

Fakultet elektrotehnike i računarstva
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Zavod za elektroniku, mikroelektroniku,
računalne i inteligentne sustave

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Prevođenje programskih jezika

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9. Za zadanu gramatiku izgradite parser zasnovan na tehnici parsiranja Pomakni-Pronađi.

- (1) $\langle S \rangle \rightarrow p \langle A \rangle m \langle C \rangle$ (3) $\langle A \rangle \rightarrow d \langle S \rangle a$ (5) $\langle C \rangle \rightarrow d \langle A \rangle$
(2) $\langle S \rangle \rightarrow b \langle A \rangle$ (4) $\langle A \rangle \rightarrow e$

a) Određivanje relacije IspodZnaka

$$\text{ZAPOČINJE}(S) = \{ p, b \}$$

$$\text{ZAPOČINJE}(A) = \{ d, e \}$$

$$\text{ZAPOČINJE}(C) = \{ d \}$$

Na temelju (1):

$$\langle S \rangle \rightarrow \underline{p \langle A \rangle} m \langle C \rangle \quad \langle S \rangle \rightarrow p \underline{\langle A \rangle m} \langle C \rangle \quad \langle S \rangle \rightarrow p \langle A \rangle \underline{m \langle C \rangle}$$

$$\text{IspodZnaka}(p, d) \quad \text{IspodZnaka}(\langle A \rangle, m) \quad \text{IspodZnaka}(m, d)$$

$$\text{IspodZnaka}(p, e)$$

Na temelju (2):

$$\langle S \rangle \rightarrow \underline{b \langle A \rangle}$$

$$\text{IspodZnaka}(b, d)$$

$$\text{IspodZnaka}(b, e)$$

Na temelju (3):

$$\langle A \rangle \rightarrow \underline{d \langle S \rangle} a \quad \langle A \rangle \rightarrow d \underline{\langle S \rangle} a$$

$$\text{IspodZnaka}(d, p) \quad \text{IspodZnaka}(\langle S \rangle, a)$$

$$\text{IspodZnaka}(d, b)$$

Na temelju (5):

$$\langle C \rangle \rightarrow \underline{d \langle A \rangle}$$

$$\text{IspodZnaka}(d, d)$$

$$\text{IspodZnaka}(d, e)$$

Dodatno:

$$\text{IspodZnaka}(\nabla, p)$$

$$\text{IspodZnaka}(\nabla, b)$$

b) Određivanje relacije ReduciranZnakom

$$\text{SLIJEDI}(\langle S \rangle) = \{ a, \perp \}$$

$$\text{SLIJEDI}(\langle A \rangle) = \{ a, m, \perp \}$$

$$\text{SLIJEDI}(\langle C \rangle) = \{ a, \perp \}$$

Na temelju (1):

$\langle S \rangle \rightarrow p \langle A \rangle m \underline{\langle C \rangle}$

ReduciranZnakom($\langle C \rangle$, \perp)

ReduciranZnakom($\langle C \rangle$, a)

Na temelju (2):

$\langle S \rangle \rightarrow b \underline{\langle A \rangle}$

ReduciranZnakom($\langle A \rangle$, \perp)

ReduciranZnakom($\langle A \rangle$, a)

Na temelju (3):

$\langle A \rangle \rightarrow d \langle S \rangle \underline{a}$

ReduciranZnakom(a, \perp)

ReduciranZnakom(a, m)

ReduciranZnakom(a, a)

Na temelju (4):

$\langle A \rangle \rightarrow \underline{e}$

ReduciranZnakom(e, \perp)

ReduciranZnakom(e, m)

ReduciranZnakom(e, a)

Na temelju (5):

$\langle C \rangle \rightarrow d \underline{\langle A \rangle}$

ReduciranZnakom($\langle A \rangle$, \perp)

ReduciranZnakom($\langle A \rangle$, a)

Dodatno:

ReduciranZnakom($\langle S \rangle$, \perp)

c) Izgradnja tablice Pomakni/Pronađi

	a	b	e	d	m	p	\perp
$\langle S \rangle$	P()						R()
$\langle A \rangle$	R()				P()		R()
$\langle C \rangle$	R()						R()
a	R()				R()		R()
b			P()	P()			
e	R()				R()		R()
d		P()	P()	P()		P()	
m				P()			
p			P()	P()			
∇		P()				P()	

```

P() {
    Pomakni;
}

R() {
    ako ( VrhStoga = "p<A>m<C>" )
        Reduciraj1();
    inače ako (VrhStoga = "b <A>" )
        Reduciraj2();
    inače ako (VrhStoga = "d<S>a" )
        Reduciraj3();
    inače ako ( VrhStoga = "e" )
        Reduciraj4();
    inače ako ( VrhStoga = "d <A>" )
        Reduciraj5();
    inače ako ( (VrhStoga = "<S> $\nabla$ ")
        &&
        (Ulaz = " $\perp$ ")
        )
        Prihvati();
    inače
        Odbaci();
}
    
```

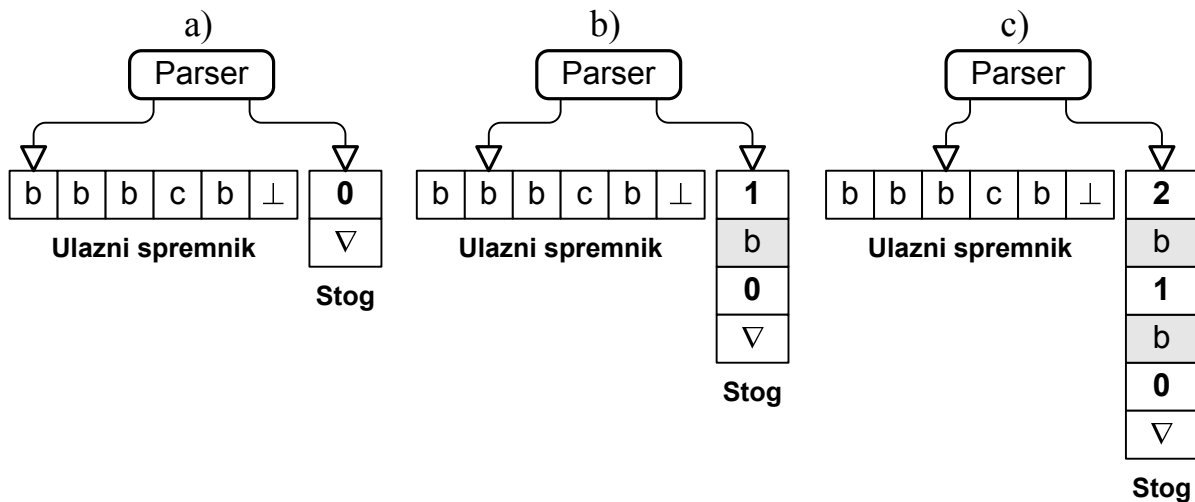
10. Prikažite korake tijekom parsiranja niza *bbcb* primjenom zadanog *LR(1)* parsera.

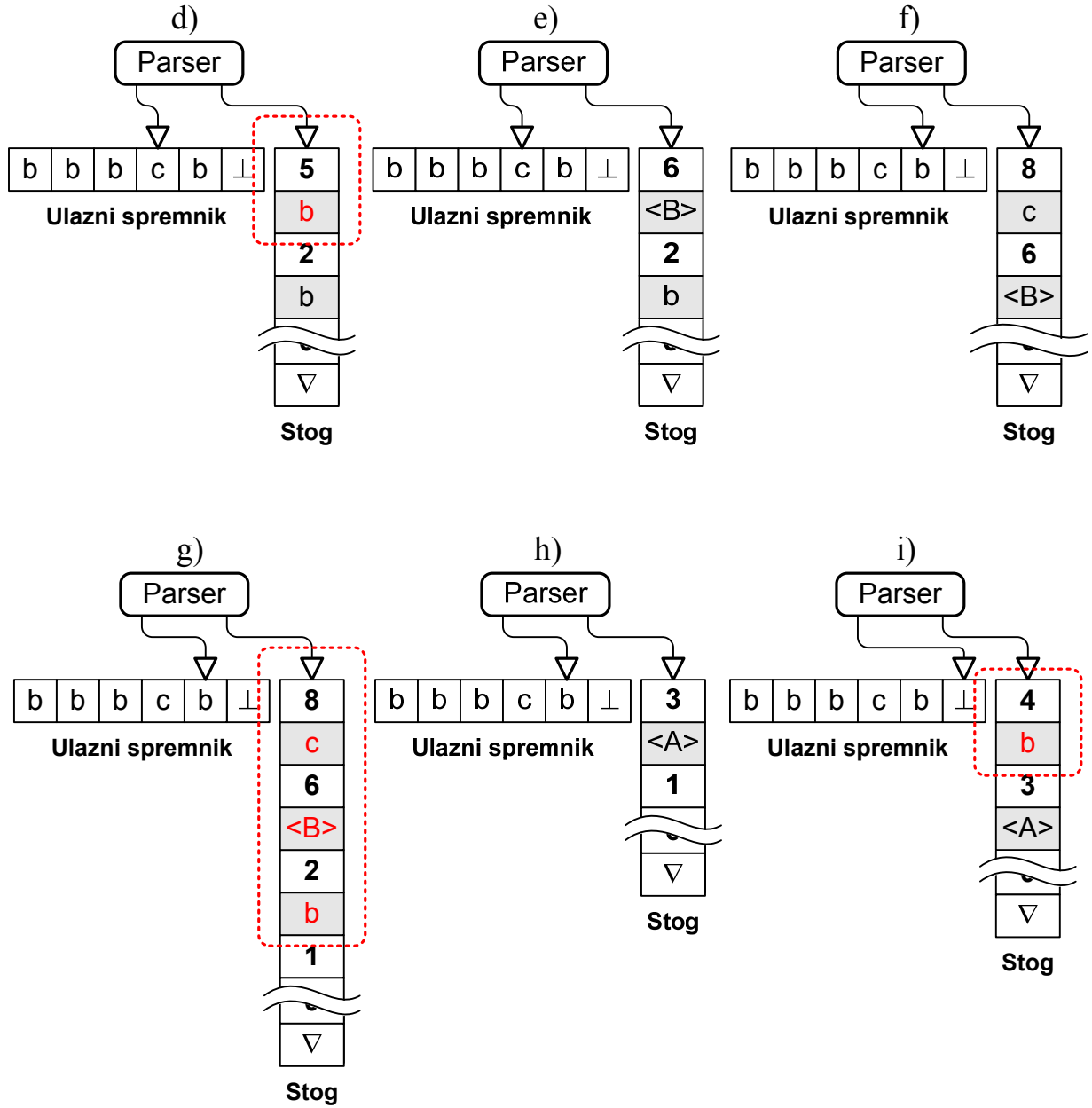
Stanje	Akcija			Novo Stanje		
	b	c	⊥	<S>	<A>	
0	P1					
1	P2				S3	
2	P5					S6
3	P4					S7
4			R3			
5		R3				
6		P8				
7			Prihvati			
8	R2					

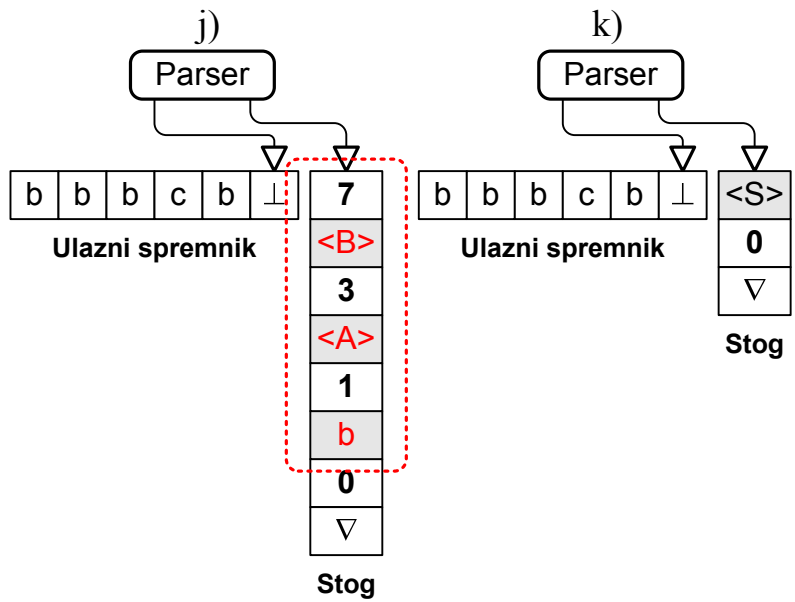
R1 = Reduciraj (<S> → b <A>)

R2 = Reduciraj (<A> → b c)

R3 = Reduciraj (→ b)







11. Za zadanu gramatiku izgradite $SLR(1)$ parser.

(1) $S \rightarrow a A c$

(2) $A \rightarrow x S$

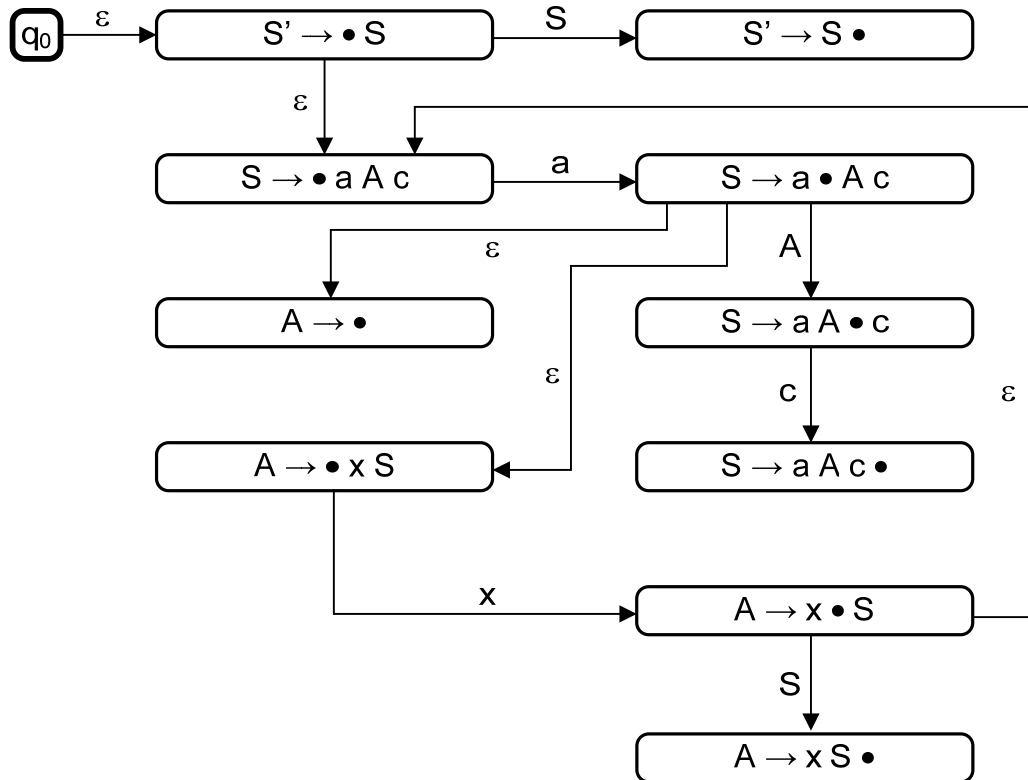
(3) $A \rightarrow \epsilon$

Dodajemo produkciju

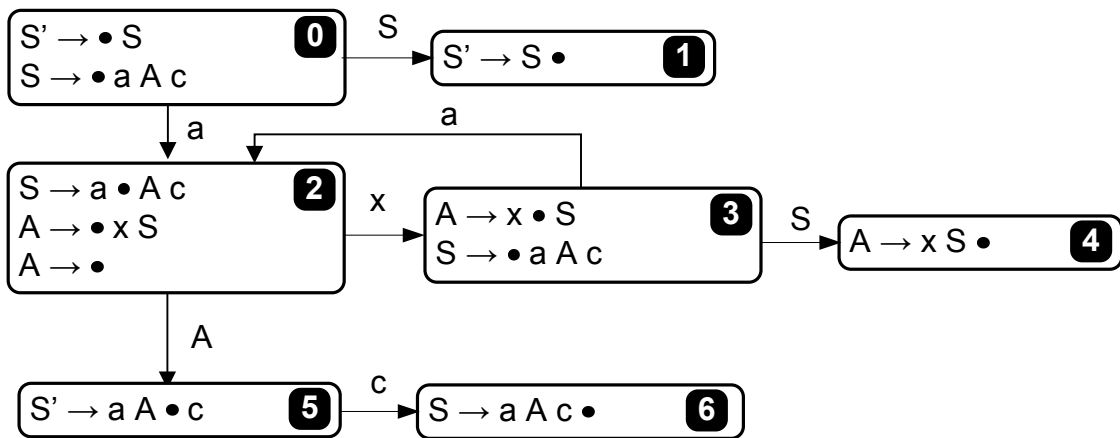
(4) $S' \rightarrow S$

Zašto? Što se događa ako ne dodamo produkciju (4)?

ϵ -NKA



DKA



$Slijedi(S) = \{ c, \perp \}$

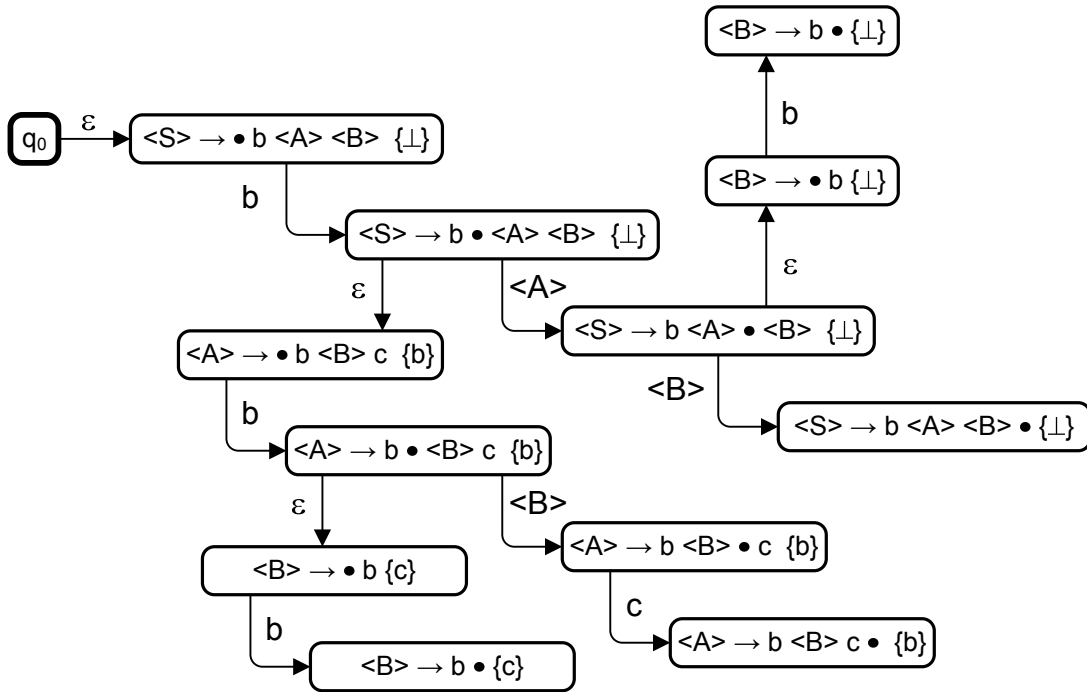
$Slijedi(A) = \{ c \}$

Stanje	Akcija				Novo Stanje	
	a	c	x	\perp	<S>	<A>
0	P2				S1	
1				Prihvati		
2		R3	P3			S5
3	P2				S4	
4		R2				
5		P6				
6		R1		R1		

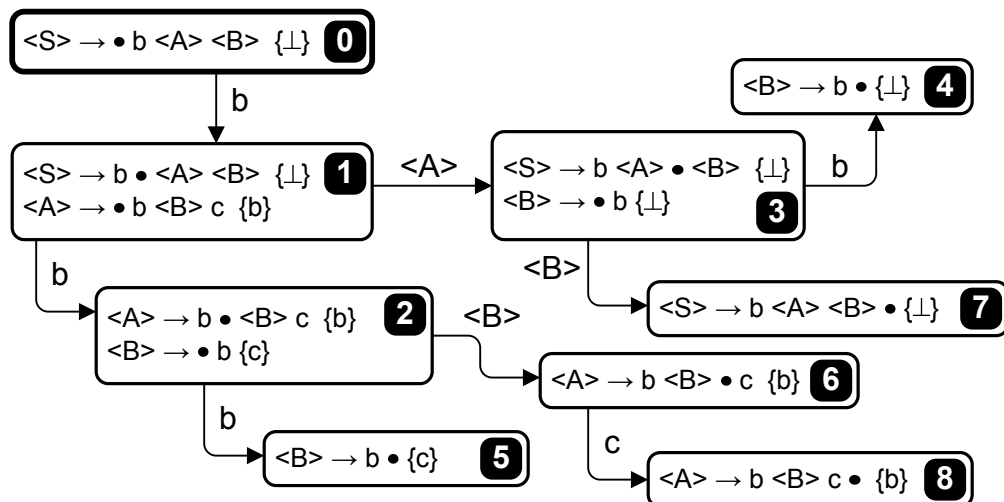
12. Za zadanu gramatiku izgradite LR(1) parser.

- (1) $\langle S \rangle \rightarrow b \langle A \rangle \langle B \rangle$ (2) $\langle A \rangle \rightarrow b \langle B \rangle c$ (3) $\langle B \rangle \rightarrow b$

ϵ -NKA



DKA



Stanje	Akcija			Novo Stanje		
	b	c	⊥	<S>	<A>	
0	P1					
1	P2				S3	
2	P5					S6
3	P4					S7
4			R3			
5		R3				
6		P8				
7			Prihvati			
8	R2					

(2) $\langle Z \rangle_{Vr, Br} \rightarrow \{Uvećaj\}_{p, q} \langle Z \rangle_{vr, br} 0 \{IzračunajVr_0\}_{r, z}$
 $p \leftarrow Br, br \leftarrow q, r \leftarrow vr, Vr \leftarrow z$

(3) $\langle Z \rangle_{Vr, Br} \rightarrow \{Uvećaj\}_{p, q} \langle Z \rangle_{vr, br} 1 \{IzračunajVr_1\}_{r, w, z}$
 $p \leftarrow Br, br \leftarrow q, r \leftarrow vr, w \leftarrow Br, Vr \leftarrow z$

(4) $\langle Z \rangle_{Vr, Br} \rightarrow 0$
 $Vr \leftarrow 0$

(5) $\langle Z \rangle_{Vr, Br} \rightarrow 1 \{IzračunajVr_2\}_{r, w}$
 $r \leftarrow Br, Vr \leftarrow w$

14. Izgradite potisni automat za zadanu atributnu prijevodnu gramatiku. Za sve akcije Zamijeni prikazati stanje na stogu neposredno prije i neposredno poslije primjene akcije.

$$(1) \quad \langle S \rangle \rightarrow a_p b_q \langle A \rangle_r \{X_v\} \\ v \leftarrow p \times q + r$$

$$(2) \quad \langle A \rangle_p \rightarrow a_q \langle B \rangle_r \\ p \leftarrow q + r$$

$$(3) \quad \langle B \rangle_p \rightarrow c_q \\ p \leftarrow q$$

a) Dodavanje akcijskih znakova

$$(1) \quad \langle S \rangle \rightarrow a_p b_q \langle A \rangle_r \{R\}_{x1, x2, x3, x4} \{X_v\} \\ x1 \leftarrow p \quad x2 \leftarrow q \quad x3 \leftarrow r \quad v \leftarrow x4$$

$$(2) \quad \langle A \rangle_p \rightarrow a_q \langle B \rangle_r \{Zbroj\}_{x1, x2, x3} \\ x1 \leftarrow q \quad x2 \leftarrow r \quad p \leftarrow x3$$

$$(3) \quad \langle B \rangle_p \rightarrow c_q \\ p \leftarrow q$$

b) Izgradnja potisnog automata za atributnu prijevodnu gramatiku

$$(1) \quad \langle S \rangle \rightarrow a_p b_q \langle A \rangle_r \{R\}_{x1, x2, x3, x4} \{X_v\} \\ x1 \leftarrow p \quad x2 \leftarrow q \quad x3 \leftarrow r \quad v \leftarrow x4$$

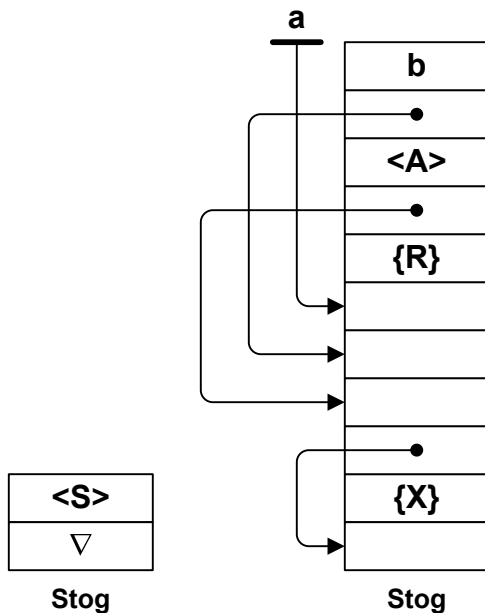
$$(2) \quad \langle A \rangle_p \rightarrow a_q \langle B \rangle_r \{Zbroj\}_{x1, x2, x3} \\ x1 \leftarrow q \quad x2 \leftarrow r \quad p \leftarrow x3$$

$$(3) \quad \langle B \rangle_p \rightarrow c_q \\ p \leftarrow q$$

	a	b	c	⊥
<S>	(1)	-	-	-
<A>	(2)	-	-	-
	-	-	(3)	-
b	-	Izvuci; Pomakni;	-	-
∇	-	-	-	Prihvati;
{R}	Izračunaj izraz $p \times q + r$ koristeći vrijednosti u tri polja ispod znaka {R} na stogu, rezultat zapiši u polje na koje pokazuje kazaljka u četvrtom polju; Izvuci; Zadrži;			
{X}	Ispiši rezultat aritmetičkog izraza; Izvuci; Zadrži;			
{Zbroj}	Zbroji vrijednosti u dva polja ispod znaka {Zbroji} na stogu, rezultat zapiši u polje na koje pokazuje kazaljka u trećem polju; Izvuci; Zadrži;			

- (1) Zamijeni prema slici 1; Pomakni;
- (2) Zamijeni prema slici 2; Pomakni;
- (3) Izvuci; Zadrži;

Slika 1



Slika 2

