CSCA48 Final Exam

Fall 2020

PART 2

Question #4 (15 marks)

Consider a binary search tree where each node, in addition to its normal fields, also contains a pointer to its parent node.

```
typedef struct BSTNode {
        int data;
        struct BSTNode* parent;
        struct BSTNode* left;
        struct BSTNode* right;
} BSTNode;
```

Write the following **recursive** functions:

`insert(BSTNode *root, int x)` insert x into the BST rooted at root

`delete(BSTNode *root, int x)` delete one occurrence of x from the BST rooted at root

Question #5 (10 marks)

What is the Big-O complexity of the following algorithm run on a graph implemented as:

A) an adjacency list

B) an adjacency matrix

Explain your answers. Clearly state any assumptions you make.

```
1:     start with an empty graph G
2:     loop N times:
3:           insert a new node
4:           if ( G has at least 2 nodes):
5:                 insert a new edge between two random nodes
6:     pick 2 random nodes X and Y
7:     if ( X and Y are connected ):
8:           remove all edges to and from X
9:           remove X from the graph
```

Question #6 (5 marks)

In one sentence (no more than 50 words) each, explain the following terms:

- Dependency
- API
- Method Overloading
- Information Hiding
- Inheritance