e-Quals Unit Syllabus

Level 2 Create designs and test software components

7266/7267 – 201

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Unit 201 Create designs and test software components

Rationale

The aim of this unit is to enable candidates to develop the skills required to create a detailed design specification for a software component from a given outline specification and to competently test a given software component by preparing test data, test plans and recording and analysing the test results.

Learning outcomes

There are **six** outcomes to this unit. The candidate will be able to:

Describe the common features of high-level programming languages

Specify data types and data structures

Develop a software component design specification

Prepare for testing

Record and analyse test results

Identify Health and Safety requirements

Guided learning hours

It is recommended that 60 hours should be allocated for this unit. This may be on a full time or part time basis.

Connections with other qualifications

This unit contributes towards the knowledge and understanding required for the following qualifications:

Outcome	This award contributes to the knowledge and understanding of the following Areas of Occupational Competence in the City & Guilds NVQ for IT Practitioners (4324)
1,2,3	212 Software development – design 2
4,5	219 Testing ICT systems 2
6	101 Health and Safety in ICT and Contact Centres 1

Key Skills

This unit contributes towards the Key Skills in the following areas:

Communication	C2.3
Application of Number	N1.1
Information technology	None
Working with others	None
Improving own learning	LP2.1, LP2.2, LP2.3
Problem solving	PS2.1, PS2.2, PS2.3

Assessment and grading

Assessment will be by means of a **set assignment** covering practical activities and a **multiple choice test** covering underpinning knowledge.

Unit 201 Create designs and test software components

Outcome 1 Describe the common features of high-level programming languages

Underpinning knowledge

The candidate will be able to:

1 describe the main features of a programming language:
   - a syntax
   - b keywords
   - c comments
   - d variables
   - e constants

2 describe the use of arithmetic operators:
   - a addition
   - b subtraction
   - c multiplication
   - d division
   - e modulus

3 list and describe the three fundamental program constructs:
   - a sequence
   - b selection
   - c iteration

4 describe the types of iteration:
   - a entry condition
   - b exit condition

5 describe the purpose and use of relational operators:
   - a less than
   - b greater than
   - c equal to
   - d less than or equal to
   - e greater than or equal to
   - f not equal to

Underpinning knowledge continued

6 describe the purpose and use of logical operators:
   a and
   b or
   c not
7 describe the purpose and use of assignment operators
8 state that consistent naming conventions should be used for variables, files, functions/procedures/subroutines.

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Outcome 2 Specify data types and data structures

Practical skills

The candidate will be able to:

1 document the design of components by specifying
   a variable names and data types
   b constants
   c argument names and data types
   d return value data types
   e data structures
   f external and internal filename.

Underpinning knowledge

The candidate will be able to:

1 identify the basic data types: integer, floating point, character, string, boolean
2 describe string manipulation methods
3 describe the difference between local and global variables and the purpose of data hiding
4 describe how parameters are passed by
   a value
   b reference
5 describe how values can be returned from a function/procedure/subroutine
6 describe one-dimensional arrays and the use of a subscript to access an element in the array
7 describe how data in an array can be
   a searched
   b sorted
8 describe the meaning of the terms file, record and field and the relationships between them
9 list the limitations of a sequential file
10 describe how data can be read from and written to a sequential file
11 state the difference between an external filename and an internal filename
12 describe the binary number system and methods of conversion between decimal and binary
13 describe the ASCII character set and the difference between the ASCII and the binary representation of a number.

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Outcome 3 Develop a software component design specification

Practical skills

The candidate will be able to:

1 interpret and/or produce
   - a a decision table
   - b a structure chart
   - c a file layout
   - d a screen layout
   - e a print layout

2 produce program design language algorithms for components

3 apply validation checks to input data

4 specify screen error messages

5 check the design for consistency and completeness

6 verify that the design conforms fully with the given specification.

Underpinning knowledge

The candidate will be able to:

1 state the purpose of a decision table

2 state how a structure chart can be used to represent the links between modules

3 state that pseudocode, structured English or flowcharts can be used as a program design language

4 describe the purpose of validation checks on input data

5 identify the different types of validation check that can be performed:
   - a range
   - b type (alphabetic, numeric)
   - c check digits

6 list examples of error conditions that can occur in software.

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Outcome 4 Prepare for testing

Practical skills

The candidate will be able to:

1 identify from a given specification the tests required to carry out functional testing

2 prepare a test plan

3 prepare test data.

Underpinning knowledge

The candidate will be able to:

1 describe 'white box testing' as logical testing dependant on the logic of the code used in software

2 describe 'black box testing' as functional testing carried out independently of the code used in software

3 state that the purpose of testing is to prove that software matches its specification and to find errors so that they can be corrected

4 list the essential features of a test plan (Appendix A)

- a test number
- b date
- c purpose/type of test
- d expected outputs for stated inputs

5 describe the importance of designing test data to confirm a program works correctly under normal and exceptional circumstances

- a valid
- b invalid
- c boundary

6 state that recovery testing is done to ensure that data can be recovered after a hardware/software failure

7 state that performance testing is required to ensure that a system can deal with large volumes of data and still achieve the response times required by the user

8 state that to comply with quality control procedures a standardised and rigorous approach to testing is required.

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Outcome 5 Record and analyse test results

Practical skills

The candidate will be able to:

1 use a test plan to carry out a series of tests

2 record the test results in a test log

3 provide evidence of testing eg printed output, screen shots, file output

4 use the test log to produce a report which:

- a specifies the presence or absence of errors
- b makes proposals for rectifying errors
- c reports on the success of the test against the original software specification.

Underpinning knowledge

The candidate will be able to:

1 list the essential features of a test log (Appendix B)

- a test number
- b date
- c actual results
- d record of discrepancies between actual results and expected results

2 state that the test number must provide a cross reference between a test plan its corresponding test log and test output (printed, screen shots or file)

3 describe the importance of testing software in the target environment

4 describe the different types of software error

- a syntax
- b logical
- c run-time
- d non compliance with specification

5 describe common causes of run-time errors eg forever loops, illegal file operations, divide by zero

6 describe the difference between testing and debugging

7 describe the purpose of test plans, test logs, test results and test reports in relation to technical documentation and the relevance of testing in relation to software quality and maintenance

8 describe how well thought out test plans and test data can be reused for subsequent testing after errors are resolved or maintenance amendments made

9 describe the purpose of version control procedures when developing, testing, amending and maintaining software and documentation with reference to quality assurance.

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Outcome 6 Identify Health and Safety Requirements

Practical skills

The candidate will be able to:

1 maintain a safe working environment for self and others

2 use safe working practices at all times

3 operate equipment according to suppliers, manufacturers and/or workplace requirements

4 use and maintain equipment, materials and accessories to a safe standard

5 use reporting procedures to report any hazards.

Underpinning knowledge

The candidate will be able to:

1 describe what elements and practices create a good working environment
   - a frequent breaks away from the computer
   - b correct positioning of screens/chairs/keyboards
   - c adequate lighting and ventilation

2 identify the health and safety precautions to adopt when using a computer
   - a ensuring that power cables are safely secured
   - b ensuring that power points are not overloaded

3 identify injuries common in a bad working environment
   - a repetitive strain injury
   - b eye strain
   - c bad posture

4 identify cleaning procedures related to IT equipment

5 explain the term 'ergonomics'

6 describe the main points of relevant legislation: Health and Safety at work Act 1974, electrical regulations, working with VDUs, COSHH regulations

7 explain the importance of keeping fire doors and exits clear and unblocked

8 describe the use of different types of fire extinguishers, in particular those suitable for use in the IT environment

9 identify the difference between hazards and risks.

Unit record sheet

Use this form to track your progress through this unit.

Tick the boxes when you have covered each outcome. When they are all ticked, you are ready to be assessed.

Outcome	✓	Date
1 **Describe the common features of high-level programming languages**	☐	
2 **Specify data types and data structures**	☐	
3 **Develop a software component design specification**	☐	
4 **Prepare for testing**	☐	
5 **Record and analyse test results**	☐	
6 **Identify Health and Safety requirements**	☐	

Candidate Signature ---------- **Date** ----------

City & Guilds Registration Number ---------- ----------

Centre Name ---------- **Centre Number** ----------

1 Appendix A

2 TEST PLAN

SYSTEM NAME: PROGRAM NAME: MODULE NAME:			VERSION NO: TESTER NAME:	PAGE NO:
Test No	**Date**	**Purpose/Type of Test**	**Input/Filename**	**Expected Output/Filename**

3 Appendix B

4 TEST LOG

SYSTEM NAME: PROGRAM NAME: MODULE NAME:			VERSION NO: TESTER NAME:	PAGE NO:
Test No	**Date**	**Actual Output/Filename**	**Comments on discrepancies**	

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