# CSCI 162 Assignment 3

Due Mar 25, 2014

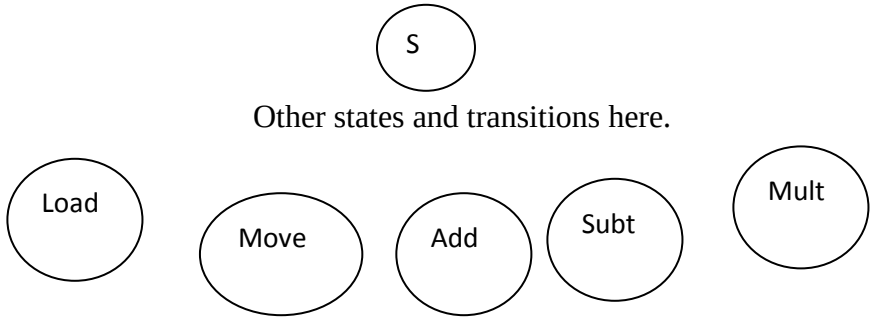
## Part 1: [20]

Answer these questions in a .doc or .txt file and submit via D2L. The name of the file must be in the format JB123456789.txt (or .doc) where JB is your initials and 123456789 is your student number.

1. [6] Beta-reduce these lambda expressions. Show your work at each step.
1a. [1] (λx.x) y
1b. [2] (λz.z) ((λb.b) a)
1c. [3] (λx.λy.x y y) (λa.a) b

2a. [2] Give a Huffman Encoding for the following:
Load=25%, Move=24%, Add=23%, Subt=16%, Mult=12%

2b. [3] Draw a FSA with a start Point S and Final States Load, Move, Add, Subt and Mult that will recognize what sort of operation is being decoded.




3. [3] Abstract data types.
3a. [1] What is an abstract Data type?
3b. [1] What are the defining operations of a stack? What do they do?
3c. [1] How is a queue different from a stack?

4. [6] Examine this function:

```
1 Int Plus(int A, int B) {
2    If (A==0)
3       Return(B);
4   Else
5      Return(Plus(A-1, B+1));
6 }
```

4a. [1] Is this a recursive function? How can you tell?
4b. [1] What will Plus(3,5) return?
4c. [1] What will happen with this function if A is negative? How about if only B is negative?
4d. [3] What will the contents of the stack be when line 3 is executed if Plus(3,5) is executed?

# Part 2 [25]

Sudoku are easy to learn yet highly addictive language-independent logic puzzles which have recently taken the whole world by storm. Using pure logic and requiring no math to solve, these fascinating puzzles offer endless fun and intellectual entertainment to puzzle fans of all skills and ages.

The Classic Sudoku is a number placing puzzle based on a 9x9 grid with several given numbers. The object is to place the numbers 1 to 9 in the empty squares so that each row, each column and each 3x3 box contains the same number only once.

| | | | |
|---|---|---|---|
| | | 4 | |
| | 2 | | 3 |
| 2 | | | |
| | 4 | | 1 |

A 4x4 Sudoku is a simpler version of the same problem where the numbers from 1 to 4 are entered in the empty squares with these three constraints:

- Each row must contain each of the digits from 1 to 4.
- Each column must contain each of the digits from 1 to 4.
- Each 2x2 box must contain each of the digits from 1 to 4.

Each game starts with a number of squares already filled in and the user must fill in the remaining squares without violating the three constraints listed above.

Your mission is to create a 4x4 Sudoku solver in Prolog that takes as input the starting puzzle and returns ***a*** correct solution. (If there is more than one solution that is OK).

What to hand in:

1. The listing of your code.
2. The input/output of running your code on the puzzle given above.
3. The input/output of running your code on a puzzle you create that has exactly 1 solution.