On admission to the examination room, you should acquaint yourself with the instructions below. You must listen carefully to all instructions given by the invigilators. You may read the question paper, but must not write anything until the invigilator informs you that you may start the examination.

You will be given five minutes at the end of the examination to complete the front of any answer books used.

May/June 2015 **SE3SQ11 2014/15 A 001**

1 Answer Book
Any calculator (including programmable calculator) permitted

UNIVERSITY OF READING

SOFTWARE QUALITY AND TESTING (SE3SQ11)

Two hours

Answer any **THREE** out of FOUR questions.

EACH Question is 20 marks.

1. (a) Define the essential elements of a test-case to be used for dynamic testing.

(4 marks)

> The ATM is maintained by local staff in order that customers can withdraw sums of money. Withdrawals are only possible if the machine is properly stocked, the customer submits a valid card and PIN combination and has sufficient funds.

Case Q1. (used in parts b and c of this question)

(b) Explain how a hierarchy of use cases can provide a hierarchy of acceptance tests? Credit will be given for including an illustration based on the behaviour of an automatic teller machine (ATM – aka cash machine) with the summary use-case Case Q1.

(8 marks)

(c) Continuing with the ATM with summary use-case CASE Q1: Propose a use case describing a user accessing the ATM to obtain payment; assume no obstacles that would cause failure in following the case to obtain money. Then define a set of test-cases that exercise it using the principle of equivalence partitioning.

(8 marks)

2. (a) Describe, with the aid of a suitable diagram, the fundamental test process (FTP) and then explain its role in planning and executing tests.

(4 marks)

(b) Explain why version control is important in testing and suggest which artefacts need to be controlled in a large-scale software development. Credit will be given for including reference to the UML architectural view of software artefacts.

(8 marks)

(c) Describe the Fagan inspection method of testing and how it might benefit agile style developments. Credit will be given for including an outline of the process and for the correct classification of inspection as a kind of test.

(8 marks)

3. (a) Discuss the assertion "software quality does not come from testing". Credit will be given for FOUR distinct and pertinent observations.

(4 marks)

(b) Discuss the objectives of testing when software products are under development in a programme of uninterrupted continuous cycles of backlog driven sprints. Credit will be given to THREE points made in regard to each of the verification and validation aspects of testing.

(6 marks)

(c) Consider the Waterfall, V-Model and Scrum (Agile) development processes. Compare and contrast their strengths in terms of their timeliness and effectiveness in detecting faults.

(10 marks)

4. This question concerns white box dynamic testing of the program code shown in Resource Q4. This resource represents a sub-component of an ordering system in which a customer uses a computer interface to order goods.

Resource Q4

```
Line
Number
   1    '''''''''''''''''''''''''''''''''''''''''''''''''''''''''''''''''''''''''
   2    'Global variables available to all procedures in this module
   3    '''''''''''''''''''''''''''''''''''''''''''''''''''''''''''''''''''''''''
   4    Dim Minstock                'The minimum stock threshold
   5    Dim ResidualStock           'The current stock level
   6    Dim RestockFlag As Boolean  'True when the system needs to
   7                                'replenish its stock of widgets.
   8    '''''''''''''''''''''''''''''''''''''''''''''''''''''''''''''''''''''''''
   9    'Procedures
   10   '''''''''''''''''''''''''''''''''''''''''''''''''''''''''''''''''''''''''
   11
   12   'StockAvailable determines whether the stock is
   13   'available using the availability rules of requirement R2.
   14   'StockAvailable returns true if stock is available.
   15   'StockAvailable sets the Restocking flag to satisfy R3.
   16   '''''''''''''''''''''''''''''''''''''''''''''''''''''''''''''''''''''''''
   17   Public Function StockAvailable(Q) As Boolean
   18       Const NOSTOCKLEFT = -1  'Constant used to indicate
   19                               'out of stock condition
   20       'Calculate a new residual stock assuming Q are removed
   21       ResidualStock = ResidualStock - Q
   22       'Apply stock availability rules
   23       If ResidualStock < 0 Then 'Not enough stock
   24           ResidualStock = NOSTOCKLEFT
   25           StockAvailable = False
   26       Else                        'Enough Stock
   27           StockAvailable = True
   28       End If
   29
   30       'Test to see if Restocking will be needed
   31       If ResidualStock < Minstock Then
   32           RestockFlag = True
   33       Else
   34           RestockFlag = False
   35       End If
   36   End Function
```

Notes:
(1) The line numbers are not part of the source code but are added for reference in the questions.
(2) The code is writtent in Visual Basic.

(Question continues on next page)

(a) Analyse the source code between lines 1 and 36 and identify the individual executable statements to complete the following table:

Statement	Source Line
1	17, 36
2	
3	
etc	

(4 marks)

(b) Analyse the source code between lines 1 and 36 and then estimate the % Statement Coverage achieved using the single test case: Q=5. You may assume that ResidualStock=5. Be sure to justify your answer by identifying the statements covered by the test case.

(8 marks)

(c) Analyse the source code between lines 17 and 36 by creating a control flow graph from the blocks of listed code lines and use this to determine the % Branch Coverage achieved with the single test case: Q=5. You may assume that ResidualStock=5. Be sure to show the key working details in your analysis.

(8 marks)

(End of Question Paper)