CISC 3115
Test-1

Please complete the test and submit it as a plain text email with the subject “CISC 3115 Test1” to nzhou@brooklyn.cuny.edu by midnight on Wednesday, February 24.

Question 1

What is the output of the following program?

class Q1 {
    public static void main(String[] args){
        Point p = new Point();
        int a[] = {1,2};
        int x, y;

        p.x = 1; p.y = 2;
        x = 1; y = 2;
        f(p, a, x++, --y);

        System.out.println("p.x = " + p.x);
        System.out.println("p.y = " + p.y);
        System.out.println("a[0] = " + a[0]);
        System.out.println("a[1] = " + a[1]);
        System.out.println("x = " + x);
        System.out.println("y = " + y);
    }
}

static void f(Point p, int[] a, int x, int y){
    System.out.println("in f x = " + x);
    System.out.println("in f y = " + y);
    p.x = 3; p.y = 4;
    a[0] = 3; a[1] = 4;
    x = 3; y = 4;
}

class Point {
    int x, y;
}
Question 2

Consider the following program:

class Q2 {
    public static void main(String[] args){
        System.out.println(f(5));
    }

    static long f(long n){
        if (n == 0)
            return 1;
        else if (n == 1)
            return 1;
        else
            return f(n-1) + f(n-2);
    }
}

1. What is the output of the program?

2. Depict the calls on the run-time stack when f(1) is encountered for the second time.
Question 3

An $n \times n$ BC-matrix is a square matrix of unique integers in the range from 1 to $n^2$, in which each row, each column, and each of the two corner-to-corner diagonals has the same sum. For example,

\[
\begin{array}{ccc}
2 & 9 & 4 \\
7 & 5 & 3 \\
6 & 1 & 8 \\
\end{array}
\]

is a $3 \times 3$ BC-matrix. Write a function of the following specification that takes a 2-dimensional array and returns true if and only if the array is a BC matrix.

```java
public static boolean bcMatrix(int[][] a);
```
Question 4

Consider the following functions:

```java
public static String f(String str){
    return f_aux(str, str.length());
}

static String f_aux(String str, int n){
    return (n == 0) ? "" : str.charAt(n-1) + f_aux(str, n-1);
}
```

1. Explain the behavior of the function \texttt{f}. For example, what is the return value of the function call \texttt{f("abc")}? 

2. Convert the function \texttt{f\_aux} to an iterative one that uses a loop.
Question 5 (extra 10 points)

Give two different implementations of the following function that converts a decimal number to a binary number as a string, one using loops and the other using recursion.

- public static String dec2bin(int value)

For example, the call dec2bin(12) returns "1100".