City & Guilds

A City & Guilds Group Business

5220-32-035/535 Level 3 Advanced Technical Extended Diploma in Digital Technologies (720) (Application Development) – Theory Exam (2)

Exam date: June 2019

<table>
<tr><td>Q1</td><td colspan="4">Explain how each of the following styles of programming can be used to create software applications.

• Event Driven.
• Object Oriented.
• Procedural.</td></tr>
<tr><td></td><td>Acceptable answer(s)</td><td>Guidance</td><td>Max marks</td><td>Ref</td></tr>
<tr><td></td><td>2 marks each for any of the following, to a maximum of 6 marks:
• In a program using Event Driven programming the code is split into methods (1) which respond to events raised by system or user actions (1).
• In Object Oriented programming entities are defined to combine the data and methods as classes (1) which are used as objects in the program (1).
• Procedural programming defines the required functionality as a set of separate methods (1) which are called, on demand, when needed by different parts of the program (1).</td><td>Candidates may give very different explanations from those in the model answers, but the answers must be technically accurate.

Candidates must focus on the ‘use’ of each style by explaining how the program’s operations and/or components are defined.

Marks awarded are capped for each separate explanation at a total of 2 marks.

Candidates should be allowed to give any valid explanation and marks should be awarded for each distinct element in the explanation.

Where a point is duplicated within each explanation, by meaning, the duplicated item will not be awarded a mark.</td><td>6</td><td>5220-035 310.1.1</td></tr>
<tr><td>AO</td><td colspan="4">AO2</td></tr>
<tr><td>LO</td><td colspan="4">310.1 Create program specifications</td></tr>
</table>

Q2	State **three** project constraints that can be considered when gathering end-user requirements.			
	Acceptable answer(s)	**Guidance**	**Max marks**	**Ref**
	1 mark each for any of the following, to a maximum of 3 marks: • budget (1) • time (1) • specialist skills (1) • quality (1)	The list contains project constraints. The candidate may give examples of project constraints that are not included in the unit. For example, • hardware • software • user availability Candidates may use different terminology to represent each constraint and marks should be awarded if these are equivalent. Where an item is duplicated within the answers given, either by name or meaning, the duplicated item will not be awarded a mark. Marks are capped to a maximum of 1 mark for each valid item stated.	**3**	**5220-035 310.1.1**
AO	AO1			
LO	310.1 Create program specifications			

Q3	Explain one benefit for **each** of the following aspects of market research conducted before starting a software application development project. • Current products. • Future developments.			
	Acceptable answer(s)	**Guidance**	**Max marks**	**Ref**
	2 mark each for any of the following, to a maximum of 4 marks: • Research into <u>current products</u> may help the developer identify features that should be included in the program (1) and understand the structure of successful programs (1) already created. • Understanding <u>future developments</u> can extend the potential life-span of a program (1) by ensuring that it will still function correctly when changes take place (1) in technologies.	Candidates may give very different explanations from those in the model answers, but the answers must be technically accurate. Marks awarded are capped for each separate explanation at a total of 2 marks. Candidates should be allowed to give any valid explanation and marks should be awarded for each distinct element in the explanation. Where a point is duplicated within each explanation, by meaning, the duplicated item will not be awarded a mark.	**4**	**5220-035 310.1.1**
AO	AO2			
LO	310.1 Create program specifications			

Q4	State **three** systems life-cycle models that can be used when developing a software application project.			
	Acceptable answer(s)	**Guidance**	**Max marks**	**Ref**
	1 mark each for any of the following, to a maximum of 3 marks: • Waterfall (1) • Rapid Application Development (RAD) (1) • Agile (1)	The list contains systems life-cycle models. The candidate may give examples of system life-cycle models that are not included in the unit. For example, • V model • Prototyping • Spiral Where an item is duplicated within the answers given, either by name or meaning, the duplicated item will not be awarded a mark. Marks are capped to a maximum of 1 mark for each valid model stated.	**3**	**5220-035 310.1.2**
AO	A01			
LO	310.1 Create program specifications			

<table>
<tr><td>Q5</td><td colspan="4">Explain how the following sections of the requirements document help the developer of a software application meet the client’s needs.

• Overview of project aims.
• Design specification.
• Project management.</td></tr>
<tr><td></td><td>Acceptable answer(s)</td><td>Guidance</td><td>Max marks</td><td>Ref</td></tr>
<tr><td></td><td>2 marks each for any of the following, to a maximum of 6 marks:
• The overview of project aims section provides a summary of what the client wants (1) and allows the developer to design the application to meet those aims (1).
• The design specification section allows for preview of the layouts and aesthetics of the proposed application to be verified by the client (1) before the developer begins work (1) on the application.
• The project management section helps by the specification giving the developer a clear understanding of the roles of project members (1) and the timescales expected (1) to be met during development to meet the client’s needs.</td><td>Candidates may give very different explanations from those in the model answers, but the answers must be technically accurate.

Candidates must focus on ‘how’ each section helps the developer meet the needs of the client rather than the contents of the section.

Marks awarded are capped for each separate explanation at a total of 2 marks.

Candidates should be allowed to give any valid explanation and marks should be awarded for each distinct element in the explanation.

Where a point is duplicated within each explanation, by meaning, the duplicated item will not be awarded a mark.</td><td>6</td><td>5220-035 310.1.3</td></tr>
<tr><td>AO</td><td colspan="4">AO2</td></tr>
<tr><td>LO</td><td colspan="4">310.1 Create program specifications</td></tr>
</table>

Q6	State **four** components or structures that are used to hold single or multiple data values in program code.			
	Acceptable answer(s)	**Guidance**	**Max marks**	**Ref**
	1 mark each for any of the following, to a maximum of 4 marks: • variable (1) • array (1) • stack (1) • queue (1)	The list contains components or structures used to hold single or multiple data values. The candidate may give examples of components or structures that are not included in the unit. For example, • list • collection Marks should not be awarded where candidates state the types of data values that will be held in the components or structures for example, • Integer • Float • String Where an item is duplicated within the answers given, either by name or meaning, the duplicated item will not be awarded a mark. Marks are capped to a maximum of 1 mark for each valid component stated.	**4**	**5220-035 310.2.1**
AO	AO1			
LO	310.2 Create design specifications			

Q7	Explain how the following types of 'variable scope' control the availability of data values in the program code of a software application. • Local. • Global. • Static.			
	Acceptable answer(s)	**Guidance**	**Max marks**	**Ref**
	2 mark each for any of the following, to a maximum of 6 marks: • Data values scoped as <u>local</u> variables are only available within the module (1) and the data they refer to is only accessed or changed within the module (1). • Data values scoped as <u>global</u> variables are available for use throughout the application (1) and any module may access or change the data they refer to (1). • <u>Static</u> scope can be applied to data values scoped as local and global variables (1). When used in a function, the value is preserved between calls to the function (1).	Candidates may give very different explanations from those in the model answers, but the answers must be technically accurate. Marks awarded are capped for each separate explanation at a total of 2 marks. Candidates should be allowed to give any valid explanation and marks should be awarded for each distinct element in the explanation. Where a point is duplicated within each explanation, by meaning, the duplicated item will not be awarded a mark.	**6**	**5220-035 310.2.1**
AO	AO2			
LO	310.2 Create design specifications			

Q8	Explain how **each** of the following iterative programming constructs are used by the programmer to control the 'flow of execution' in software application program code. • for() • while() • do … while().			
	Acceptable answer(s)	**Guidance**	**Max marks**	**Ref**
	2 marks each for any of the following, to a maximum of 6 marks: • A for() iteration repeats a set of steps until a condition evaluates as false (1) and the change in the control variable is managed by the construct (1) without intervention by the programmer. • A while() iteration may not run its instructions as the condition may immediately evaluate to false (1). The programmer must manage the change in the iteration variable in code (1) to allow the iteration to repeat. • A do … while() iteration loop will always run at least once as the condition is not evaluated until after the first execution of the instructions (1). The programmer must manage the change in the iteration variable in code (1) to allow the iteration to repeat.	Candidates may give very different explanations from those in the model answers, but the answers must be technically accurate. Candidate explanations for the while() and do … while() iterations must identify the potentially different code execution based on the placement of the conditional check. Marks awarded are capped for each separate explanation at a total of 2 marks. Candidates should be allowed to give any valid explanation and marks should be awarded for each distinct element in the explanation. Where a point is duplicated within each explanation, by meaning, the duplicated item will not be awarded a mark.	**6**	**5220-035 310.2.2**
AO	AO2			
LO	310.2 Create design specifications			

<table>
<tr><td>Q9</td><td colspan="4">Explain one benefit of using pseudocode to model each of the following during the design specification phase of a software application project.

• Structures.
• Algorithms.
• Dry runs.</td></tr>
<tr><td></td><td>Acceptable answer(s)</td><td>Guidance</td><td>Max marks</td><td>Ref</td></tr>
<tr><td></td><td>2 mark each for any of the following, to a maximum of 6 marks:
• The whole set of structures can be centrally defined in pseudocode by the application architect before distribution to specialist developers (1) where a program may require different development skills (1).
• Pseudocode used to define algorithms will allow early identification of errors (1) in advance of the formal coding by a specialist (1).
• Pseudocode will allow the early identification of logic errors (1) through the use of dry runs on code algorithms by tracing execution through each instruction (1).</td><td>Candidates may give very different explanations from those in the model answers, but the answers must be technically accurate.

Marks awarded are capped for each separate explanation at a total of 2 marks.

Candidates should be allowed to give any valid explanation and marks should be awarded for each distinct element in the explanation.

Where a point is duplicated within each explanation, by meaning, the duplicated item will not be awarded a mark.</td><td>6</td><td>5220-035 310.2.3</td></tr>
<tr><td>AO</td><td colspan="4">AO2</td></tr>
<tr><td>LO</td><td colspan="4">310.2 Create design specifications</td></tr>
</table>

Q10	State **four** aspects of 'program operation' that can be represented using diagrams or graphical models.			
	Acceptable answer(s)	**Guidance**	**Max marks**	**Ref**
	1 mark each for any of the following, to a maximum of 4 marks: • data flow (1) • system flow (1) • data flow between objects (1) • parameter passing (1) • interfaces (1)	The list contains diagrams and graphical models. The candidate may give examples that are not included in the unit by stating specific types of diagrams that are used to model operations. For example, • flowchart • navigation diagram • activity diagram • interaction diagram • component diagram Marks should not be awarded where candidates state design diagrams that do not represent 'flow', for example, • interface design diagram • database design diagram Where an item is duplicated within the answers given, either by name or meaning, the duplicated item will not be awarded a mark. Marks are capped to a maximum of 1 mark for each valid diagram, or model stated.	**4**	**5220-035 310.2.3**
AO	AO1			
LO	310.2 Create design specifications			

Q11	Explain the use of the following functionality testing methods that can be applied to software applications before final release. • Usage. • Target environment.			
	Acceptable answer(s)	**Guidance**	**Max marks**	**Ref**
	2 marks each for any of the following, to a maximum of 4 marks: • Usage testing allows the validation of the processes implemented in the application (1) against the purpose outlined in the application specification (1). • Target environment testing is performed on the machines used by the end-user (1) to identify any functionality differences between their machines and the development systems (1) which may have higher specifications.	Candidates may give very different explanations from those in the model answers, but the answers must be technically accurate. Marks awarded are capped for each separate explanation at a total of 2 marks. Candidates should be allowed to give any valid explanation and marks should be awarded for each distinct element in the explanation. Where a point is duplicated within each explanation, by meaning, the duplicated item will not be awarded a mark.	**4**	**5220-035 310.3.1**
AO	AO2			
LO	310.3 Use testing methodologies			

Q12	Explain why the following aspects of application software testing can be included in the software documentation of a development project. • Testing technique justification. • Test plan. • Test log.			
	Acceptable answer(s)	**Guidance**	**Max marks**	**Ref**
	2 marks each for any of the following, to a maximum of 6 marks: • Testing technique justification allows the client to understand why testing was conducted in a particular way (1) so that they can be satisfied that the technique was appropriate to their needs (1). • Test plan details provide a summary of proposed tests (1) used to verify the required functionality (1) as specified by the client. • Test log details provide confirmation of the tests conducted (1) and identify any issues that remain outstanding (1) following the tests.	Candidates may give very different explanations from those in the model answers, but the answers must be technically accurate. Marks awarded are capped for each separate explanation at a total of 2 marks. Candidates should be allowed to give any valid explanation and marks should be awarded for each distinct element in the explanation. Where a point is duplicated within each explanation, by meaning, the duplicated item will not be awarded a mark.	**6**	**5220-035 310.4.1/ 4.2**
AO	AO2			
LO	310.4 Determine how documentation supports software development			

Q13	Explain why **each** of the following is included in the user documentation of a software application. • Input validation rules. • Troubleshooting guide.			
	Acceptable answer(s)	**Guidance**	**Max marks**	**Ref**
	2 marks each for any of the following, to a maximum of 4 marks: • Input validation rules are defined in the documentation to make it clear to the end-user (1) where any constraints exist on the data that can be used by the program (1) to avoid processing errors. • A troubleshooting guide can allow end-users to identify solutions to problems (1) and resolve them without the need for direct external support (1).	Candidates may give very different explanations from those in the model answers, but the answers must be technically accurate. Candidate's answers should focus on a reason 'why' each is included in the documentation. Marks must not be awarded for 'how' they are used. Marks awarded are capped for each separate explanation at a total of 2 marks. Candidates should be allowed to give any valid explanation and marks should be awarded for each distinct element in the explanation. Where a point is duplicated within each explanation, by meaning, the duplicated item will not be awarded a mark.	**4**	**5220-035 311/312 /313.3.2**
AO	AO2			
LO	311/312/313.3 Produce documentation to support the program			

Q14	You are a software developer and have been asked to explain some features of an application which have been modelled in pseudocode. The pseudocode specifies an algorithm used to calculate a salary bonus based on a sales net amount recorded by its employees. To demonstrate your level of understanding you have been asked to carry out the following **three** tasks relating to the pseudocode in **Figure 1**. a) Explain the purpose of the code specified between lines 13 and 21. b) Explain the purpose of the code specified at line 22. c) Identify and correctly locate using line numbers, **five** separate coding techniques used in the pseudocode. You must use the following format for your answer: Line number Coding technique identified

```
1  array int net[x]
2  array float gross[x]
3
4  int a = 0
5  int b = 20
6  int c = 60
7  int d = 0
8  float e = 0
9
10
11 i = 0
12 WHILE (i < x)
13     a = net[i]
14     if (a < b)
15         d = a
16     else if (a > c)
17         d = a + a * .20
18     else
19         d = a + a * .10
20     end if
21     gross[i] = d
22     e = e + (d - a)
23 i = i + 1
24 LOOP
25
26 OUTPUT e
```

Figure 1

<table>
<tr><th></th><th>Acceptable answer(s)</th><th>Guidance</th><th>Max marks</th><th>Ref</th></tr>
<tr><td></td><td>
Marks as outlined below to a maximum of 9 marks:
<table>
<tr><th>Q</th><th>Expected answer</th></tr>
<tr><td>a</td><td>The variable ‘a’ is assigned the value in the array element ‘net[i]’ (1) and the value of ‘d’ is calculated based on the value of ‘a’ (1).</td></tr>
<tr><td>b</td><td>The value of ‘e’ is updated with the value of the bonus for each current iteration (1) to keep a ‘running total’ of all bonuses awarded (1).</td></tr>
<tr><td>c</td><td>The identified coding techniques can include:
<table>
<tr><th>Line</th><th>Technique used</th></tr>
<tr><td>Lines 1, 2</td><td>array (1)</td></tr>
<tr><td>Lines 4,5,6,7</td><td>use of integer type (1)</td></tr>
<tr><td>Line 8</td><td>use of float type (1)</td></tr>
<tr><td>Lines 4 – 8</td><td>declare and initialise variables</td></tr>
<tr><td>Lines 4-8, 15, 17, 19, 22, 23</td><td>variable assignment (1)</td></tr>
<tr><td>Lines 12 – 24</td><td>use of ‘while’ iteration</td></tr>
<tr><td>Lines 14 – 20</td><td>use of ‘if.. else if.. else’ construct (1)</td></tr>
<tr><td>Lines 12, 14, 16</td><td>conditional check (1)</td></tr>
<tr><td>Line 13</td><td>assign array element to variable (1)</td></tr>
<tr><td>Lines 17, 19</td><td>multiplication</td></tr>
<tr><td>Line 21</td><td>array element assignment (1)</td></tr>
<tr><td>Line 22</td><td>precedence defined by parentheses (1)</td></tr>
<tr><td>Line 26</td><td>output to user (1)</td></tr>
</table></td></tr>
</table>
</td><td>
In response to <u>questions 14a and b,</u> candidates may give a very different explanation from that in the model answer, but the answers must be technically accurate and explain the purpose of the pseudocode effectively.

The key marking points are:
a)
• variable assigned
• value calculated as a result
b)
• ‘e’ updated each iteration
• running total

In response to question 14a) The explanation is capped at a total of 2 marks.

In response to question 14b) The explanation is capped at a total of 2 marks.

In response to <u>question 14c)</u> marks should only be awarded where the candidate provides the valid line number and technique in their answer.

Each valid line number and unique technique is awarded 1 mark.
Question 14c) is capped at a total of 5 marks.
</td><td>9</td><td>5220-035

AO4</td></tr>
<tr><td>AO</td><td colspan="4">AO4</td></tr>
<tr><td>LO</td><td colspan="4">Integration</td></tr>
</table>

Q15	You are a junior software developer working in a large company. You have been asked to create a proposal for implementing a program that will be installed on the Windows PCs of the company's accounts department to automate bonus calculations. Your manager has asked for an outline of the processes required to produce the program. Discuss what can be included in the outline you will submit to your manager. The outline should use technical language appropriate to the intended audience.			
	Acceptable answer(s)	**Guidance**	**Max marks**	**Ref**

	Indicative content:
	A candidate's discussion may include consideration of:
	• Planning
	  ○ Life cycle models
	  ○ Sourcing
	  ▪ Budget
	  ○ Hardware
	  ○ Networks
	  ▪ Wireless
	  ○ User requirements
	  ▪ target platform
	  ▪ target device(s)
	  ▪ system constraints
	  ○ Legislation and regulations
	  ○ Compliance
	• Design
	  ○ Skill requirements
	  ▪ developers
	  ▪ users
	  ○ Development timescales
	  ○ Data requirements
	  ○ Data storage
	  ○ Interface design
	  ▪ Accessibility
	  ▪ Controls
	  ▪ Mock ups/wireframes
	  ○ Security
		0 marks – No awardable material
		
		Band 1:
		1– 3 marks
		The response demonstrates a limited understanding of the processes and technologies involved and is mostly a statement of facts which are not developed. The approach to the task is inconsistent. Statements may be occasionally incorrect, and the use of precise technical language is sparse.
		
		Band 2:
		4 – 6 marks
		The candidate has produced a discussion that expands on the factual knowledge but lacks detail in some areas. They show an adequate understanding of the processes and technologies involved including some reasons for their selection. They have provided some valid reasons for their choices. The response is structured and presented in a logical order representing the sequences of processes that would be carried out during development.
		
		Band 3:
		7 – 9 marks
		The candidate has shown a thorough understanding of the processes and technologies involved. They have covered these in the correct logical order, including reasons behind the processes and technologies, the
			9	**5220-035 AO4**

	▪ Threats ▪ Vulnerabilities ▪ Risks ▪ Data ▪ Countermeasures o Hardware o Networks • Implementation o Development software ▪ Appropriate for mobile devices o Native platform development options o Framework-based development • Programming o Style o Language o Paradigm • Testing o test plan o test log o user acceptance schedules • Deployment o private distribution o validation • Maintenance o Technical documentation o Security o User support o Accounts o Fault log o Patching and updating	factors that need to be considered and the impact these factors may have on the implementation. They have clearly understood how all of the processes and technologies link to one another in terms of order and importance. They have provided valid reasons for their choices. The response is clear, coherent and all information has been logically presented.		
AO	Integration			
LO	AO4			