EECS 4313 Assignment 4

- Data Flow Testing, Slice-Based Testing and Mutation Testing

Due: Noon, April 4, 2016

1. Assignment goals

The purpose of this assignment is to give you experience applying data flow testing, slice-based testing and mutation testing approaches. Your task will be to create a test suite in JUnit, produce bug reports (if any), and submit a written report describing your testing.

2. Getting started

Using the development environment you created for Assignments 2 and 3, complete the following tasks:

1. Perform data flow analysis for one of the methods that you have tested. Calculate the value of the following coverage criteria:
   - All-Defs
   - All-Uses
   - All-P-Uses / Some-C-Uses
   - All-C-Uses / Some-P-Uses

   If necessary, add test cases to bring these values as close to 100% as possible.
2. Derive the slices for all A-defs (defined by assignment) and P-uses (used in a decision predicate) in the method. Calculate the percentage of slices that your testing covers. If necessary, add test cases to bring the percentage as close to 100% as possible.
3. Install the PIT mutation testing tool. Evaluate the effectiveness of all your test cases (test cases from A2, A3 and newly created test cases for this assignment) using PIT. Add or modify test cases, accordingly.
4. If you believe that the additional test cases have revealed new bugs, attach bug reports in the written report (see section below for details).

3. Written Report

For this assignment, you should create a written report (a4.pdf). The report must include the following information:

- The data flow analysis you performed and the calculation of the coverage metrics. You must show which test cases are responsible for which dc-paths.
- A description of the test cases you added to improve coverage. If your coverage was already high, discuss how your testing was able to achieve this.
- The slices that you identified and the percentage of slices that your testing covers. You must show which test cases are responsible for which slices.
- A description of the test cases you added to improve slice coverage. If your coverage was already high, discuss how your testing was able to achieve this.
- Evaluate the effectiveness of your test cases using mutation testing. Discuss and address any issues if you have found in your written report.

- Attaching bug reports if bugs are discovered using your testing methods. You should use the same bug report format as in Assignment 1. **Do not** file these bug reports to the project's bug report system.
- An appendix with the specification of the methods you are testing.

Presenting your thought processes in English is an important skill for a software engineer. If you have trouble in writing English, ask someone to proof-read and correct your writing. You can also consult the English as a Second Language Open Learning Centre (http://www.yorku.ca/eslolc) at the York University.

4. Submission

You should work with **at least one and at most two** partners (a team thus has 2 - 3 members). Submit a PDF of your report (a4.pdf) and the test code package (i.e., eecs4313a4) electronically. Your report must include the names and the student numbers of all the team members. **Only 1 submission per group, please!** You do not need to submit a hardcopy of the written report.

Navigate to the directory where it contains the code package and the report. Use the following commands to submit:

- submit 4313 a4 eecs4313a4
- submit 4313 a4 a4.pdf