Formleg mál og reiknanleiki

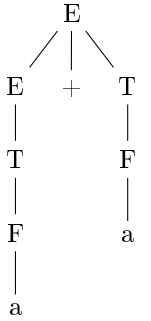
Pétur

October 11, 2018

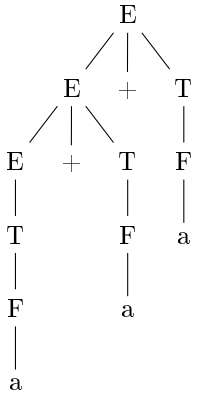
1.

a)

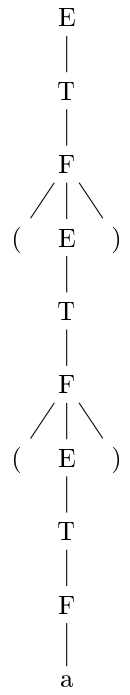
b)



c)



d)



2.

$$A \rightarrow BAB \mid B \mid \epsilon$$
$$B \rightarrow 00 \mid \epsilon$$

I use the first rule from the Chomsky algorithm. Add a new start so that the new start state dose not appear on the right hand side.

$$S \rightarrow A$$
$$A \rightarrow BAB \mid B \mid \epsilon$$
$$B \rightarrow 00 \mid \epsilon$$

Second rule from Chomsky algorithm. Get rid of the ϵ. Fyrst i take it from the rule

$$B \rightarrow 00 \mid \epsilon$$

After that modification the CFG looks like this.

$$S \rightarrow A$$
$$A \rightarrow BAB \mid B \mid \epsilon \mid BA \mid AB$$
$$B \rightarrow 00$$

Then i move the last ϵ to the start state because the CFL has also the empty string in it.

$$S \rightarrow A \mid \epsilon$$
$$A \rightarrow BAB \mid B \mid BA \mid AB$$
$$B \rightarrow 00$$

Third rule, remove all unit rules

$$S \rightarrow A \mid \epsilon$$
$$A \rightarrow BAB \mid B \mid BA \mid AB$$
$$B \rightarrow 00$$

After third rule has bin applied then the CFG looks like this.

$$
\begin{aligned}
S &\rightarrow BAB \mid 00 \mid BA \mid AB \mid \epsilon \\
A &\rightarrow BAB \mid 00 \mid BA \mid AB \\
B &\rightarrow 00
\end{aligned}
$$

Then i ad new rules and make sure its in the form of Chomsky normal form.

$$
\begin{aligned}
S &\rightarrow BC \mid DD \mid BA \mid AB \mid \epsilon \\
A &\rightarrow BC \mid DD \mid BA \mid AB \\
B &\rightarrow DD \\
C &\rightarrow AB \\
D &\rightarrow 0
\end{aligned}
$$

3.

Here is the CFG for the CFL F.

$$
\begin{aligned}
F &\rightarrow A \\
A &\rightarrow aA \mid B \mid aD \\
B &\rightarrow bB \mid C \\
C &\rightarrow cC \mid \epsilon \\
D &\rightarrow bDc \mid \epsilon
\end{aligned}
$$

5.

a)

$$
\begin{aligned}
R &\rightarrow aA \mid bB \mid cC \\
A &\rightarrow aR \mid bD \mid cE \\
B &\rightarrow aE \mid bR \mid cD \\
C &\rightarrow aD \mid bE \mid cR \\
D &\rightarrow aE \mid bE \mid cE \mid \epsilon \\
E &\rightarrow aE \mid bE \mid cE
\end{aligned}
$$

b)