Az informatika számítástudományi alapjai

9. feladatsor

3. Adjunk meg az alábbi nyelveket elfogadó veremautomatát

b. $\{a^n x \mid n \geq 0,\ x \in \{a, b\}^* \text{ and } |x| \leq n\}$.

c. $\{a^i b^j c^k \mid i, j, k \geq 0 \text{ and } j = i \text{ or } j = k\}$.

5. Adjunk (nem feltétlen determinisztikus) veremautomatákat az alábbi nyelvekre ($n_a(x)$ *és* $n_b(x)$ az x szóban lévő *a* ill. *b* betűk száma):

a. $\{x \in \{a,b\}^* \mid n_a(x) < n_b(x)\}$

b. $\{x \in \{a,b\}^* \mid n_a(x) \neq n_b(x)\}$

c. $\{x \in \{a,b\}^* \mid n_a(x) = 2n_b(x)\}$

Például: $S \to [S] \mid SS \mid \lambda$

Move Number	State	Input	Stack Symbol	Move
1	q_0	Λ	Z_0	(q_1, SZ_0)
2	q_1	Λ	S	$(q_1, [S]), (q_1, SS), (q_1, \Lambda)$
3	q_1	[	[	(q_1, Λ)
4	q_1	]	]	(q_1, Λ)
5	q_1	Λ	Z_0	(q_2, Z_0)
	(all other combinations)			none

Kezdőállapot: q_0
Elfogadó állapot: q_2
Kezdeti veremtartalom: Z_0

(vegyünk egy jó és egy rossz példát)

4. Adjunk meg a G 2-es típusú grammatikához egy olyan veremautomatát, amely a G grammatika által generált nyelvet ismeri fel, majd mutassuk meg, hogy az 10011 szót felismeri az automata!

a. $G=(\{S,A,B\},\{0,1\},S,H)$,ahol H szabályai:

$S \to SA$, $S \to AB$,

$A \to BS$, $B \to SA$,

$A \to 1$, $S \to 1$, $B \to 0$.

b. ismeri fel, és mutassuk meg, hogy a *bbcbba* szót is elfogadja!

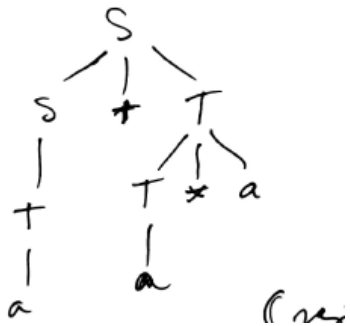
$G=(\{S,A,B,C,D\},\{a,b,c\},S,H)$, ahol H szabályai:

$S \to AB$, $A \to CA$, $A \to SS$, $B \to CD$,

$A \to b$, $D \to a$, $C \to c$, $C \to b$.

$S \to S + T \mid T$

$T \to T * a \mid a$



Reduction	Stack (reversed)	Unread Input	Derivation Step
	Z_0	$a + a * a$	
	$Z_0\ \underline{a}$	$+ a * a$	
(1)	$Z_0\ \underline{T}$	$+ a * a$	$\Rightarrow\ a + a * a$
(2)	$Z_0\ S$	$+ a * a$	$\Rightarrow\ T + a * a$
	$Z_0\ S +$	$a * a$	
	$Z_0\ S + \underline{a}$	$* a$	
(3)	$Z_0\ S + T$	$* a$	$\Rightarrow\ S + a * a$
	$Z_0\ S + T\ *$	a	
	$Z_0\ S + \underline{T * a}$		
(4)	$Z_0\ \underline{S + T}$		$\Rightarrow\ S + T * a$
(5)	$Z_0\ S$		$\Rightarrow\ S + T$
	(accept)		S

5.30. For a certain CFG G, the moves shown below are those by which the nondeterministic bottom-up PDA $NB(G)$ accepts the input string $aabbab$. Each occurrence of $\vdash^*$ indicates a sequence of moves constituting a reduction. Draw the derivation tree for $aabbab$ that corresponds to this sequence of moves.

$$
\begin{aligned}
(q_0, aabbab, Z_0) &\vdash (q_0, abbab, aZ_0) \vdash (q_0, bbab, aaZ_0) \\
&\vdash (q_0, bab, baaZ_0) \vdash^* (q_0, bab, SaZ_0) \\
&\vdash (q_0, ab, bSaZ_0) \vdash^* (q_0, ab, SZ_0) \vdash (q_0, b, aSZ_0) \\
&\vdash (q_0, \Lambda, baSZ_0) \vdash^* (q_0, \Lambda, SSZ_0) \vdash^* (q_0, \Lambda, SZ_0) \\
&\vdash (q_1, \Lambda, Z_0) \vdash (q_2, \Lambda, Z_0)
\end{aligned}
$$

5.31. Let G be the CFG with productions $S \to S + T \mid T \qquad T \to [\,S\,] \mid a$. Both parts of the question refer to the moves made by the nondeterministic bottom-up PDA $NB(G)$ in the process of accepting the input string $[\,a + [\,a\,]\,]$.

a. If the configuration at some point is $(q_0, +[\,a\,]\,], S[\,Z_0)$, what is the configuration one move later?

b. If the configuration at some point is $(q_0, +[\,a\,]\,], T[\,Z_0)$, what is the configuration one move later?

3.

Környezetfüggetlenek-e az alábbi nyelvek? Miért?

a. $L = \{a^n b^m a^m b^n \mid m, n \geq 0\}$
b. $L = \{xayb \mid x, y \in \{a, b\}^* \text{ and } |x| = |y|\}$
c. $L = \{xcx \mid x \in \{a, b\}^*\}$
d. $L = \{xyx \mid x, y \in \{a, b\}^* \text{ and } |x| \geq 1\}$

5.29. Consider the CFG G with productions

$$S \to aB \mid bA \mid \Lambda \qquad A \to aS \mid bAA \qquad B \to bS \mid aBB$$

generating $AEqB$, the nondeterministic bottom-up PDA $NB(G)$, and the input string $aababb$. After the first few moves, the configuration of the PDA is $(q_0, abb, baaZ_0)$. There are two possible remaining sequences of moves that cause the string to be accepted. Write both of them.