

Software Quality Assurance (WS12/13)

Problem Set 3

Due: in exercise, 28.11.2012

Given is the function ALL_POSITIVE implemented in Java .

```
1 boolean ALL_POSITIVE(int[] array) {
2   boolean result;
3   int i,len,tmp;
4   len = array.length;
5   i=0;
6   result=true;
7   while (i<len&&result) {
8     tmp=array[i];
9     if (tmp<=0)
10      result=false;
11     i++;
12  }
13  return result;
14 }
```

Problem 1: Data Flow Oriented Test

- Please create a control flow diagram with data flow annotation for the function ALL_POSITIVE.
- Please determine the minimal necessary test path for fulfilling the **all defs** criterion of the ALL_POSITIVE function. Please denote the required test path and mark this path in the control flow diagram.
- Please determine the minimal necessary test path for fulfilling the **all c-uses** criterion for the ALL_POSITIVE function. Please denote the required test path and mark this path in the control flow diagram.
- Please determine the minimal necessary test path for fulfilling the **all p-uses** criterion for the ALL_POSITIVE function. Please denote the required test path and mark this path in the control flow diagram.
- Please determine the minimal necessary test path for fulfilling the **all c-uses/some p-uses** criterion for the ALL_POSITIVE function. Please denote the required test path and mark this path in the control flow diagram.

Hint:

format for Def-Use-pair

(<def-node, ..., c-use-node>, variable)

(<def-node, ..., p-use-node1,p-use-node2>,variable)

node1, node2 are the nodes, where the two edges of the p-uses point to

Problem 2: Path Coverage Test

- a) Please determine the minimal necessary test cases for fulfilling the structured path coverage test for the parameter $k=1$ for the ALL_POSITIVE operation.
- b) Please determine the minimal necessary test cases for fulfilling the *boundary interior test* for the ALL_POSITIVE operation.

Problem 3: Functional Test: Equivalence Class Partitioning

A booking system processes incoming payment and payout of business customers and private customers according to transaction principles. For this processing, the system requires the account number as well as **the booking amount**. A **booking** is valid if it does not exceed the limit of the maximum amount of 5000€. A business account number begins with a B. A private account number begins with a P.

- a) Please determine the equivalence class partitions for the given functionalities.
- b) Please determine the test cases for all the equivalence classes.

Problem 4: Equivalence Class Partitioning with Boundary Value Analysis

A student data management program processes registration number, name, major, and mark (on average) of every single student. The student registration number is a five-digit integer that is not smaller than 10000. The program knows the majors Mathematics, Computer Science, Philosophy, and English. The program knows the marks 1.0, 2.0, 3.0, 4.0, and 5.0. A valid name has at least 3 and at most 20 characters.

- a) Please determine the equivalence class partitions for the given functionalities.
- b) Please determine the test cases for all the equivalence classes using the procedure of boundary value analysis.