Course- AI ASSISTED CODING

LAB TEST-04

HALL NO: 2403A52106

SET-A:

Question 1: Python to Java Translation

Task:

Write a Python program to calculate the factorial of a number using recursion.

Use an **AI-assisted code translator (such as ChatGPT, GitHub Copilot, or Google Gemini)** to convert the Python code into **Java**.

Instructions:

• Verify the correctness of the translated Java code by executing it.

• Identify and document at least **two syntactic or semantic differences** between Python and Java observed during translation.

• Optimize the Java code if needed and note the improvements

CODE IN PYTHON:

```
def factorial(n):
    """Calculates the factorial of a non-negative integer recursively."""
    if n == 0 or n == 1:
        return 1
    else:
        return n * factorial(n - 1)


# Example usage
number = 5
result = factorial(number)
print(f"The factorial of {number} is {result}")


number = 0
result = factorial(number)
```

```
print(f"The factorial of {number} is {result}")


number = 7
result = factorial(number)
print(f"The factorial of {number} is {result}")
```

Converted Java Code (Same Logic as Your Python Code):

```
public class FactorialExample {

    // Recursive method to calculate factorial
    public static int factorial(int n) {
        if (n == 0 || n == 1) {
            return 1;
        } else {
            return n * factorial(n - 1);
        }
    }

    public static void main(String[] args) {
        int number;

        number = 5;
        System.out.println("The factorial of " + number + " is " + factorial(number));

        number = 0;
        System.out.println("The factorial of " + number + " is " + factorial(number));

        number = 7;
        System.out.println("The factorial of " + number + " is " + factorial(number));
    }
}
```

OUTPUT:

```
The factorial of 5 is 120

The factorial of 0 is 1

The factorial of 7 is 5040
```

✅ Explanation of the Java Code

1. Class Definition

```
public class FactorialExample {
```

- **Every Java program must be inside a class.**
- **Here the class name is FactorialExample.**

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2. Recursive Method

```
public static int factorial(int n) {
```

- **This method calculates the factorial of a number.**
- **It returns an int value.**

✅ Base Condition

```
if (n == 0 || n == 1) {
   return 1;
}
```

- **Factorial of 0 and 1 is always 1.**
- **This stops the recursion from going forever.**

✅ Recursive Step

```
else {
   return n * factorial(n - 1);
}
```

- **For any number n > 1,**
  factorial(n) = n × factorial(n−1)
- **The function keeps calling itself until it reaches 1.**

---

3. main() Method (Program Starts Here)

public static void main(String[] args) {

- **This is the entry point of every Java program.**

☑ **Example 1**

number = 5;

System.out.println("The factorial of " + number + " is " + factorial(number));

- **Calls factorial(5)**
- **Output: 120**

☑ **Example 2**

number = 0;

System.out.println("The factorial of " + number + " is " + factorial(number));

- **factorial(0) = 1**

☑ **Example 3**

number = 7;

System.out.println("The factorial of " + number + " is " + factorial(number));

- **factorial(7) = 5040**

Question 2: C++ to Python Translation

Task:

Write a C++ program to sort an array of integers using the Bubble Sort algorithm.

Use an AI-assisted code translation tool to convert the C++ code into Python.

Instructions:

- **Run both versions and compare outputs for correctness.**
- **Identify one issue (if any) introduced by AI translation and fix it manually.**
- **Comment on the performance or readability differences between the two languages.**

C++ Program: Bubble Sort:

```
#include <iostream>
using namespace std;

int main() {
    int arr[] = {5, 2, 9, 1, 5, 6};
    int n = 6;

    // Bubble Sort
    for (int i = 0; i < n - 1; i++) {
        for (int j = 0; j < n - i - 1; j++) {
            if (arr[j] > arr[j + 1]) {
                // Swap
                int temp = arr[j];
                arr[j] = arr[j + 1];
                arr[j + 1] = temp;
            }
        }
    }
    // Output sorted array
    cout << "Sorted array: ";
    for (int i = 0; i < n; i++) {
        cout << arr[i] << " ";
    }

    return 0;
}
```

Python Version (AI-Translated from C++ Code):

```
arr = [5, 2, 9, 1, 5, 6]
n = len(arr)

# Bubble Sort
for i in range(n - 1):
    for j in range(n - i - 1):
        if arr[j] > arr[j + 1]:
            arr[j], arr[j + 1] = arr[j + 1], arr[j]  # Swap

# Output sorted array
print("Sorted array:", arr)
```

✅ Explanation of the C++ and Python Bubble Sort Programs

1. What the program does

Both the C++ and Python programs sort a list/array of integers using the Bubble Sort algorithm.

Bubble Sort works by:

- **Comparing each pair of adjacent elements**
- **Swapping them if they are in the wrong order**
- **Repeating this until the whole array is sorted**

✅ 2. How Bubble Sort works in the code

Outer loop:

Runs multiple passes through the list.

Inner loop:

Compares each pair arr[j] and arr[j+1].

Swap condition:

If left element > right element, swap them.

After each pass, the largest element "bubbles up" to the end.

✅ 3. AI Translation (C++ → Python)

The Python version is automatically generated from the C++ code.
It follows the same logic:

- **Loops translate to for loops**
- **Swapping in Python is simpler:**
- **arr[j], arr[j+1] = arr[j+1], arr[j]**

✅ 4. Output Comparison

Both languages correctly produce:

1 2 5 5 6 9

So the logic works the same in both.

✅ 5. Issue Found + Fix

The AI-translated Python code prints the list with brackets ([ ]).
To match C++ output format, we manually changed:

```
print("Sorted array:", *arr)
```

☑ 6. Performance & Readability

- **C++ is faster because it's compiled and uses static typing.**
- **Python is easier to read and write.**
- **Both have the same bubble sort time complexity: O(n^2).**