



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:	2008/09	Semester:	Semester 2
Module Title:	Software Testing and Inspection	Module Code:	CS4004
Duration of Exam:	2½ Hours	Percent of Total Marks:	60
Lecturer(s):	Power & McElligott	Paper marked out of :	100

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 Bug reporting

(10 marks)

Discuss the significance of the Severity and Summary fields in the Bugzilla bug reporting system. Support your answer with two example bugs from Assignment 1.

Q2 Functional Testing

(20 marks)

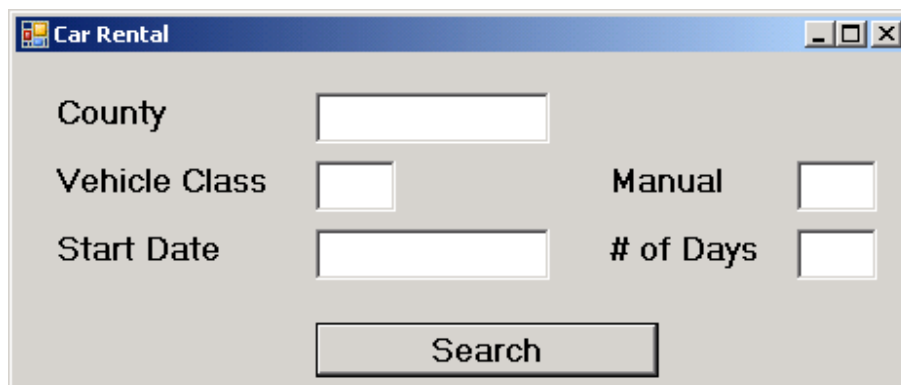
A component has been developed to allow a car hire clerk to search the availability of cars using one or more of the following criteria (see Figure 1).

- County which must be 4 to 9 alphabetic characters in length
- Vehicle class which is a number in the range 1 to 8
- Start date of the format dd/mm/yyyy
- Manual which should be a value of **y** or **n** (lowercase only)
- Duration in days which should be an integer in the range 1 to 30

The system returns a list of cars that match the criteria (can be empty) or a suitable error message.

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:

- for each **equivalence class** you create you should specify its number, its description, whether it is valid/invalid and provide an example.
- 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.



The screenshot shows a graphical user interface for a car rental search. It features a title bar labeled 'Car Rental'. Below the title bar, there are four text input fields arranged in two rows: 'County', 'Vehicle Class', 'Start Date', and '# of Days'. To the right of the 'Vehicle Class' and 'Start Date' fields is a checkbox labeled 'Manual'. At the bottom center of the window is a button labeled 'Search'.

Figure 1

Q3 Structural Testing

(20 marks)

- Write test cases to achieve 100% statement coverage (S) of the program shown in Figure 2. For each test case you should write its test case number, its description and expected outcome.
- Draw a Control Flow Graph (CFG) for this program.
- Using your CFG write sufficient test cases to achieve
 - 100% decision coverage (D)
 - 100% condition coverage (C)
 - 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 java.util.Scanner;
2 import java.io.*;
3 import java.awt.image.BufferedImage;
4 import javax.imageio.ImageIO;
5 import java.awt.Color;
6 public class ImageExamQuestion
7 {
8     public static void main(String [] args) throws IOException
9     {
10         File imageFile = new File(args[0]);
11         BufferedImage storedImage = ImageIO.read(imageFile);
12         int imageWidth, imageHeight, row, column, entireColourAsInteger;
13         int redValue, greenValue, blueValue;
14         Color existingColour, newColour;
15         imageWidth = storedImage.getWidth();
16         imageHeight = storedImage.getHeight();
17         for (row = 0; row < imageHeight; row++)
18         {
19             for (column = 0; column < imageWidth; column++)
20             {
21                 entireColourAsInteger = storedImage.getRGB(column, row);
22                 existingColour = new Color(entireColourAsInteger);
23                 redValue = existingColour.getRed();
24                 blueValue = existingColour.getBlue();
25                 greenValue = existingColour.getGreen();
26                 if (column < (imageWidth / 2))
27                 {
28                     redValue = 255 - redValue;
29                     blueValue = 255 - blueValue;
30                     greenValue = 255 - greenValue;
31                 }
32                 else
33                 {
34                     if (redValue >= 50 && redValue < 100)
35                         redValue += 50;
36                     else if (redValue >= 100)
37                         redValue -= 50;
38                 }
39                 newColour = new Color(redValue, greenValue, blueValue);
40                 storedImage.setRGB(column, row, newColour.getRGB());
41             }
42         }
43         ImageIO.write(storedImage, "jpg", imageFile);
44     }
45 }
```

Figure 2

Q4 Technical report**(10 marks)**

Choose two resources from the SECASE case study on Software Testing that you found useful and discuss their relevance to the CS4004 module material.

End of Section A

Section B

Attempt 2 questions.

Q5 Exploratory testing**(20 marks)**

(a) Explain the rationale of context-driven testing, distinguishing it from the other three 'schools of testing.' (8)

(b) How does exploratory testing fit the idea of context-driven testing? What are the key features of exploratory testing? How does it differ from random testing? (12)

Q6 Software Inspections**(20 marks)**

(a) Define the terms 'Defect', 'Failure' and 'Error', as defined in the paper "What Do We Know About Defect Detection Methods". (6)

(b) Outline the use of a checklist as a tool used in software inspections. (8)

(c) Distinguish between the entry criteria and exit criteria for an inspection, in the case of a program inspection and in the case of a specification inspection. (6)

Q7 Test Automation**(20 marks)**

(a) Some types of software are more suited to the use of automated test oracles than others. Define the term *test oracle* and discuss this statement. (8)

(b) Discuss the use of automation for system performance testing. Your answer should refer to need for automation, the kind of tools that are used, and the costs involved. (12)

Q8 Test Planning**(20 marks)**

(a) Define regression testing and outline the two main reasons for using it. (8)

(b) "The schedule is the central part of the test plan." Outline the contents of this part of the plan, referring to other parts of the test plan in your answer. (12)