# RHODES UNIVERSITY
DEPARTMENT OF COMPUTER SCIENCE

EXAMINATION: NOVEMBER 2017

COMPUTER SCIENCE HONOURS
PAPER 2 – QUALITY ASSURANCE

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**External Examiner**: Prof. M. Kuttel

**MARKS**: 120
**DURATION**: 2 hours

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**GENERAL INSTRUCTIONS TO CANDIDATES**

1. This paper consists of 10 questions and 8 pages. ***Please ensure that you have a complete paper.***

2. Answer all questions in the answer book provided OR in your preferred word processor and save regularly to your Exam Folder.

3. If answering online, diagrams may be drawn by hand in the answer book provided, and must be referred to with a unique diagram number.

4. The Concise Oxford English Dictionary may be used during this examination.

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**PLEASE DO NOT TURN OVER THIS PAGE UNTIL TOLD TO DO SO.**

# SECTION A: QUALITY ASSURANCE THEORY [70 MARKS]

**Question 1** **(2 + 2 + 2 + 2 = 8 Marks)**

a) What is the main difference between a walkthrough and an inspection of code for a financial application?

b) You have been asked to create a test case that can check modifications of customers in a database. Put the following test conditions into an optimal order for the test execution schedule.

| | |
|---|---|
| I | Print modified customer record. |
| II | Change customer address: house number and street name. |
| III | Capture and print the on-screen error message. |
| IV | Change customer address: postal code. |
| V | Confirm existing customer is on the database by opening the record. |
| VI | Close the customer record and close the database. |
| VII | Try to add a new customer with no details at all. |

c) Which of the following encourages objective testing? Give a reason for your answer.

| | |
|---|---|
| I | Unit testing |
| II | System testing |
| III | Independent testing |
| IV | Destructive testing |
| V | Usability testing |

d) Give two examples of code issues that can be identified by static code analysis.

**Question 2** **(1 + 2 + 2 + 2 = 7 Marks)**

a) Which of the following could be a coverage measure for state transition testing?

I All states have been reached.
II The response time for each transition is adequate.
III Each transition has been exercised.
IV All boundaries have been exercised.
V Specific sequences of transitions have been exercised.

b) For each of the options excluded in your answer to (a), state for which testing technique the option could be used as a coverage measure.

c) Which of the following could be used to assess the coverage achieved for white box test techniques?

I Decision outcomes exercised
II Partitions exercised
III Boundaries exercised
IV Conditions or multiple conditions exercised
V Statements exercised

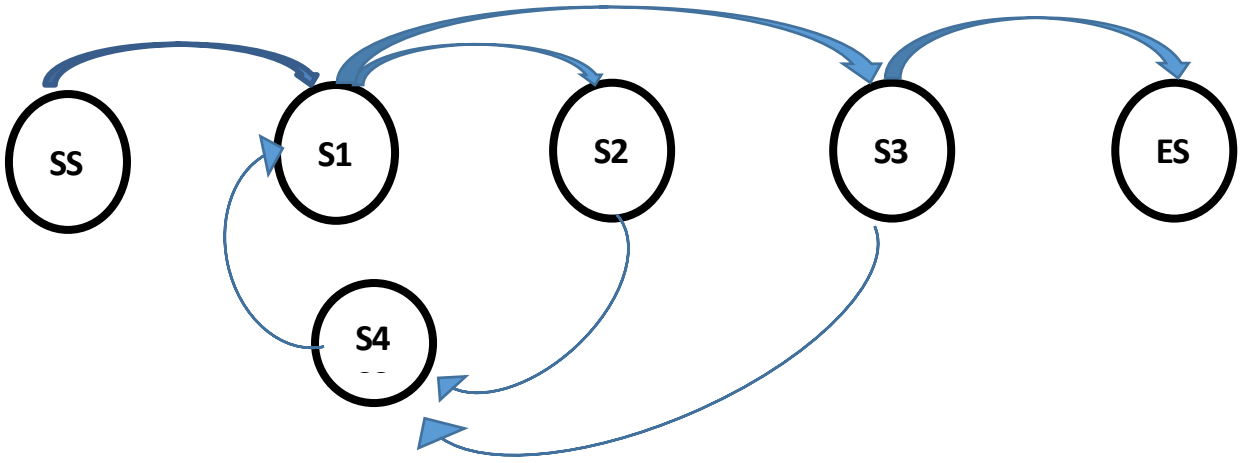
d) Which of the following could be used to assess the coverage achieved for black box testing techniques?

I Decision outcomes exercised
II Partitions exercised
III Boundaries exercised
IV State transitions exercised
V Statements exercised

**Question 3** **(3 + 2 = 5 Marks)**

a) Postal rates for "light letters" are 25c up to 10g letter, 35c up to 50g, plus an extra 10c for each additional 25g up to 100g. What test inputs (given in grams) would you use when applying equivalence partitioning to test the above? Give a reason why each input has been selected.

b) Given the state diagram for PIN entry in the figure below, create a test case with the minimal series of valid transitions to cover every state.



**Question 4** **(10 + 4 = 14 Marks)**

a) In the context of testing in an AGILE environment, describe the Software Testing Lifecycle according to the "V" model. Include a diagram of the "V" model itself.

b) Discuss how Verification and Validation fits into the testing lifecycle described above.

**Question 5** **(3 + 3 + 3 + 3 = 12 Marks)**

Provide clear definitions of the following "testing terms" and briefly discuss their relevance when testing a banking application used by clients to access banking services.

a) Regression testing
b) Re-testing
c) Alpha testing
d) Beta testing

**Question 6** **(3 + 5 = 8 marks)**

a) Would it be beneficial to automate a test suite being used to test a web app currently under development? Give a reason for your answer.

b) Automated testing is beneficial to both the software and the human resources involved in testing. Discuss, providing examples of benefits to each.

**Question 7** **(8 marks)**

List five typical steps in an automated testing life cycle and give a short explanation of the importance of each step in realising the greatest benefits of automation.

**Question 8** **(8 marks)**

Hybrid automation frameworks are widely used today as they provide the best of both data- and keyword-driven testing. Discuss this statement with reference to the purpose, as well as strengths and weaknesses of data- and keyword-driven test frameworks.

## SECTION B: APPLICATION OF QUALITY ASSURANCE TECHNIQUES [50 MARKS]

**Question 9** **([3+3] + 6 + 4 + [4*5] = 36 Marks)**

a) Give an explanation of Black Box Testing and White Box Testing, focussing on their purpose and use in Quality Assurance.

b) Read the **FOUR SCENARIOS** given as Appendix A. For each scenario identify (name) at least two software testing techniques that can be used to generate appropriate test cases for the scenario. (Note: You should identify both Black Box and White Box Testing Techniques, which you will need to expand on in part 9(d).)

c) For each scenario, state what verification needs to take place (if at all). (Hint: What further questions could be asked?)

d) Select any two Black Box testing techniques and any two White Box testing techniques that you have identified in part 9(b) and demonstrate how each would be applied to the appropriate scenario. (In other words, you need to show all your workings in applying each technique to generate test cases for the appropriate scenario.)

**Question 10** **(3 + 3 + 8 = 14 marks)**

You are involved in a project to automate the checkout counters in a large supermarket chain. Given below are the main changes planned:

- Checkout will in future be done by customers themselves using specially designed hardware.
- Hardware includes a barcode scanner, a weight sensitive packing area (to prevent users omitting to scan certain items) and a credit card reader.
- Software for the various processes will be integrated with the hardware to provide an automated checkout process.
- Software processes include the ability to scan individual items, calculate the total payable, process credit cards, and issue an invoice/receipt after payment.
- An additional process that verifies whether all items packed have in fact been scanned, is included based on the weight of the items purchased.

Your part in the project is to develop test cases to test the correct functionality of the integrated hardware/software automated checkout system.

a) Without writing actual test cases, give three (3) test ideas aimed at testing the functionality of the hardware. For example, one idea would be to verify that the credit card reader is working correctly.

b) Without writing actual test cases, give three (3) test ideas aimed at testing the functionality of the software including the GUI.

c) Take one idea from (a) and one idea from (b) and for each, write a full test case including all the required information. Please state all assumptions made in completing the test case information.

## END OF EXAMINATION

# APPENDIX A
# Scenarios (for use in Question 9)

**SCENARIO 1**

If you take the train before 9.30am or in the afternoon after 4pm until 7.30pm (the rush hour), you must pay full fare. A saver ticket is available for trains between 9.30am and 4pm and after 7.30pm.

**SCENARIO 2**

If you hold an over 60's rail card, you get a 34% discount on whatever ticket you buy. If you are travelling with a child (under 16), you can get 50% discount on any ticket if you hold a family rail card, otherwise you get a 10% discount. You can only hold one type of rail card.

**SCENARIO 3**

A website shopping basket starts out empty. As purchases are selected, they are added to the shopping basket. Items can also be removed from the shopping basket. When the customer decides to check out, a summary of the items in the basket and the total costs are shown, for the customer to say whether this is okay or not. If the contents and the price are okay, then you leave the summary display and go to the payment system. Otherwise you go back to shopping so you can remove items if you want.

**SCENARIO 4**

If you are flying with an economy ticket, there is a possibility that you may get upgraded to business class, especially if you hold a gold card in the airline's frequent flyer programme. If you don't hold a gold card, there is a possibility that you will get bumped off the flight if it is full and/or you check-in late.