AlgorithmToolkit – Mini Project 3

Single-File Java Implementation of Common DSA Algorithms

1. Objective

To combine essential Data Structures and Algorithms into a single, reusable Java toolkit.

2. Project Description

This project contains one Java file: AlgorithmToolkit.java which includes:

SortingUtil

• Bubble Sort

• Insertion Sort

• Merge Sort

• Quick Sort

SearchUtil

• Linear Search

• Binary Search

CollectionUtil

• Generic Stack (Linked List)

• Generic Queue (Linked List)

AnalysisUtil

• Measure execution time

• Benchmark algorithms

Main Method

• Includes minimum 2 test cases per method

• Prints results and success messages

3. Features

• Self-contained in a single file

• Clean and documented algorithms

• All methods tested

• Custom Stack & Queue

• Benchmark utility included

4. Time Complexities

Sorting Algorithms:

Bubble Sort - $O(n^2)$

Insertion Sort - $O(n^2)$

Merge Sort - O(n log n)

Quick Sort - O(n log n) average

Searching Algorithms:

Linear Search - O(n)

Binary Search - O(log n)

Stack / Queue operations:

All O(1)

5. How to Run

Command Line:

javac AlgorithmToolkit.java

java AlgorithmToolkit

6. Sample Output

[1, 2, 5, 5, 6, 9]

[1, 2, 5, 5, 6, 9]

[PASS] Sorting Algorithms

Linear Search 5 → 2

Binary Search 7 → 3

[PASS] Searching Algorithms

Stack pop → 30

[PASS] Queue

MergeSort time: 0 ms

QuickSort average: 0.0 ms

[PASS] Analysis Util

All tests completed.

7. Project Structure

AlgorithmToolkit.java

README.md

8. Requirements

• JDK 8+

• Any Java IDE or terminal

9. Author

(Add your name, roll number, course)