

GLA University, Mathura

Department of Computer Engineering & Applications

Course: B. Tech CSE Year: 3rd

Subject: TAFL (BCSE0011)

Assignment: 2 (Module: 2)

Note:

1. You have to submit your assignment on university portal along with your class roll no. and name in each pages.
2. Choose your assignment set according to your Roll No.

SET:1 (Roll No. 1 to 5)

Q1: Convert the following two CFG into CNF.

$G1 = \{S \rightarrow a, S \rightarrow AZ, A \rightarrow a, Z \rightarrow z\}$

$G2 = \{S \rightarrow a, S \rightarrow aZ, Z \rightarrow a\}$

Q2. Given the following ambiguous context free grammar

$S \rightarrow Ab \mid aaB$

$A \rightarrow a \mid Aa$

$B \rightarrow b$

- (a) Find the strings generated by the grammar that has two leftmost derivations. Show the derivations.
- (b) Show the two derivation trees for the strings.

Q3: Construct PDA for the given CFG, and test whether 0104 is acceptable by this PDA.

$S \rightarrow 0BB$

$B \rightarrow 0S \mid 1S \mid 0$

Q4. State and prove pumping lemma for CFG. Prove that the given language is not context free:

i) $L = \{a^i b^j c^i d^j \mid i, j \geq 0\}$

ii) $L = \{a^i b^i c^i \mid i \geq 1\}$

Q5. Eliminate null productions

i) $S \rightarrow aSb \mid aAb \mid ab \mid a$

$A \rightarrow \epsilon$

ii) $S \rightarrow aXbX$

$X \rightarrow aY \mid bY \mid \epsilon$

$Y \rightarrow X \mid d$

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SET:2 (Roll No. 6 to 10)

Q1. Prove that given grammar is ambiguous

$S \rightarrow 0s/1AA$

$A \rightarrow 0/1A/0B$

$B \rightarrow 1/0BB$ for string 0100110

Q2. For the grammar $S \rightarrow aAS/a$, $A \rightarrow SbA/SS/ba$. To generate the string aabaaabbbaa find:

a. LMD

b. RMD

c. Parse tree

Q3: Construct PDA for the given CFG, and test whether 0104 is acceptable by this PDA.

$S \rightarrow 0BB$

$B \rightarrow 0S \mid 1S \mid 0$

Q4. Reduce the given CFG into CNF

i) $S \rightarrow bA/aB$

$A \rightarrow bAA/aS/a$

$B \rightarrow aBB/bS/b$

ii) $S \rightarrow ASA/bA$

$A \rightarrow B/S$

$B \rightarrow a$

Q5. Convert the grammar into GNF

i) $S \rightarrow AB$

$A \rightarrow BS/a$

$B \rightarrow SA/b$

ii) $S \rightarrow ABb/a$

$A \rightarrow aaA$

$B \rightarrow bAb$

SET:3 (Roll No. 11to 15)

Q1. Eliminate unit production from the given grammar

$S \rightarrow AB, A \rightarrow a, B \rightarrow C/b, C \rightarrow D, D \rightarrow E, E \rightarrow a$

Q2. Remove the useless symbol from the given context free grammar:

$S \rightarrow aB/bX$

$A \rightarrow BAd/bSX/a$

$B \rightarrow aSB/bBX$

$X \rightarrow SBD/aBx/ad$

Q3: Construct PDA for the given CFG, and test whether 0104 is acceptable by this PDA.

$S \rightarrow 0BB$

$B \rightarrow 0S \mid 1S \mid 0$

Q4. Consider a context free grammar G with the following productions:

$S \rightarrow 1S1 / T$

$T \rightarrow 1X1 / X$

$$X \rightarrow 0 X 0 / 1.$$

i) Write four strings of $L(G)$.

ii) Give an example of a string $w \in \{0,1\}^+$ such that $|w| > 7$ and $w \notin L(G)$.

Q5: Convert the following two CFG into GNF.

$$G1 = \{S \rightarrow aAbB, B \rightarrow bBb, A \rightarrow aAa\}$$

$$G2 = \{S \rightarrow aAbB, B \rightarrow bB\epsilon, A \rightarrow aA\epsilon\}$$

SET:4 (Roll No. 16 to 20)

Q1: Convert the following two CFG into CNF.

$$G1 = \{S \rightarrow a, S \rightarrow AZ, A \rightarrow a, Z \rightarrow z\}$$

$$G2 = \{S \rightarrow a, S \rightarrow aZ, Z \rightarrow a\}$$

Q2: Convert the following grammar to a PDA that accepts the same language.

$$S \rightarrow 0S1 \mid A$$

$$A \rightarrow 1A0 \mid S \mid \epsilon$$

Q3: Construct PDA for the given CFG, and test whether 0104 is acceptable by this PDA.

$$S \rightarrow 0BB$$

$$B \rightarrow 0S \mid 1S \mid 0$$

Q4. Eliminate null productions

i) $S \rightarrow aSb/aAb/ab/a$

$$A \rightarrow \epsilon$$

ii) $S \rightarrow aXbX$

$$X \rightarrow aY/bY/\epsilon$$

$$Y \rightarrow X/d$$

Q5. Given the following ambiguous context free grammar

$$S \rightarrow Ab \mid aaB$$

$$A \rightarrow a \mid Aa$$

$$B \rightarrow b$$

(a) Find the strings generated by the grammar that has two leftmost derivations. Show the derivations.

(b) Show the two derivation trees for the strings.

SET:5 (Roll No. 21 to 25)

Q1. Explain why the given grammar is ambiguous.

$$S \rightarrow 0A \mid 1B$$

$$A \rightarrow 0AA \mid 1S \mid 1$$

$$B \rightarrow 1BB \mid 0S \mid 0$$

Q2. Eliminate unit production from the given grammar and convert it into GNF.

$$E \rightarrow E+T/T$$

$$T \rightarrow T*F/F$$

$$F \rightarrow (E)/a$$

Q3: Construct PDA for the given CFG, and test whether 0104 is acceptable by this PDA.

$$S \rightarrow 0BB$$

$$B \rightarrow 0S \mid 1S \mid 0$$

Q4: Convert the following two CFG into CNF.

$$G1 = \{S \rightarrow a, S \rightarrow AZ, A \rightarrow a, Z \rightarrow z\}$$

$$G2 = \{S \rightarrow a, S \rightarrow aZ, Z \rightarrow a\}$$

Q5: Convert the following two CFG into GNF.

$$G1 = \{S \rightarrow aAbB, B \rightarrow bBb, A \rightarrow aAa\}$$

$$G2 = \{S \rightarrow aAbB, B \rightarrow bB\epsilon, A \rightarrow aA\epsilon\}$$

SET:6 (Roll No. 26 to 30)

Q1: Construct PDA for the given CFG, and test whether 0104 is acceptable by this PDA.

$$S \rightarrow 0BB$$

$$B \rightarrow 0S \mid 1S \mid 0$$

Q2: Draw a PDA for the CFG given below:

$$S \rightarrow aSb$$

$$S \rightarrow a \mid b \mid \epsilon$$

Q3. State and prove pumping lemma for CFG. Prove that the given language is not context free:

$$i) L = \{a^i b^j c^i d^j \mid i, j \geq 0\}$$

$$ii) L = \{a^i b^j c^i \mid i \geq 1\}$$

Q4: Convert the following two CFG into CNF.

$$G1 = \{S \rightarrow a, S \rightarrow AZ, A \rightarrow a, Z \rightarrow z\}$$

$$G2 = \{S \rightarrow a, S \rightarrow aZ, Z \rightarrow a\}$$

Q5: Construct PDA for the given CFG, and test whether 0104 is acceptable by this PDA.

$$S \rightarrow 0BB$$

$$B \rightarrow 0S \mid 1S \mid 0$$

SET:7 (Roll No. 31 to 35)

Q1. Reduce the given CFG into CNF

$$i) S \rightarrow bA/aB$$

$$A \rightarrow bAA/aS/a$$

$$B \rightarrow aBB/bS/b$$

ii) $S \rightarrow ASA/bA$

$A \rightarrow B/S$

$B \rightarrow a$

Q2: Construct PDA for the given CFG, and test whether 0104 is acceptable by this PDA.

$S \rightarrow 0BB$

$B \rightarrow 0S \mid 1S \mid 0$

Q3. Prove that given grammar is ambiguous

$S \rightarrow 0s/1AA$

$A \rightarrow 0/1A/0B$

Q4. State and prove pumping lemma for CFG. Prove that the given language is not context free:

i) $L = \{a^i b^j c^i d^j \mid i, j \geq 0\}$

ii) $L = \{a^i b^i c^i \mid i \geq 1\}$

Q5. Convert the grammar into GNF

i) $S \rightarrow AB$

$A \rightarrow BS/a$

$B \rightarrow SA/b$

ii) $S \rightarrow ABb/a$

$A \rightarrow aaA$

$B \rightarrow bAb$

SET:8 (Roll No. 36 to 40)

Q1: Convert the following two CFG into CNF.

$G1 = \{S \rightarrow a, S \rightarrow AZ, A \rightarrow a, Z \rightarrow z\}$

$G2 = \{S \rightarrow a, S \rightarrow aZ, Z \rightarrow a\}$

Q2. Given the following ambiguous context free grammar

$S \rightarrow Ab \mid aaB$

$A \rightarrow a \mid Aa$

$B \rightarrow b$

(a) Find the strings generated by the grammar that has two leftmost derivations. Show the derivations.

(b) Show the two derivation trees for the strings.

Q3: Construct PDA for the given CFG, and test whether 0104 is acceptable by this PDA.

$S \rightarrow 0BB$

$B \rightarrow 0S \mid 1S \mid 0$

Q4. State and prove pumping lemma for CFG. Prove that the given language is not context free:

i) $L = \{a^i b^j c^i d^j \mid i, j \geq 0\}$

ii) $L = \{a^i b^i c^i \mid i \geq 1\}$

Q5. Eliminate null productions

i) $S \rightarrow aSb/aAb/ab/a$

- $A \rightarrow \epsilon$
 ii) $S \rightarrow aXbX$
 $X \rightarrow aY/bY/\epsilon$
 $Y \rightarrow X/d$

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SET:9 (Roll No. 41 to 45)

Q1. Prove that given grammar is ambiguous

- $S \rightarrow 0s/1AA$
 $A \rightarrow 0/1A/0B$
 $B \rightarrow 1/0BB$ for string 0100110

Q2. For the grammar $S \rightarrow aAS/a$, $A \rightarrow SbA/SS/ba$. To generate the string aabaaabbbaaa find:

- a. LMD
 b. RMD
 c. Parse tree

Q3: Construct PDA for the given CFG, and test whether 0104 is acceptable by this PDA.

- $S \rightarrow 0BB$
 $B \rightarrow 0S \mid 1S \mid 0$

Q4. Reduce the given CFG into CNF

- i) $S \rightarrow bA/aB$
 $A \rightarrow bAA/aS/a$
 $B \rightarrow aBB/bS/b$
 ii) $S \rightarrow ASA/bA$
 $A \rightarrow B/S$
 $B \rightarrow a$

Q5. Convert the grammar into GNF

- i) $S \rightarrow AB$
 $A \rightarrow BS/a$
 $B \rightarrow SA/b$
 ii) $S \rightarrow ABb/a$
 $A \rightarrow aaA$
 $B \rightarrow bAb$

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SET:10 (Roll No. 46 to 50)

Q1. Eliminate unit production from the given grammar

- $S \rightarrow AB, A \rightarrow a, B \rightarrow C/b, C \rightarrow D, D \rightarrow E, E \rightarrow a$

Q2. Remove the useless symbol from the given context free grammar:

- $S \rightarrow aB/bX$
 $A \rightarrow BAd/bSX/a$
 $B \rightarrow aSB/bBX$
 $X \rightarrow SBD/aBx/ad$

Q3: Construct PDA for the given CFG, and test whether 0104 is acceptable by this PDA.

$$S \rightarrow 0BB$$

$$B \rightarrow 0S \mid 1S \mid 0$$

Q4. Consider a context free grammar G with the following productions:

$$S \rightarrow 1S1 \mid T$$

$$T \rightarrow 1X1 \mid X$$

$$X \rightarrow 0X0 \mid 1.$$

i) Write four strings of $L(G)$.

ii) Give an example of a string $w \in \{0,1\}^+$ such that $|w| > 7$ and $w \notin L(G)$.

Q5: Convert the following two CFG into GNF.

$$G1 = \{S \rightarrow aAbB, B \rightarrow bBb, A \rightarrow aAa\}$$

$$G2 = \{S \rightarrow aAbB, B \rightarrow bB\epsilon, A \rightarrow aA\epsilon\}$$

SET:11 (Roll No. 51 to 55)

Q1: Convert the following two CFG into CNF.

$$G1 = \{S \rightarrow a, S \rightarrow AZ, A \rightarrow a, Z \rightarrow z\}$$

$$G2 = \{S \rightarrow a, S \rightarrow aZ, Z \rightarrow a\}$$

Q2: Convert the following grammar to a PDA that accepts the same language.

$$S \rightarrow 0S1 \mid A$$

$$A \rightarrow 1A0 \mid S \mid \epsilon$$

Q3: Construct PDA for the given CFG, and test whether 0104 is acceptable by this PDA.

$$S \rightarrow 0BB$$

$$B \rightarrow 0S \mid 1S \mid 0$$

Q4. Eliminate null productions

i) $S \rightarrow aSb \mid aAb \mid ab \mid a$

$$A \rightarrow \epsilon$$

ii) $S \rightarrow aXbX$

$$X \rightarrow aY \mid bY \mid \epsilon$$

$$Y \rightarrow X \mid d$$

Q5. Given the following ambiguous context free grammar

$$S \rightarrow Ab \mid aaB$$

$$A \rightarrow a \mid Aa$$

$$B \rightarrow b$$

(a) Find the strings generated by the grammar that has two leftmost derivations. Show the derivations.

(b) Show the two derivation trees for the strings.

SET:12 (Roll No. 56 to 60)

Q1. Explain why the given grammar is ambiguous.

$$S \rightarrow 0A \mid 1B$$

$$A \rightarrow 0AA \mid 1S \mid 1$$

$$B \rightarrow 1BB \mid 0S \mid 0$$

Q2. Eliminate unit production from the given grammar and convert it into GNF.

$$E \rightarrow E+T/T$$

$$T \rightarrow T*F/F$$

$$F \rightarrow (E)/a$$

Q3: Construct PDA for the given CFG, and test whether 0104 is acceptable by this PDA.

$$S \rightarrow 0BB$$

$$B \rightarrow 0S \mid 1S \mid 0$$

Q4: Convert the following two CFG into CNF.

$$G1 = \{S \rightarrow a, S \rightarrow AZ, A \rightarrow a, Z \rightarrow z\}$$

$$G2 = \{S \rightarrow a, S \rightarrow aZ, Z \rightarrow a\}$$

Q5: Convert the following two CFG into GNF.

$$G1 = \{S \rightarrow aAbB, B \rightarrow bBb, A \rightarrow aAa\}$$

$$G2 = \{S \rightarrow aAbB, B \rightarrow bB\epsilon, A \rightarrow aA\epsilon\}$$

SET:13(Roll No. 61 to 65)

Q1: Construct PDA for the given CFG, and test whether 0104 is acceptable by this PDA.

$$S \rightarrow 0BB$$

$$B \rightarrow 0S \mid 1S \mid 0$$

Q2: Draw a PDA for the CFG given below:

$$S \rightarrow aSb$$

$$S \rightarrow a \mid b \mid \epsilon$$

Q3. State and prove pumping lemma for CFG. Prove that the given language is not context free:

$$i) L = \{a^i b^j c^i d^j \mid i, j \geq 0\}$$

$$ii) L = \{a^i b^j c^i \mid i \geq 1\}$$

Q4: Convert the following two CFG into CNF.

$$G1 = \{S \rightarrow a, S \rightarrow AZ, A \rightarrow a, Z \rightarrow z\}$$

$$G2 = \{S \rightarrow a, S \rightarrow aZ, Z \rightarrow a\}$$

Q5: Construct PDA for the given CFG, and test whether 0104 is acceptable by this PDA.

$$S \rightarrow 0BB$$

$$B \rightarrow 0S \mid 1S \mid 0$$

SET:14 (Roll No. 66 to 70)

Q1. Reduce the given CFG into CNF

- i) $S \rightarrow bA/aB$
 $A \rightarrow bAA/aS/a$
 $B \rightarrow aBB/bS/b$
- ii) $S \rightarrow ASA/bA$
 $A \rightarrow B/S$
 $B \rightarrow a$

Q2: Construct PDA for the given CFG, and test whether 0104 is acceptable by this PDA.

- $S \rightarrow 0BB$
- $B \rightarrow 0S \mid 1S \mid 0$

Q3. Prove that given grammar is ambiguous

- $S \rightarrow 0s/1AA$
- $A \rightarrow 0/1A/0B$

Q4. State and prove pumping lemma for CFG. Prove that the given language is not context free:

- i) $L = \{a^i b^j c^i d^j \mid i, j \geq 0\}$
- ii) $L = \{a^i b^j c^i \mid i \geq 1\}$

Q5. Convert the grammar into GNF

- i) $S \rightarrow AB$
 $A \rightarrow BS/a$
 $B \rightarrow SA/b$
- ii) $S \rightarrow ABb/a$
 $A \rightarrow aaA$
 $B \rightarrow bAb$

SET:15 (Roll No. 71 to 80)

Q1. Explain why the given grammar is ambiguous.

- $S \rightarrow 0A \mid 1B$
- $A \rightarrow 0AA \mid 1S \mid 1$
- $B \rightarrow 1BB \mid 0S \mid 0$

Q2. Eliminate unit production from the given grammar and convert it into GNF.

- $E \rightarrow E+T/T$
- $T \rightarrow T * F / F$
- $F \rightarrow (E) / a$

Q3: Construct PDA for the given CFG, and test whether 0104 is acceptable by this PDA.

- $S \rightarrow 0BB$
- $B \rightarrow 0S \mid 1S \mid 0$

Q4: Convert the following two CFG into CNF.

- $G1 = \{S \rightarrow a, S \rightarrow AZ, A \rightarrow a, Z \rightarrow z\}$
- $G2 = \{S \rightarrow a, S \rightarrow aZ, Z \rightarrow a\}$

Q5: Convert the following two CFG into GNF.

$G1 = \{S \rightarrow aAbB, B \rightarrow bB|b, A \rightarrow aA|a\}$

$G2 = \{S \rightarrow aAbB, B \rightarrow bB|\epsilon, A \rightarrow aA|\epsilon\}$

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