Теория алгоритмов
Домашнее задание 1
Часть 1

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25 февраля 2020 г.

Задан алфавит $\Sigma = \{a, b\}$

1) $\begin{cases} b \to a \\ a \to \epsilon \end{cases}$

a) $aaaa \Rightarrow aaa$
b) $bbbbb \Rightarrow abbbb \Rightarrow aabbb \Rightarrow aaabb \Rightarrow aaaab \Rightarrow aaaaa => aaa$
c) ϵ
d) $abababaaba \Rightarrow aaababaaba \Rightarrow aaaaababa \Rightarrow aaaaaaaba \Rightarrow aaaaaaaaa \Rightarrow aaaaaaaa$
e) $bbbabaaabbb \Rightarrow abbabaaabbb \Rightarrow aababaaabbb \Rightarrow ... \Rightarrow aaaaaaaaaaa \Rightarrow aaaaaaaaaa$
f) $aabbaaabbba \Rightarrow aaabaaabbba \Rightarrow ... \Rightarrow aaaaaaaaaaa \Rightarrow aaaaaaaaaa$
g) $bbababaaaa \Rightarrow abababaaaa \Rightarrow ... \Rightarrow aaaaaaaaaa \Rightarrow aaaaaaaaa$
h) $bababaaabb \Rightarrow aababaaabb \Rightarrow ... \Rightarrow aaaaaaaaaa \Rightarrow aaaaaaaaa$

2) $\begin{cases} bab \to a \\ a \to .b \end{cases}$

a) $aaaa \Rightarrow baaa$
b) $bbbbb$
c) ϵ
d) $abababaaba \Rightarrow aaababa \Rightarrow aaaaa \Rightarrow baaaa$
e) $bbbabaaabbb \Rightarrow bbaaaabbb \Rightarrow bbbaaabbb$
f) $aabbaaabbba \Rightarrow babbaaabbba$
g) $bbababaaaa \Rightarrow baabaaaa \Rightarrow bbabaaaa$
h) $bababaaabb \Rightarrow aabaaabb \Rightarrow babaaabb$

3) $\begin{cases} bba \to ab \\ ab \to a \\ b \to \varepsilon \end{cases}$

a) $aaaa \Rightarrow aaa \Rightarrow aa \Rightarrow a \Rightarrow \epsilon$
b) $bbbbb \Rightarrow bbbb \Rightarrow bbb \Rightarrow bb \Rightarrow b \Rightarrow \epsilon$
c) ϵ
d) $abababaaba \Rightarrow aababaaba \Rightarrow aaabaaba \Rightarrow aaaaba \Rightarrow aaaaa$
e) $bbbabaaabbb \Rightarrow babbaaabbb \Rightarrow baabaabbb \Rightarrow baaaabbb \Rightarrow baaaabb \Rightarrow baaaab \Rightarrow baaaa \Rightarrow aaaa$
f) $aabbaaabbba \Rightarrow aaabaabbba \Rightarrow aaabaabab \Rightarrow aaaaabab \Rightarrow aaaaaab \Rightarrow aaaaaa$
g) $bbababaaaa \Rightarrow abbabaaaa \Rightarrow aabbaaaa \Rightarrow aaabaaa \Rightarrow aaaaaa$
h) $bababaaabb \Rightarrow baabaaabb \Rightarrow baaaaabb \Rightarrow baaaaab \Rightarrow baaaaa \Rightarrow aaaaa$

4) $\begin{cases} ba \to ab \\ ab \to a \\ a \to \varepsilon \end{cases}$

a) $aaaa \Rightarrow aaa \Rightarrow aa \Rightarrow a \Rightarrow \epsilon$
b) $bbbbb$
c) ϵ
d) $abababaaba \Rightarrow aabbababa \Rightarrow aababbaba \Rightarrow aaabbbaba \Rightarrow aaabbabba \Rightarrow aaababbba \Rightarrow aaaabbbba \Rightarrow$
$aaaabbbab \Rightarrow aaaabbabb \Rightarrow aaaababbb \Rightarrow aaaaabbbb \Rightarrow aaaaabbb \Rightarrow aaaaabb \Rightarrow aaaaab \Rightarrow$
$aaaaa \Rightarrow aaaa \Rightarrow ... \Rightarrow \epsilon$
e) $bbbabaaabbb \Rightarrow bbabbaaabbb \Rightarrow babbbaaabbb \Rightarrow abbbbaaabbb \Rightarrow abbbabaabbb \Rightarrow ... \Rightarrow aabbbbaabbb \Rightarrow$
$aabbbbabaabbb \Rightarrow ... \Rightarrow aabbabbabbb \Rightarrow aababbbabbb \Rightarrow aaabbbbabbb \Rightarrow aaabbbabbbb \Rightarrow ... \Rightarrow aaabbabbbbb \Rightarrow$
$... \Rightarrow aaaabbbbbbb \Rightarrow aaaabbbbbb \Rightarrow ... \Rightarrow aaaa \Rightarrow aaa \Rightarrow ... \Rightarrow \epsilon$
f) $aabbaaabbba \Rightarrow aababaabbba \Rightarrow aaabbaabbba \Rightarrow aaababaabbba \Rightarrow aaaabbabbba \Rightarrow aaaababbbba \Rightarrow$
$aaaaabbbbba \Rightarrow aaaaabbbbab \Rightarrow ... \Rightarrow aaaaaabbbbb \Rightarrow aaaaaabbbb \Rightarrow ... \Rightarrow aaaaaa \Rightarrow aaaaa \Rightarrow$
$... \Rightarrow \epsilon$
g) $bbababaaaa \Rightarrow babbabaaaa \Rightarrow abbbabaaaa \Rightarrow abbabbaaaa \Rightarrow ababbbaaaa \Rightarrow aabbbbaaaa \Rightarrow$
$aabbbabaaa \Rightarrow ... \Rightarrow aaabbbbaaa \Rightarrow aaabbbabaa \Rightarrow ... \Rightarrow aaaabbbbaa \Rightarrow aaaabbbaba \Rightarrow ... \Rightarrow$
$aaaaabbbba \Rightarrow aaaaabbbab \Rightarrow ... \Rightarrow aaaaaabbbb \Rightarrow aaaaaabbb \Rightarrow ... \Rightarrow aaaaaa \Rightarrow aaaaa \Rightarrow ... \Rightarrow \epsilon$
h) $bababaaabb \Rightarrow abbabaaabb \Rightarrow ababbaaabb \Rightarrow aabbbaaabb \Rightarrow aabbabaabb \Rightarrow ... \Rightarrow aaabbbaabb \Rightarrow$
$aaabbababb \Rightarrow aaababbabb \Rightarrow aaaabbbabb \Rightarrow aaaabbabbb \Rightarrow ... \Rightarrow aaaaabbbbb \Rightarrow aaaaabbbb \Rightarrow ... \Rightarrow$

$aaaaa \Rightarrow aaaa \Rightarrow ... \Rightarrow \epsilon$

5) $\begin{cases} aa \to a \\ bb \to b \\ ab \to b \\ a \to .\varepsilon \end{cases}$

a) $aaaa \Rightarrow aaa \Rightarrow aa \Rightarrow a \Rightarrow \epsilon$
b) $bbbbb \Rightarrow bbbb \Rightarrow bbb \Rightarrow bb \Rightarrow b$
c) ϵ
d) $ababababa \Rightarrow babababa \Rightarrow bbababa \Rightarrow bababa \Rightarrow bbaba \Rightarrow baba \Rightarrow bba \Rightarrow ba \Rightarrow b$
e) $bbbabaaabbb \Rightarrow bbbabaabbb \Rightarrow bbbababbb \Rightarrow bbababbb \Rightarrow babab b \Rightarrow bababb \Rightarrow babab \Rightarrow bbab \Rightarrow bab \Rightarrow bb \Rightarrow b$
f) $aabbaaabbba \Rightarrow abbaaabbba \Rightarrow abbaabbba \Rightarrow abbabbba \Rightarrow ababbba \Rightarrow ababba \Rightarrow ababa \Rightarrow baba \Rightarrow bba \Rightarrow ba \Rightarrow b$
g) $bbababaaaa \Rightarrow bbababaaa \Rightarrow bbababaa \Rightarrow bbababa \Rightarrow bababa \Rightarrow bbaba \Rightarrow baba \Rightarrow bba \Rightarrow ba \Rightarrow b$
h) $bababaaabb \Rightarrow bababaabb \Rightarrow bababab b \Rightarrow bababab \Rightarrow bbabab \Rightarrow babab \Rightarrow bbab \Rightarrow bab \Rightarrow bb \Rightarrow b$

6) $\begin{cases} aa \to a \\ b \to bb \\ a \to .b \end{cases}$

a) $aaaa \Rightarrow aaa \Rightarrow aa \Rightarrow a \Rightarrow b$
b) $bbbbb \Rightarrow bbbbbb \Rightarrow bbbbbbb \Rightarrow ...$
c) ϵ
d) $ababababa \Rightarrow abbabababa \Rightarrow abbbabababa \Rightarrow ...$
e) $bbbabaaabbb \Rightarrow bbbabaabbb \Rightarrow bbbababbb \Rightarrow bbbbababbb \Rightarrow bbbbbababbb \Rightarrow ...$
f) $aabbaaabbba \Rightarrow abbaaabbba \Rightarrow abbaabbba \Rightarrow abbabbba \Rightarrow abbbabbba \Rightarrow abbbbabbba \Rightarrow ...$
g) $bbababaaaa \Rightarrow bbababaaa \Rightarrow bbababaa \Rightarrow bbababa \Rightarrow bbbababa \Rightarrow bbbbababa \Rightarrow ...$
h) $bababaaabb \Rightarrow bababaabb \Rightarrow bababab b \Rightarrow bbababab b \Rightarrow bbbababab b \Rightarrow ...$