



# UNIVERSITY of LIMERICK

O L L S C O I L L U I M N I G H

Faculty of Science and Engineering

Department of Computer Science  
and Information Systems

## Final Examination Paper

Academic Year:	<b>2007/08</b>	Semester:	<b>Semester 2</b>
Module Title:	<b>Software Testing and Inspection</b>	Module Code:	<b>CS4004</b>
Duration of Exam:	<b>2½ Hours</b>	Percent of Total Marks:	<b>60</b>
Lecturer(s):	<b>McElligott &amp; Power</b>	Paper marked out of :	<b>100</b>

### Instructions to Candidates:

**The paper is divided into two sections: Section A and Section B**

**Section A: ALL 4 questions** in this section should be attempted. You must achieve 40% of the marks for each question in this section in order to keep your related assignment marks.

**Section B:** You are expected to attempt **2 full** questions from this section.

**State clearly any assumptions you make.**

## Section A (Four questions)

### Q1 Functional Testing

(20 marks)

A concert venue has commissioned a system that will allow it to sell tickets on the web. You are involved in testing the system component that accepts the customers' requirements for tickets, having determined the particular event and performance/date.

The following is an extract from the specification:

The system shall prompt the user for the following data:

- The overall number of tickets required
- The type of seating required
- The different tariffs/concessions the customer wants to avail of

The following constraints apply:

- A customer is allowed up to 10 tickets per transaction
- All the tickets ordered in a transaction must be for the same type of seating.
- There are four different types of seating:
  - D (Dress circle which costs €40)
  - U (Upper Circle which costs €30)
  - S (Stalls which cost €20)
  - B (Box which costs €60 per seat)
- The tariffs/concessions are as follows:
  - F (Full price)
  - C (Children under 10 years of age - half price)
  - S (Students with college ID - 25% off)
  - O (Old age pensioners - 20% off)

The system shall accept transactions that specify the number of tickets and the type of seating. If the tariff/concession is not specified, then the default is F. For each tariff or concession required, the customer is allowed to enter the tariff code followed by a number for the quantity of tickets required at that tariff, e.g. C4. There is no limit to the number of tariffs that may be availed of, but the total for the four tariffs must not exceed the number of tickets ordered. The component outputs the total price.

You are required to design test cases for this system using equivalence classes and boundary value analysis. The test cases should be documented as follows:

- (i) for each **equivalence class** you create you should specify its number, its description, whether it is valid/invalid and provide an example.
- (ii) a table specifying for each **test case** its number, the test case (i.e., the input values), whether the test case is valid or invalid, the classes covered (including boundaries if any), and the expected outcome.

**Q2 Structural Testing****(20 marks)**

- (a) Write test cases to achieve 100% statement coverage (S) of the program shown in Figure 1 below. For each test case you should write its test case number, its description and expected outcome.
- (b) Draw a Control Flow Graph (CFG) for this program.
- (c) Using your CFG write sufficient test cases to achieve
  - (i) 100% decision coverage (D)
  - (ii) 100% condition coverage (C)
  - (iii) 100% decision-condition coverage (DC).

For each test case you should write its test case number, its description and expected outcome. Use a table similar to that used in Assignment 2 this semester.

In your answer you should indicate whether each particular test case contributes to S, D, C or DC coverage.

```
1 import javax.swing.JOptionPane;
2 public class PluralsOfSomeCommonNouns
3 {
4     public static void main(String[] args)
5     {
6         String wordInput, result, vowels = "aeiou", userInput, response;
7         String pattern = "[a-zA-Z]{2,}";
8         int wordLength;
9         do
10        {
11            wordInput = JOptionPane.showInputDialog(null, "Please enter a word");
12            userInput = wordInput;
13            wordInput = wordInput.toLowerCase();
14            wordLength = wordInput.length();
15            if (wordInput.equals("") || !(wordInput.matches(pattern)))
16                result = "A word (i.e. >= 2 alphabetic characters) is required as input.";
17            else if (wordInput.endsWith("quy"))
18                result = userInput + ", " +
19                    userInput.substring(0, wordLength - 1) + "ies";
20            else if ((vowels.indexOf(wordInput.substring(wordLength - 2,
21                wordLength - 1)) != -1) && (wordInput.endsWith("y")))
22                result = userInput + ", " + userInput + "s";
23            else if (wordInput.endsWith("y"))
24                result = userInput + ", " + userInput.substring(0, wordLength - 1)
25                    + "ies";
26            else
27                result = "Cannot form the plural form of the word\n" + userInput
28                    + "\nusing the rules provided here.";
29            JOptionPane.showMessageDialog(null, result);
30            response = JOptionPane.showInputDialog(null,
31                "Would you like to form another plural (y/n)?");
32        } while (!(response.equals("n")) && !(response.equals("N")));
33    }
34 }
```

Figure 1

**Q3 Bug reporting****(10 marks)**

The IEEE Standard 829 proposes a template called the Test Incident Report. Compare and contrast this template to the format for reporting a new bug in Bugzilla, as encountered during Assignment 1.

**Q4 The Foundation Certificate in Software Testing****(10 marks)**

Compare and contrast the scope of CS4004 with the scope of the syllabus for the Foundation Certificate of the International Software Testing Qualifications Board (ISTQB), based on your findings in Assignment 4 this semester.

**End of Section A**

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**Section B**

Attempt 2 questions.

**Q5 Levels of testing****(20 marks)**

- (a) Differentiate between Unit and Component in the context of testing. (4 marks)
- (b) Outline the V model of software development and use it to explain the different levels of testing. (10 marks)
- (c) "Structural testing is used mostly at the unit level, and system-level testing uses functional testing, but system-level testing is concerned with more than functionality." Explain. (6 marks)

**Q6 Software Inspections****(20 marks)**

- (a) Differentiate between the terms Defect and Bug (4 marks)
- (b) Distinguish between a walkthrough and an inspection paying particular attention to the purpose of each and the type of preparation involved. (6 marks)
- (c) Discuss the advantages of using inspection for detecting defects in different types of artefacts throughout the system life cycle. (10 marks)

**Q7 Testing Tools and Automation****(20 marks)**

- (a) Compare and contrast the use of static and dynamic analysis tools in software testing, using an example of each type of tool. (8 marks)
- (b) Discuss the term **script** as it pertains to software testing. (4 marks)
- (c) "Capturing tests does have a place, but it is not a large place in software test automation." Explain this statement, referring to different types of scripting. (8 marks)

**Q8 Test Planning****(20 marks)**

- (a) What are the key elements of a Test Plan? (6 marks)
- (b) Discuss the relationship between Risk and test planning. (7 marks)
- (c) Discuss the relationship between test planning and the maturity of the software. (7 marks)