Instructor: Muhammad Aizaz Akmal Email: aizaz.akmal@uet.edu.pk

# Assignment 1


Spring 2024

## Theory of Automata

Department of Computer Science

**University of Engineering and Technology, Lahore (New Campus)**

**Instructor: Muhammad Aizaz Akmal** **Email: aizaz.akmal@uet.edu.pk**

**Note: You have to submit the handwritten copy of this assignment before the due date. Make sure A4 size blank paper should be used to solve the assignment**

**Deadline: 6th May**

**Problem 1: Prove that the given languages are regular by using Myhill Nerode Theorem. [05]**

a) String of odd length over input alphabet ∑= {a, b}
b) String of $a^n b^m c^p$ over input alphabet ∑= {a, b, c}. where n, m, p >= 0

**Problem 2: Prove that the given languages are non-regular by using Pumping Lemma. [05]**

a) The language of balanced parenthesis over input alphabet ∑= { (, ) }.
b) The strings of a's and b's which more number of b's than a's.

**Problem 3: Prove that the languages L1 and L2 accept the same the same language. [05]**

L1: (aa + ab + ba + bb)*
L2: ((ba + ab)* (aa + bb)*)*

**Problem 4: Write the context free grammar for the following languages. [03]**

a) $a^n b^m$ where m > n.
b) c++ assignment statement.
c) Equal numbers of a's and b's.
d) start and end with same letter

**Problem 5: Convert the following CFG into CNF. [03]**

a) *S* -> a*X*b*X*
*X* -> a*Y* | b*Y* |∈
*Y* -> *X* |c

*b)* *S -> bA |aB| C*
*A -> bAA|aS | a*
*B -> aBB| bS |b|∈*
*C-> a | c*

**Problem 6: Construct the Push Down Automata (PDA) of the following given languages. [03]**

a) String which contain equal a's and b's regardless of their order.
b) String in which a's are more than b's.