GANPAT UNIVERSITY
U.V.PATEL COLLEGE OF ENGINEERING
2CEIT601 : THEORY OF COMPUTATION

ASSIGNMENT - 2

Unit-4: Regular Language and Finite Automata

1. Describe pumping lemma for regular language. Prove that $\mathbf{L = \{a^i b^i \mid i \geq 0\}}$ is not regular.
2. Explain Closure property of Regular languages.

Unit-5 & 6: Context-free languages and pushdown automata

1. Explain Types of Formal Grammar. Write Chomsky hierarchy of grammar.
2. Explain Ambiguous Grammar and check that the given grammar is ambiguous or not.

(1) **S -> SbS | a**

(2) **S → aSb | SS**
S → ε

(3) **A → AA**
A → (A)
A → a

(4) **S → XY**
X → X0 | 0
Y → 1

(5) **E →E+T/T**
T→T*F/F
F→id

3. Convert the given Context free grammar (CFG) into Chomsky normal form (CNF)

1) **S → ASB**
A → aAS|a|ε
B → SbS|A|bb

2) **S → a | aA | B**
A → aBB | ε
B → Aa | b

3) **S->AAA|B**
A->aA|B
B-> ε

4) **S->bA/aB**
A->bAA/aS/a
B->aBB/bS/b

4. Explain Closure properties of CFLs.

5. Write the Context Free Grammar for the given languages
   (1) L= $\{a^n b^m a^{2n} \mid n, m \geq 0\}$
   (2) L= {Set of all Balanced Parenthesis.}
   (3) L={ Set of all palindromes over a's & b's}
   (4) L= $\{ a^i b^j c^k \mid i, j, k \geq 0 \text{ and } i = j + k \}$
   (5) L= $\{a^i b^j \mid i <= j\}$

6. Define the Push Down Automata and construct Push Down Automata for the given language & also Constuct transition table.
   L(G)={ WW^R lW € (a,b)*. and W^R is the reverse of word W}

7. Construct Push Down Automata for the given language
   $D = \{ a^i b^j c^k \mid i, j, k \geq 0, \text{ and } i = j \text{ or } j = k \}$

8 Construct Push Down Automata & transition table for $L=\{x \in \{a,b\}^* \mid n_a(x) \neq n_b(x)\}$ (i.e number of a's are not equal to number of b).

9 Construct Push Down Automata for the given language
   (1) LL={ Design PDA to accept string with more a's than b's}
   (2) L= $\{a^n b^{n+m} c^m \mid n, m \geq 1\}$

Submit the assignment on or before 10/05/2024