Capital University of Science and Technology

Department of Computer Science

CS3613 – Theory of Automata and Formal Languages

ASSIGNMENT NO. 3

Semester: Fall 2022 **Max Marks:** 10

Instructor: Hashim Ayub

Assigned Date: 20 Dec 2022 **Due Date: 26 Dec 2022**

Name: **Reg. No.**

PROBLEMS

1. Consider the Context Free Grammar: **S → aSa | bb | b**

   Prove that this generates the language defined by the regular expression

   a * bbb

2. Consider the following CFG:

   S → XWG

   X → aX | bX | G

   W → bb | aa | bW | aW

   G → aG | bG

   Prove that this generates the language of all strings with a triple b in them which is the language defined by (a + b)*bbb(a + b)*

3. Consider the following CFG:

   S → aX

   X → aX | bX | A

   What is the language of this CFG that will be generated?

4. What is the language this CFG will be generating while considering the

following CFG:

$S \rightarrow XaXaX$

$X \rightarrow aX \mid bX \mid A$

5. Consider the CFG:
   S → SS 1 XaXaX 1 A
   X → bX IAProve that X can generate any b*.

6. Show that the set $L=\{a^n b^n \mid n>=1\}$ is not a regular.

7. Consider a grammar G is given as follows

$S \rightarrow AB \mid aaB$

$A \rightarrow a \mid Aa$

$B \rightarrow b$

Determine whether the grammar G is ambiguous or not. If G is ambiguous, construct an unambiguous grammar equivalent to G.

8. Simplify the following grammar

$S \rightarrow aAa \mid bBb \mid BB$

$A \rightarrow C$

$B \rightarrow S \mid A$

$C \rightarrow S \mid \varepsilon$

9. Discuss in detail about ambiguous grammar and removing ambiguity from grammar.

10. Construct a derivation tree for the string 0011000 using the grammar

$S \rightarrow A0S \mid 0 \mid SS$

$A \rightarrow S1A \mid 10$