**CSC3202 Data Structures and Algorithms**

**ASSIGNMENT 1**

**Application using Stack**

**DATE**: 26 October 2022

**INSTRUCTIONS:**

1. Submit the algorithm and program listing via PutraBLAST.
2. Submission dateline is 8 November 2022.
3. Copying or other forms of cheating is forbidden. The faculty has very strong rules about this and the standard penalty of first offence is to award 0 marks to all parties concerned.
4. Use Java to implement your solution.

**QUESTION:**

In the programming language Lisp, each of four basic arithmetic operators appears before an arbitrary numbers of operands, which are separated by spaces. The resulting expression is enclosed in parentheses. The operators behave as follows:

- (+ a b c …) returns the sum of all operands, and (+) returns 0.
- (- a b c …) returns a – b – c – …, and (-a) returns -a. The minus operator must have at least one operand.
- (* a b c …) returns the product of all operands, and (*) returns 1.
- (/ a b c …) returns a / b / c - …, and (/ a) returns 1/a. The divide operator must have at least one operand.

You can form larger arithmetic expressions by combining these basic expressions using a fully parenthesized prefix notation. For example, the following is a valid Lisp expression:

(+ (- 6) (* 2 3 4) (/ (+ 3) (*) (- 2 3 1)))

This expression is evaluated successively as follows:

(+ (- 6) (* 2 3 4) (/ 3 1 -2 ))
(+ -6 24 -1.5)
16.5

Now, your task is to do the following:

1. Design an algorithm to that use stack to evaluate a legal Lisp expression composed of the four basic operators and integer values.
2. Write a Java program that reads Lisp expression and evaluate it.
3. Test your program on a set of valid and invalid Lisp expression.