## **COMP 258: Assignment 2 Weight: 10% Due Date: January 29**

Name: Dang Huy Doan

**Instructions:** Provide all answers to questions in this document. Submit the document in the provided drop box on Brightspace. The test is marked out of 40.

**Question 1**

In your own words describe the advantages of generic data structures over non-generic data structures. (5 Marks)

Answer: Generic data structures provide more flexibility than non-generic data structures because they can be used to store data of various types. They also offer a more concise notation and easier implementation, as they are not tied to a specific type of data. Furthermore, generic data structures can be easily adapted to fit the requirements of an application. Finally, they offer better scalability than non-generic data structures when it comes to adding or removing elements.

**Question 2**

**a)**

Given the following list of numbers: 50, 25, 75, 13, 33, 60, 88, 7, 19, 80, 101.

Create a graphic displaying the tree these numbers were inserted into a binary search tree in the order above. Insert the graphic into this document. (5 Marks)

**A picture containing chart

Description automatically generated**

**b)**

Do you consider the tree to be an efficiently structured tree? If yes, provide a sequence that would create an inefficiently structured tree. If no, provide a sequence that would create an efficiently structured tree. (5 Marks)

Answer: The tree above already balances and efficiently structured because the branches are balanced and doesn’t keep sprouting in 1 branch. Inefficiently tree will be like this with this order: [13, 7, 19, 25, 33, 50, 60, 75, 80, 88, 101]

Chart, scatter chart

Description automatically generated

**Question 3**

**a)**

Describe the two features required for a recursive method. When does a recursive method behave like an infinite loop? (5 Marks)

Answer: Termination and self-similarity. Termination allows the method to stop when a certain condition is met, while self-similarity allows the method to break the problem down into pieces that are similar in structure to the original problem.

**b)**

The Fibonacci numbers are the numbers in the following integer sequence.  
0, 1, 1, 2, 3, 5, 8, 13, 21, 34, 55, 89, 144, ……..

In mathematical terms, the sequence Fn of Fibonacci numbers is defined by the recurrence relation

Fn = Fn-1 + Fn-2

with starting values always being

F0 = 0 and F1 = 1.

Write a recursive method: int fib(int n), that prints the numbers in the sequence and returns Fn.

For example fib(12) would return 144. (10 Marks)

Answer:

Text

Description automatically generated

**Question 4**

Write a recursive method in your Tree class called findMax. It will return the largest object in your tree. (10 Marks)

Text

Description automatically generated