a) Show how the technique of dotted automata ha to be applied to compute a deterministic automaton for E
(b) Prove that the obtained automaton is minimal

Exercise 2.
Let L={$a^nb^mc^p$ | n+m=p}. Is L a member of R? Answer by either furnishing an FSA automaton or proving L is not a member.

Exercise 3.
Let A=<S,∑,M, 0, {3}> be the automaton whose Transition function M is as in the enclosed figure. Show how the algorithm for removing nondeterminist applies to A.

	a	b	c	d	ε
0	{1,2}	-	-	-	{2,4}
1	-	{3}	{2,4}		{0}
2	{2,4}	-	{[illegible]}		{0,1}
3	{4}	{1,2}	{0,1}	{5}	-
4	{5}	{3}	{2}	-	{2,3}
5	{0}	-	{2}	-	{0}

Exercise 4.
Let L={$a^nb^mc^p$ | n+m=p, n>0, m≥0}.

(a) Write an LL(1) grammar G for L;
(b) Prove that G ∈LL(1);
(c) Show how to compute an adaptive parsing table for G, by computing it;
(d) Use such a table in parsing “aac” (use the driver defined by the LL(1) push-down automaton)

$$\text{Ex 1: } E = \overbrace{a\, b\, b^* c \mid d\, b^* f}$$

$$I0 = C_S(\{\Delta (a\, b b^* c \mid d\, b^* f)\}) = C(\Delta\, a\, b\, b^* c) \cup C(\Delta\, d\, b^* f)$$

$$= \{\Delta\, \underline{a}\, b\, b^* c,\ \underline{d}\, b^* f\}$$

$$M(0, a) = C_S(\{\Delta\, b\, b^* c\}) = C(\Delta\, b\, b^* c) =$$

$$= \{b\, b^* c\} = I_1$$

$$M(0, d) = C(\Delta\, b^* g) = \{\Delta\, b\, b^* f,\ \Delta\, g\}$$

$$= I2$$

$$M(1, b) = C(\Delta\, b^* c) = \{\Delta\, \underline{b}\, b^* c,\ \Delta\, \underline{c}\}$$

$$= I3$$

$$M(2, b) = C(\Delta\, b^* f) = I2$$

$$M(2, g) = \{\Delta\} = I_4$$

$M(3,b) = e(\Delta\, h^{t}\, c) = I3$

$M(3,2) = \{\Delta\} = I4$

	a	b	d	g	c
0	1	—	2	—	—
1	—	3	—	—	—
2	—	2	—	4	—
3	—	3	—	—	4
4	—	—	—	—	—

b) <u>step 1</u> $\Pi = \langle \{0,1,2,3\},\{4\} \rangle$

$\Pi_r = \langle \{0 \quad \{1 \quad \{2$

$0 \nsim 1 \Leftarrow \langle\langle 0,a\rangle 1\rangle$
$\langle\langle 1,a\rangle 1\rangle$

$0 \nsim 2 \Leftarrow \langle\langle 0,a\rangle 1\rangle$
$\langle\langle 2,a\rangle 1\}$

$1 \nsim 2 \quad \langle\langle 1,g\rangle 1\rangle$
$\langle\langle 2,g\rangle 4\rangle$

Ex 4. $L = \{a^n b^m c^p \mid n+m=p,\ n>0,\ m \geq 0\}$

(a)

$$S ::= aSc \mid aBc$$
$$B ::= bBc \mid \varepsilon$$

Grammar G is: (by factoring):

$$S ::= {}^{0}aD$$
$$D ::= Sc \,{}^{1}\mid{}^{2} Bc$$
$$B ::= bBc \,{}^{3}\mid{}^{4} \varepsilon$$

(b) We must consider separately the productions for D and B

About D, we have:
- $first(Sc) = \{a\}$, $first(Bc) = \{b, c\}$

$$first(Sc) \cap first(Bc) = \{\}$$

- neither Sc nor Bc are deriving λ

- neither Sc nor Bc are deriving λ

About B,

$$first(bBc) = \{b\}, \quad first(\varepsilon) = \varepsilon$$
$$first(bBc) \cap first(\varepsilon) = \{\}$$
$$first(bBc) = \{b\}, \quad fol(B) = \{c\}$$
$$first(bBc) \cap fol(B) = \{\}$$

This concludes the proof.

c)

FS		FW	
aD	$\{a\}$	S	$\{\$, c\}$
Sc	$\{a\}$	D	$\{\$, c\}$
Bc	$\{b, \varepsilon\}$	B	$\{c\}$
bBc	$\{b\}$		
ε	$\{\varepsilon\}$		

FS	
aD	{a}
Sc	{a}
Bc	{b, c}
bBc	{b}
ε	{ε}

FW	
S	{$, c}
D	{$, c}
B	{c}

	a	b	c	$
S	0	–	–	–
D	1	2	2	–
B	–	3	4	–

aac$	aac$	ac$	ac$	ac$
S $	a D $	D $	S c $	a D c $

aac$	aac$	ac$	ac$	ac$
S $	a A $	A $	S c $	a A c $

c$	c$	c$	$	
A c $	B c c $	c c $	c $	Stop FAIL