**CS 3160 Concepts of Programming Languages**

**Fall 2018 Assignment 3**

**Due 10-1-2018**

1. Which of the following are correct expressions in ML? Declare the type for each valid expression. (Try it using the ML compiler yourself).

(a) null [];

(b) hd [7,"c"];

(c) tl(3::[4,5]);

(d) #First {First=3, next="mine"}

(e) fn x=> (ref x) = 5 ;

(f) 5 + 7.9

(g) nil

(h) !(ref 7) + 8

2. Write an ML function **Append** using patterns and cases to append two lists such that the final output list is as shown below. Do not use any built in functions or @ operator.

Append([1,3,5],[2,4,6]);

Desired output is [1,2,3,4,5,6]

3. Translate the following Lisp code to ML.

(defun mult (x)(cond ((null x) 1)

((consp x) (\* (car x) (mult (cdr x))))))

(print (mult '(4 5 6)))

4. Write an ML program that outputs a list containing first element of every tuple in a list of tuples.

If input argument to the function is [(1, “How”), (2, “Are”), (3, “you”)] then output should be [ 1,2,3]

5. Write an ML program to produce nth Fibonacci number.

(Note : A series of numbers in which each number ( *Fibonacci number* ) is the sum of the two preceding numbers. The Fibonacci series is 1, 1, 2, 3, 5, 8, 13 etc.)

Input : Fib 6. Output : 8.

Input : Fib 7. Output : 13