PES UNIVERSITY, Bangalore

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Department of Computer Science & Engineering

Automata Formal Languages & Logic

Unit 3

Chomsky Normal Norm

1) Convert the following CFG into an equivalent CFG in Chomsky normal form
   $S \rightarrow ASA \mid B \mid \lambda$
   $A \rightarrow 00 \mid \lambda$
2) Convert the following grammar to Chomsky Normal Form
   $S \rightarrow X \mid X\,Y\,a \mid X\,b\,X$
   $X \rightarrow X\,a \mid \lambda$
   $Y \rightarrow Y\,b \mid YZ$
   $Z \rightarrow Z\,Y \mid Z\,X \mid b\,Y$

3) If G is the grammar in CNF, then fill the following table

w	|w|	Length of derivation	Max depth of the tree	Min depth of the tree
λ				
a_1				
a_1a_2				
$a_1a_2a_3$				
$a_1a_2a_3\ a_4$				
$a_1a_2a_3\ a_4\ a_5$				
$a_1a_2a_3\ a_4\ a_5\ a_6$				

4) Convert the following CFG to CNF
   S → aAa | bBb | BB
   A → C
   B → S | A
   C → S | λ

5) Design a CNF grammar for the set of strings of balanced parentheses.

CYK

1) Determine whether the string 00111 is the member of the language generated by the grammar
   S → XY
   X →YY | 0
   Y → XY | 1

2) Determine whether the string 0011 is the member of the language generated by the grammar
   S → XY
   X →YY | 0
   Y → XY | 1
3) Determine whether the string 11000 is the member of the language generated by the grammar
   S →PQ | QR
   P →QP | 0
   Q →RR | 1
   R→PQ |0

4) Determine whether the string 00000 is the member of the language generated by the grammar
   S →PQ | QR
   P →QP | 0
   Q →RR | 1
   R→PQ |0
5) Determine whether the string aabbbcc is the member of the language generated by the grammar
   S -> AB

A -> CD | CF
B -> c | EB
C -> a
D -> b
E -> c
F -> AD

Greibach Normal Form

1) Give the relationship between the length of a string and the length of its derivation if the grammar is given in GNF?
2) Convert the grammar into Greibach normal form.
   S → XY1|0
   X → 00X|Y
   Y → 1X1| λ
3) Convert the following grammar G into Greibach Normal Form (GNF)
   S → CA|BB
   B → b|cB
   C → b
   A → a

4) Consider the following CFG, find the number of productions in the grammar after it is converted into Greibach normal form.
   S → XX| a
   X → aaS | b

5) Convert the grammar
   S → XY1 | 0
   X → 00X | 1
   Y → 1X1 | 1YY | XYY | 0

CFG to PDA

1) Construct PDA for the following grammar
   S → 00S1 | 0S01 | 01S0 | 0S10 | 10S0 | 1S00 | λ

2) Give an instantaneous description to show that the grammar below accepts the string 000010101000100011

S → 00S1 | 0S01 | 01S0 | 0S10 | 10S0 | 1S00 | λ

3) Construct PDA for the following grammar
   S → 0AB1
   A → BAS | λ
   B → 0 | 1

4) Construct PDA for the following
   S → 0XYX | 0YY
   X → 1X | 1
   Y → 2Y | 2

5) Construct PDA for the following
   S → aSb | a| b | λ