

University of Toronto - Department of Computer Science

CSC410, Fall 2016

Homework 5

This homework is worth 4% of your final mark

Due: Wednesday, 23 November 2016 at 23:59

Last updated: 15 November

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 final, only some problems may be marked.

Questions? Ask them on Piazza (folder hw5).

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

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CSC410, Fall 2016 - Homework 5

Name: _____

Student Number: _____

Lecture: ☐ Monday ☐ Tuesday

I am the sole author of this homework.

Signature: _____

=====

Problem 1

Consider the following code:



```
if ((a || b) && (c ==> d)) {  
    x++  
} else {  
    x--  
}
```

}

1. [4 marks] Does considering all the following tests imply having 100% MC/DC coverage? If not, add missing case/s.

- a) a= True, b=False, c=True, d=True
- b) a=True, b=False, c=True, d=False
- c) a= True, b=False, c= False, d=False

2. [6 marks] For each condition, indicate those tests (including the ones you have added) that allow 100% decision coverage.

UPDATE: The answer should be given filling the following table (1 row is given as an example)

condition	Values of the other variables	Which test causes the branch condition to be true	Which test causes the branch condition to be false
d	a=True,b=False,c=True	Test a)	Test b)
a	b=...,c=..., d=...		
b	a=..., c=..., d=...		
c	a=..., b=..., d=...		

For example, condition d independently determines different branch results in tests a) and b). In test a) the branch condition will be true, and in test b) the branch condition will be false. These different results are caused by only changing the truth value of “d”.

3. [2 marks] Which tests are sufficient to provide 100% branch coverage?

Problem 2

Consider the following function:

```
1. int problem2(int x, int z){
2.     x--;
3.     while (x > 0) {
4.         if (z > 0) {
5.             x++;
6.             z--;
7.         } else {
8.             x--;
9.         }
10.    }
11.    return z;
12. }
```

1. [3 marks] List 3 inputs that allow loop boundary adequacy (i.e., 0, 1, many iterations)
2. [2 marks] Draw the control flow graph for the code above. What is its cyclomatic complexity?
3. [3 marks] List the paths that represent 100% Boundary Interior Coverage

Problem 3

Consider the following function:

```
int foo(int x, int y){
    return abs(x) + abs(y)
}
```

1. [6 marks] For each of the following mutants, indicate what kind of operator was applied (AOR, SVR, etc..)

a)

```
int foo(int x, int y){
    return abs(x)
}
```

b)

```
int foo(int x, int y){  
    return abs(x) - abs(y)  
}
```

c)

```
int foo(int x, int y){  
    return abs(x) + abs(x)  
}
```

d)

```
int foo(int x, int y){  
    return abs(y) + abs(y)  
}
```

e)

```
int foo(int x, int y){  
    return abs(x) * abs(y)  
}
```

f)

```
int foo(int x, int y){  
    return 0;  
}
```

2. For each test, indicate which mutants are killed:

a) [6 marks]

```
void test(){  
    int result = foo(-5, 8)  
    assert result >= 5  
}
```

b) [6 marks]

```
void test(){  
    int result = foo(-5, 8)  
    assert result >= -5 && result >= 8  
}
```

c) [6 marks]

```
void test(){  
    int result = foo(-5, 8)  
    assert result >= 13  
}
```

