



**PES UNIVERSITY, Bangalore**  
(Established under Karnataka Act No. 16 of 2013)  
**Department of Computer Science & Engineering**

**Automata Formal Languages & Logic**

**Question Bank - Unit 3**

**Questions from the Prescribed Textbook**

Topic	Exercise No.	Question No's
Chomsky Normal Form	6.1 6.2	1,6-11, 17, 19 1-5
Greibach Normal Form	6.2	10-13
CYK Algorithm	6.3	1-4
CFG to PDA	7.1	1-4, 6-8,

**Extra Questions**

**Chomsky Normal Form**

Convert the following grammar to Chomsky Normal Form

- 1)  $S \rightarrow abS \mid baS \mid \lambda$
- 2)  $S \rightarrow a \mid aA \mid B \mid C, A \rightarrow aB \mid \lambda, B \rightarrow Aa, C \rightarrow cCD, D \rightarrow add$
- 3)  $S \rightarrow A \mid aB \mid \lambda, A \rightarrow aA \mid B, B \rightarrow bB \mid C, C \rightarrow c \mid A$
- 4)  $S \rightarrow BAB, B \rightarrow bba, A \rightarrow Bc$
- 5)  $S \rightarrow ASA \mid aB, A \rightarrow B \mid S, B \rightarrow b \mid \epsilon$

**Greibach Normal Form**

Convert the following grammar to Greibach Normal Form

- 1)  $S \rightarrow Sab \mid Sba \mid \lambda$
- 2)  $S \rightarrow AB, A \rightarrow aA \mid bB \mid b, B \rightarrow b$
- 3)  $S \rightarrow abSb \mid aa$
- 4)  $S \rightarrow aSb \mid ab$
- 5)  $S \rightarrow A, A \rightarrow aBa \mid a, B \rightarrow bAb \mid b$



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**CYK Algorithm**

Apply CYK - algorithm to verify the given string (s) can be derived from the below grammar

- 1)  $S \rightarrow 00S11 \mid 11S00 \mid \lambda, w = 00111100$
- 2)  $S \rightarrow 0S1 \mid 1S0 \mid SS \mid \lambda, w = 00011110$
- 3)  $S \rightarrow AB, A \rightarrow BB \mid a, B \rightarrow AB \mid b, w = aabbbb, aabb, aabba, abbbb$
- 4)  $S \rightarrow AB, A \rightarrow BB \mid a, B \rightarrow AB \mid b, w = aabbb$
- 5)  $S \rightarrow AB \mid BC, A \rightarrow BA \mid a, B \rightarrow CC \mid b, C \rightarrow AB \mid a, w \text{ is } baaba$   
(<https://web.cs.ucdavis.edu/~rogaway/classes/120/winter12/CYK.pdf>)

**CFG to PDA**

Convert the following CFG to PDA

- 1)  $S \rightarrow aSA \mid \lambda, A \rightarrow bB, B \rightarrow b$
- 2)  $S \rightarrow 0S1 \mid A, A \rightarrow 1A0 \mid S \mid \lambda$
- 3)  $S \rightarrow aA, A \rightarrow aABC \mid bB \mid a, B \rightarrow b, C \rightarrow c$ . Show how aaabc is accepted.
- 4)  $S \rightarrow 0AA, A \rightarrow 0S \mid 1S \mid 0$
- 5)  $S \rightarrow aA \mid bB \mid cC, A \rightarrow Sa, B \rightarrow Sb, C \rightarrow \lambda$