CSC 1202 — SWE 1203 Data Structures and Algorithms
Assignment 2 Duration: 2 days (48 hours)
Due Date: 18^{th} November, 2021 at 11:00 hours

November 16, 2021

Attempt all questions individually.
It will help you!
There will be a 20 points penalty for copying!

1. (a) (10 points) Write an optimal algorithm (pseudo code) for finding the largest element of a very large array with about $10,000$ elements.
   (b) (5 points) Write the implementation of the algorithm above in any programming language of your choice
   (c) (5 points) Compute the time complexity of the algorithm above in respect to the primitive instructions (Mention all asumptions and your working).
2. (3 points) Assume that you have an algorithm that takes 2^n steps and each step takes a microsecond. What is the largest problem size n you can solve before the death of the sun? Assume that the sun will die in 5 billion years.
3. (7 points) Given the following list representation of a tree
   (A (B (E , F), C (G), D (H (M), I, J))),
   show the graphical representation of the tree.
4. (3 points) What is the order of growth (time complexity) of the following code?

```
1                int result = 0;
2                for (int i = 1; i <= n; i *= 2)
3                    for (int j = 0; j < n; j++)
4                        result++;
```

5. (7 points) Write the linked list implementation of the stack showing the pop and push methods in java.
6. (3 points) Simplify the complexity $O(log(n^2 + 1)/log(n))$