

Foundations of Software Engineering

Exercise 5

Task 1: Cohesion and Coupling

1. Define the terms cohesion and coupling.
2. One of your colleagues uses weak cohesion and high coupling between the components in his design. What are the consequences of this structure (note: think about the consequences on the different stages of the software life cycle, e.g. development, maintenance, ...)?
3. After delivering the project, the customer returns with a variety of new requirements. To avoid touching the existing software structure the system designer decided to gather all the new features in one component (utilities).
 - a. Which type of cohesion has the new utilities component? And why?
 - b. How do you assess the designer solution and what are the consequences of this solution?

Task 2: System Test

Provide definitions for the following terms:

- a. Integration test
- b. Regression test
- c. Performance test
- d. Stress test

Task 3: Testing (Unit Test)

You can find in the following a section of Java class with a function for sorting a one-dimensional integer field according to the bubblesort algorithm.

```
public static int[] elements;  
public static int length() { return elements.length; }  
public static int get(int i) { return elements[i]; }  
public static void put(int i, int x) { elements[i] = x; }  
  
public static void bubblesort(int length) {  
    int a0, a1, j;  
    int i = length() - 1;  
    while (i >= 0) {  
        j = 0;  
        while (j < i) {  
            a0 = get(j);  
            a1 = get(j + 1);  
            if (a0 > a1) {  
                put(j, a1);  
                put(j + 1, a0);  
            }  
            j++;  
        }  
        i--;  
    }  
}
```

- Create the control flow graph of the bubblesort() function. Create a separate node for each statement. Annotate the graph with the corresponding lines of code.
- Provide a test path which achieves statement coverage.
- Provide a test path which achieves branch coverage.

Note: specify the test path by listing a sequence of nodes.

Task 4: Unit Test (Equivalence Classes)

ABC company wants to store the following information about its customers: Name, year of birth, postal code and street. Name and street may have a maximum of 20 characters. Postal codes are natural numbers with a maximum of five digits (including zero).

Perform an equivalence partitioning with boundary value analysis. First set up the equivalence classes and their upper and lower boundaries, then define the minimum test cases required to test these classes. Clarify which partitioning class is being tested by each test case.