# Data Structures and Algorithms

# INFO 6205

# Homework 3

# Due: September 28, 2019

1. The Recursive operations for Factorial and Fibonacci sequence was discussed in class.

A) For factorial 6!a) Show recursive stack operations, provide details step-by-step, b**)** Walk through your stack operations and provide the result. c**)** Write Java code with input factorial 6! d**)** Compile and run your program, what is the running time of your algorithm?

B) For Fibonacci sequence with n=5, a) Show recursive stack operations, provide details step-by-step, b**)** Walk through your stack operations, provide the result. c) Provide Iterative algorithm for Fibonacci function, d**)** Write Java code for both recursive and iterative algorithms. e**)** Compile and Run your program.

C) For Towers of Hanoi problem with n=5 discs, how does the algorithm work? What data structures would you use? provide step by step operations. Write Java code, compile and run program.

5. Write a recursive method to sumDigits that has one integer parameter and returns the sum of the digits in the integer specified. The method should throw IllegalArgumentException if the integer specified is negative. For example, if the integer is 26497, then this method should return 28. Remember, your method should not use iterative loops.

6. Write a recursive method countStringBinary that has one integer parameter n and returns the number of binary strings of length n that do not have two consecutive 0's. For example, for n = 4, the number of binary strings of length 4 that do not contain two consecutive 1's is 2: 1111, 1110, 1101, 1011, 1010, 0111, 0110, 0101

7. An *n*-bit Gray code is a list of the 2*n* different *n*-bit binary numbers such that each entry in the list differs in precisely one bit from its predecessor. The *n* bit binary reflected Gray code is defined recursively. How does algorithm works for n=4, describe step-by-step. Write Java code, compile and run program.