Ira A. Fulton Schools of Engineering
Arizona State University

CSE 565: Software Verification and Validation

Specification-Based Testing Project

Purpose

This project will help you reinforce the topics discussed in the class including categories of testing, equivalence partitioning, boundary value, and cause-and-effect testing.

Objectives

Learners will be able to:

- Apply equivalence partitioning, boundary value, and cause-effect testing techniques.

Technology Requirements

- Java 17 or above

Project Description

In this project, you will gain hands-on experience in software testing methodologies. You will focus on three essential techniques:

- Equivalence Partitioning: Learn how to group inputs into classes and design test cases that cover each class efficiently.
- Boundary Value Analysis: Explore the edges of input ranges to uncover potential defects and create precise test cases.
- Cause and Effect Testing: Identify input conditions and their corresponding effects to build targeted test scenarios.

Throughout the project, you will apply these techniques to a provided software program, developing a set of well-structured test cases. By executing these tests, you will validate the program's functionality and ensure it meets the desired specifications.

To complete this project, you will use equivalence partitioning, boundary value, and cause/effect analysis techniques to develop a set of test cases for the provided program and execute the tests.

Directions

Download the provided files located in the assignment description page, then carefully review the directions before starting your work:

- CSE 565_Specification-Based Testing_Test Case Spreadsheet.xlsx
- CSE 565_Specification-Based Testing_Jar Files and Script.zip

In this assignment, we have developed a database to gather information and provide discounts about a product and its users depending on a variety of factors given. The jar file with the program is given to you, but contains at least 10 seeded defects. Using equivalence partitioning, boundary value, and cause/effect analysis techniques discussed in the lecture, please develop a set of test cases for this program and execute the tests following the instructions below:

Running Jar Files

There are three options to run your test cases for black box testing. Please make sure to have Java installed on your computer to run the jar file.

Using the GUI

- project1GUI.jar opens up the GUI where you can manually input your test cases and view the output

- To run: Open in Command Prompt or Terminal and enter “java -jar project1GUI.jar” and the GUI will open up

Using Terminal or Command Prompt

- CSE565P1.jar contains the program that runs your test cases

- The jar file takes in arguments corresponding to <name> <age> <user status> <reward member status> <season bought> <product category> <rating of the product>

    - i.e.: java -jar <PATH to jar file> 24 Returning Silver Spring Electronics 5

    - The only values that will be accepted for User Status, Rewards Member Status, Season Bought, Product Category are below.
        - User Status

                - New or Returning
        - Rewards Member Status
            - Bronze, Silver or Gold
        - Season Bought
            - Winter, Spring, Summer or Fall
        - Product Category
            - Unknown or Electronics
    - To run: Open in Command Prompt or Terminal and enter "java -jar CSE565P1.jar Peter 24 Returning Silver Spring Electronics 5" and the output will be given

Running tests automatically (Linux/ Bash for Windows/Mac)

- CSE565P1.jar contains the program that runs your test cases.
- Project1Script is a bash script where you can input your test cases, and Project1Script will automatically run them.
- To add a test case and run:
    a. Open Project1Script in vim or an editor
    b. Add in a test case by doing: java -jar <PATH to jar file> Peter 24 Returning Silver Spring Electronics 5
    c. Exit out of vim or the editor
    d. If needed, open in Bash or Terminal and make Project1Script an executable by running "chmod u+x Project1Script"
    e. In the Bash or Terminal, run "./Project1Script" and the output for each test case will be given

Requirements

Input requirements

1. User Name (string)
    1.1. Can be 5-10 characters long
    1.2. Only contain characters (no numbers)
    1.3. Cannot contain a hyphen (-) or underscore (_)

2. Age (Integer)
    2.1. Must be 18 or over

3. User Status (do not test for invalids)
    3.1. New or Returning

4. Rewards Member Status (do not test for invalids)
    4.1. Bronze, Silver or Gold

5. Season Bought (do not test for invalids)
    5.1. Winter, Spring, Summer or Fall

6. Product Category (do not test for invalids)
    6.1. Unknown or Electronics

7. Rating of Product (Integer)
    7.1. Rating must be between 1 – 10

Output requirements

8. Error messages for incorrect username, age, and rating.

9. Discounts Given based on:
    9.1. New users cannot be given any discounts regardless of reward status, product, and season

    9.2. If product category is unknown, user gets no discount

    9.3. If bought in Summer:
        9.3.1. Returning users who are gold members who bought Electronics get a 15% discount voucher

    9.4. If bought in Spring:
        9.4.1. Returning users who are bronze members who bought Electronics get a 10% discount voucher

    9.5. If bought in Winter:
        9.5.1. Returning users who are gold members who bought Electronics get a 25% discount voucher

    9.6. If bought in Fall:
        9.6.1. Returning users who are silver members who bought Electronics get a 15% discount voucher

9.7. Any other combination of returning user, reward status, product, and season does not get a discount.

Remember in equivalence partitioning, you can only test one (1) invalid partition **at a time**.

Preparing the Deliverables

Follow the steps to accurately complete this assignment:

1. Complete test case matrix (Tab 1 at the bottom of the spreadsheet) from **CSE 565_Specification-Based Testing_Test Case Spreadsheet.xlsx**

2. Execute test cases following one of the three options detailed above

3. Report results in test case matrix tab (Pass / Fail). Highlight Failed test cases with RED color.

4. Complete the defect tracking sheet (Tab 2 at the bottom of the spreadsheet) containing the defect number, a brief description of each defect, and the requirement that the defect maps to.

Submission Directions for Project Deliverables

You are given an unlimited number of attempts to submit your best work. The number of attempts is given to anticipate any submission errors you may have in regards to properly submitting your best work within the deadline (e.g., accidentally submitting the wrong paper). It is not meant for you to receive multiple rounds of feedback and then one (1) final submission. Only your most recent submission will be assessed.

You must submit your Specification-Based Testing Project deliverable in its submission space in the course. Learners may not email or use other means to submit any assignment or project for review, including feedback, and grading.

The Specification-Based Testing Project includes one (1) deliverable:

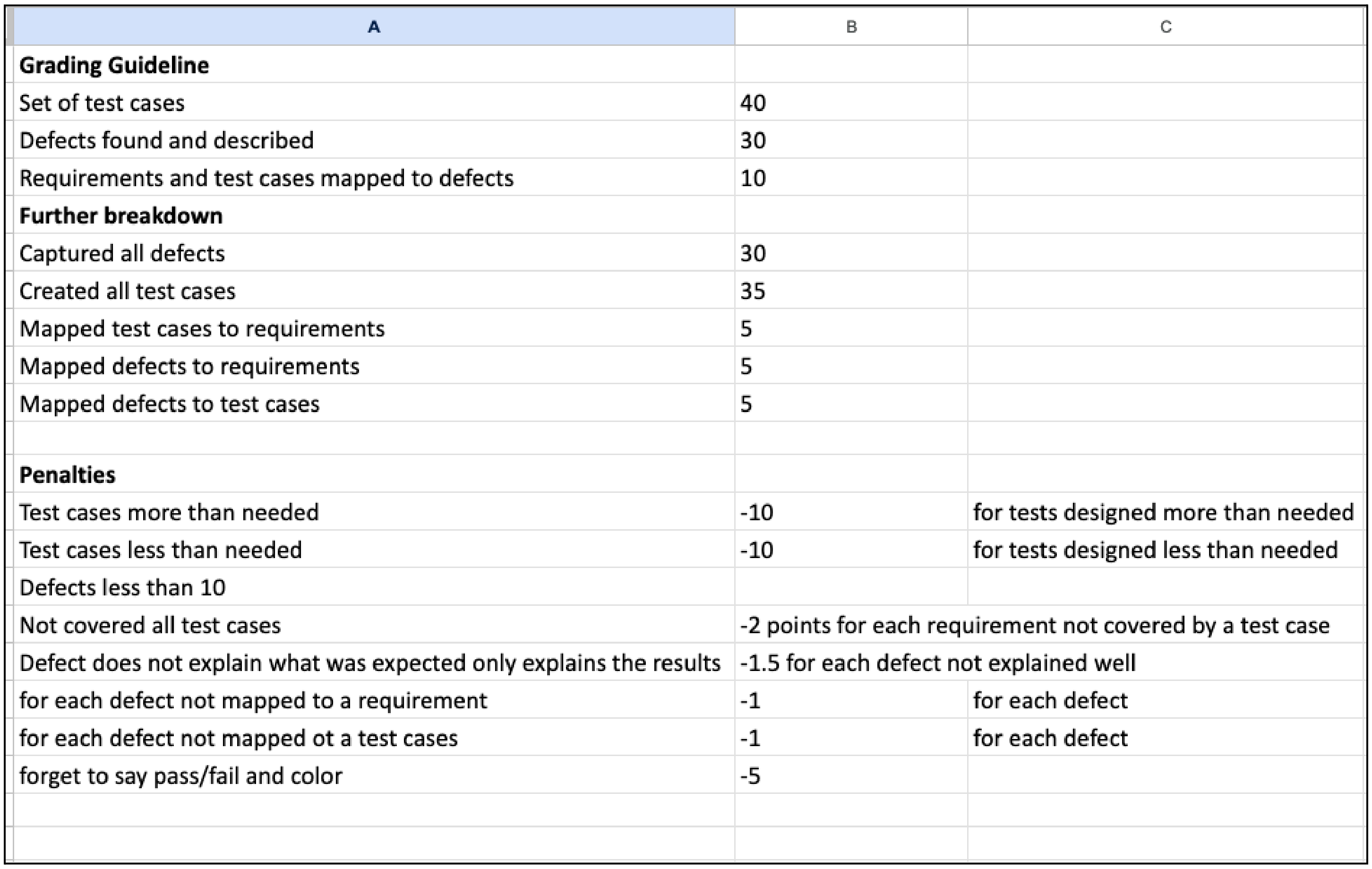
- **Test Case and Defect Spreadsheet:** Submit the Excel file containing the Test Case and Defect Spreadsheet (attached in the “Project Overview and Resources” page in the course). Title your file as “yourlastname_firstname_CSE 565_Specification-Based Testing Project.”

Evaluation

Your submission will be evaluated based on the criteria:

1. **Set of complete test cases**: included all test cases (passing and failing test cases as per the requirements)
2. **Defects found and described**: identified at least 10 defects and described them
3. **Requirements and test cases mapped to defects**: mapped 10 defects

The following is a detailed breakdown of the grading showing penalties not captured by the rubric:



A	B	C
Grading Guideline		
Set of test cases	40	
Defects found and described	30	
Requirements and test cases mapped to defects	10	
Further breakdown		
Captured all defects	30	
Created all test cases	35	
Mapped test cases to requirements	5	
Mapped defects to requirements	5	
Mapped defects to test cases	5	
Penalties		
Test cases more than needed	-10	for tests designed more than needed
Test cases less than needed	-10	for tests designed less than needed
Defects less than 10		
Not covered all test cases	-2 points for each requirement not covered by a test case	
Defect does not explain what was expected only explains the results	-1.5 for each defect not explained well	
for each defect not mapped to a requirement	-1	for each defect
for each defect not mapped ot a test cases	-1	for each defect
forget to say pass/fail and color	-5	