University of Toronto - Department of Computer Science
CSC410, Fall 2016
Homework 3

This homework is worth 4% of your final mark

Due: Sunday, 6 November 2016 at 23:59

Instructions:
The homework is to be done individually. You can write the answers on a sheet of paper or using an editor. Handwritten answers must be legible; otherwise, it will affect the mark. Write clearly which problem you are answering.

To submit, either scan your solutions or save your document as a PDF file and upload it to MarkUs.

Note that while all of the material is relevant for the midterm and final, only some problems may be marked.

Questions? Ask them on Piazza (folder hw3).

At the beginning of the homework, include and complete the following header :

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CSC410, Fall 2016 - Homework 3

Name: _____________

Student Number: ____________

Lecture: o Monday o Tuesday

I am the sole author of this homework. Signature: ____________

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Problem 1 (Symbolic execution - no loops)

Consider the following function `foo` :

```
void foo(int x, int y){
     if (x + y > 10){
          x--;
          y+= 2;
     } else {
4.         y--;
5.         x+=2;
     }
6.   if (2*(x+y) < 20){
7.         x*= 2;
8.         y*= 2;
     } else {
9.         x*=4;
10.        y*=4;
     }
11.  //ready to return
     return;
}
```

a) [2 marks] Indicate **the number of paths** `foo` has and **represent** each of them as a sequence of line numbers.
b) [3 marks per path] **Symbolically execute** each path
c) [1 mark per path] For each path, indicate **whether it is feasible or not.**
d) [1 mark per path] For each feasible path, give an example satisfying the path conditions.

Problem 2 (Symbolic execution - with loops)

Consider the following function `find`:

```
boolean find(int a[], int x){
1.   boolean found = false;
2.   int i = a.length - 1;
3.   while (!found && i >= 0){
4.         if (a[i] == x){
5.               found = true;
           }
6.         i--;
     }
7.   //ready to return value
8.   return found;
}
```

… and the following paths through it:

- Path1: 1,2,3,4,5,6,3,4,5
- Path2: 1,2,3,4,6,3,7
- Path3: 1,2,3,4,5,6,3,7
- Path4: 1,2,3,7

a) [3 marks per path] **Symbolically execute** each of the above four paths (Path1-Path4).
b) [1 mark per path] For each of the given paths, indicate **whether it is feasible or not.**
c) [1 mark per path] For each feasible path give an example satisfying the path conditions.