2011 Assessment Report

VICTORIAN CURRICULUM AND ASSESSMENT AUTHORITY

2011 Software Development GA 3: Written examination

GENERAL COMMENTS

The 2011 Information Technology: Software Development paper comprised three sections: Section A contained 20 multiple-choice questions (worth a total of 20 marks), Section B comprised six short answer questions (worth a total of 20 marks) and Section C was a case study (worth a total of 60 marks). This is the first examination for this accredited study design. Teachers and students should refer to the *VCE Information Technology Study Design 2011–2014* while reading this report and while preparing for the 2012 examination. New content in this study provided students with a challenge in Section A. Students are reminded to provide responses to all multiple-choice questions, as some students did not answer some questions. Throughout the year it may be appropriate for students to practise answering this type of question.

Section B assessed students' knowledge of many of the new areas in the study. In general, this section required students to demonstrate sound theoretical knowledge and to provide detailed and accurate responses.

The format of Section C was consistent with that of previous years, and student responses were expected to refer to the case study.

During the examination, students should:

- endeavour to use correct IT terminology
- discuss all options when asked to justify a choice or compare one option to another
- know how to respond to key instructional terms in questions, such as 'state', 'explain', 'justify' or 'describe'
- reread each question and their response to ensure the question has been answered
- avoid using pencil in Sections B and C as responses in pencil can often be difficult for assessors to read
- read the case study and questions carefully and underline or highlight key words
- endeavour to demonstrate their knowledge of the subject and apply that knowledge to the case study, as generic responses often result in low or no marks.

SPECIFIC INFORMATION

For each question, an outline answer (or answers) is provided. In some cases the answer given is not the only answer that could have been awarded marks.

Section A – Multiple-choice questions

The table below indicates the percentage of students who chose each option. The correct answer is indicated by shading.

Question	% A	% B	% C	% D
1	1	0	97	2
2	3	6	61	29
3	14	9	72	5
4	17	9	7	67
5	6	9	7	78
6	91	4	4	1
7	3	17	6	73
8	87	1	11	1
9	45	35	13	7
10	24	62	6	8
11	3	30	4	64
12	58	9	7	26
13	17	50	13	21
14	14	42	17	27
15	1	8	28	63
16	11	10	24	54
17	6	88	5	1

Question	% A	% B	% C	% D
18	6	9	34	51
19	10	5	83	2
20	34	11	48	7

Section B – Short answer questions

Note: Student responses reproduced herein have not been corrected for grammar, spelling or factual information.

Question 1

Marks	0	1	2	Average
%	20	26	54	**1.4**

Characteristics that will need to be considered include (two of):

- size of RAM
- size of screen
- processing speed
- screen resolution.

Most students were able to provide a reasonable response to this question.

Question 2

While it was clear that most students had studied both diagram methods, many were not able to clearly articulate the purpose of the lines or the purpose of the circle/ellipse in each diagram. Students should be able to read, draw and write about each of these diagram methods.

Use case diagrams and data flow diagrams appear in Unit 3, Outcome 1. Use case diagrams are new to this study design.

2a.

Marks	0	1	2	Average
%	25	28	47	**1.2**

The following is an example of a high-scoring response.

The line in a DFD illustrates the flow of data to or from an entity, process or data store, with the arrow indicating direction of flow. The line in a UCD shows that an actor interacts with a specific use case.

2b.

Marks	0	1	2	Average
%	29	31	40	**1.1**

The following is an example of a high-scoring response.

The ellipse in a UCD shows a use case – an interaction that a user has with the system, whereas a circle in a DFD shows a process in the system, where data is manipulated or transferred.

Question 3

A code of ethics and decision support frameworks are part of Unit 4, Outcome 2 and are both new to the study. A code of ethics outlines the values of the organisation and the expected behaviour of employees. A decision support framework outlines how the organisation deals with an ethical dilemma in order to ensure consistency in the process and the outcomes.

Most students struggled to provide a clear and accurate response to this question, with many simply stating that 'the code of ethics/decision support framework would help Brian'. In this style of question it is important that students provide a definition/description/explanation as well as relate the response to the scenario presented. For example, students should have explained what a code of ethics is, as well as how it was going to help Brian in this situation.

3a.

Marks	0	1	2	Average
%	51	32	17	**0.7**

The following are examples of high-scoring responses.

A code of ethics is a document in a company or profession that explains how people in that company or profession can behave in an ethical manner. A code of ethics could assist Brian in knowing what and who to prioritize in his ethical dilemma.

Brian is in an ethical situation, wanting the best for the customer and to obey his manager. A code of ethics is guidelines that all must follow, it can give Brian the reasoning and privilege to not obey his managers demands and follows the rules of ethics towards the customer.

3b.

Marks	0	1	2	Average
%	54	29	17	**0.7**

The following are examples of high-scoring responses.

A decision support framework would be an individual/group or possibly document that outlines how to go about resolving the dilemma by suggesting courses of action and outlines what the company believes Brian should do in his circumstance. DSF helps ensure Brian doesn't break the code of ethics, and solves the ethical dilemma legally correct.

A decision support framework is a package of resources that helps to prevent conflicts from occurring, and describe how to resolve them when they do occur. A decision support framework will outline the steps needed to resolve the conflict and Brian can go through these steps which will involve listening to all points of view in order to resolve the dilemma.

Question 4

This question required students to show their knowledge of security techniques and how the techniques may be tested. It is important that students read questions carefully and ensure they are answering the question asked, as a number of students wrote about what security could be implemented. Students are encouraged to highlight or underline key words and phrases in questions during writing time.

4a.

Marks	0	1	2	Average
%	20	37	43	**1.3**

Many students discussed a version of ethical hacking to test the security. Students are reminded to use technically correct IT terminology. Many students used terms incorrectly, including white-box, black-box, white/black/grey hat hacker, penetration testing, cracker, etc. Appropriate responses included the techniques of penetration testing or packet sniffing and a technical and accurate description of how the technique works.

4b.

Marks	0	1	2	Average
%	32	36	32	**1**

A security audit is a preventative security measure; it not only examines the equipment (hardware and software) but other elements of the information system (people and procedure) to ensure there are no security issues.

For full marks students needed to demonstrate knowledge of the function of a security audit and apply this knowledge to the case study.

The following is an example of a high-scoring response.

A security audit would have involved security experts examining the security of the system to identify weaknesses and gaps in the security. This may have involved the identification of the weakness that allowed the original network breach, thus allowing Big O Television to remove the weakness. The breach therefore may have been prevented.

Question 5

Marks	0	1	2	3	4	Average
%	17	5	14	25	40	**2.7**

A significant number of students were able to correctly identify that 80 GB would not be able to fit on a DVD and provide an appropriate, justified solution. The most appropriate solution was to store data on a file server, which a majority of students described; however, a range of other reasonable responses was accepted.

The following is an example of a high-scoring response.

Solution: Store the software on the file server and store the data files on the file server.

Reasons:

DVDs are not large enough to store a 80GB program so Ryan's suggestion is not appropriate

DVD's for data files is not appropriate as the information would tae to long to load. The amount of DVD's would also increase as the data files grow over time making them harder to store.

Storing all data on a server is better as all data is accessed quicker, more efficiently, memory can be added, easily backed up and archived.

Question 6

Marks	0	1	2	Average
%	37	16	47	**1.1**

Most students were able to identify user characteristics such as vision impairment, physical impairment, education level, experience with technology, etc. and were able to describe how this would affect the design of the website. However, a significant number of students confused user characteristics with non-functional requirements such as readability or easy navigation.

The following is an example of a high-scoring response.

Visual impairment: will need to design a solution with high contrast and large interface elements to accommodate for the user's impaired vision.

Technical ability: will need to have a focus on user friendliness, as the users will not have much technical knowledge e.g. simple, step by step process.

Section C – Case study

Question 1

Marks	0	1	2	3	Average
%	31	14	23	32	**1.6**

Most students were able to identify that the data transfer from CDU to RDL was the one that did not require TCP/IP. However, many students struggled to provide a technically accurate description as to why it was not required. TCP/IP is a protocol for Internet use and the use of the Internet is not required for this data transfer. Stating 'because it is not required' was not sufficient and simply restated the question.

The following is an example of a high-scoring response.

Data transfer from CDU to RDL

Explanation: The data does not transfer using the Internet. Because TCP/IP is only for data transfer over the Internet the protocol is not required.

Question 2

Marks	0	1	Average
%	61	39	**0.4**

Students had some difficulty with written responses regarding use case diagrams. As use case diagrams are new to the study, teachers are encouraged to provide more questions of this type throughout the year. Appropriate responses made comment about the dedicated computer not being included in the use case diagram because it was not being an actor (but part of the system).

Question 3

Marks	0	1	2	3	4	Average
%	39	4	18	4	34	**1.9**

A range of responses was accepted as long as the student could clearly articulate the functional requirements of the system. Functional requirements include:

- send data from roadside logger to central computer
- CDU detects the arrival/departure of a car
- transfer data from CDU to RDL
- send data to parking officers.

Functional requirements are statements about what the system is required to do; however, when responding to this question, many students confused functional and non-functional requirements. Reliability, robustness and maintainability were common answers, but these are all non-functional requirements.

Question 4

Marks	0	1	2	3	4	Average
%	37	5	17	21	21	**1.9**

The most critical non-functional requirement in this situation is response rate. When justifying a choice, students who appropriately contrasted response rate with the other non-functional choices generally provided better responses.

It is important that students are conversant with the terminology used in the problem-solving methodology stated on pages 16–18 of the study design. It was apparent that many students did not recognise, or understand, the term 'functional requirement' – part of the analysis stage of the problem-solving methodology.

The following are examples of high-scoring responses.

Justification: The success of the system depends on whether it can inform parking officers of overstaying cars in time for them to give these cars a ticket. The system's response rates will therefore need to be quick enough to get this information to the officers in time for it to be used. User friendliness and maintainability do not necessarily effect whether the system fulfils its purpose, but in this case the response rates of the system are critical to its success,

Justification: Seeing as how the parking officer will need constant updates as the whereabouts of each overstaying vehicle, the response times between detecting an overdue car then the RDL sending this information through to the council's dedicated computer and then on to the parking inspector will need to be very short. How easy the program is to use is irrelevant because there is no handling by users, it is all automatic beside the information received by the officer, and the maintainability, whilst in its own right be an important part, is not considered as it is required but the devices are assumed to be very robust.

Question 5

Marks	0	1	2	3	4	Average
%	5	8	16	30	41	**3**

Field Name	Type	Use
cduID	Integer	Unique identifier for the CDU
bayNum	***Integer***	Number of the parking bay in which the CDU is located
bayLocation	***String***	Street address of the parking bay
cduBattery	***Boolean***	Is the CDU's battery getting low?
deadlineTime	***integer or floating point***	The time by which the car must have left the parking bay (24-hour time)

Only responses from the provided list were accepted. The *VCE Software Development Study Design* states the following data types: integer, floating point, Boolean, character and string. It is important that students undertaking IT Applications and Software Development are aware of the differences in each study's definition of data types.

Question 6

6a.

Marks	0	1	2	Average
%	53	41	6	**0.6**

Most students were able to identify that the file needed to be sorted in order to perform a binary search; however, many failed to identify the data item that should be sorted – cduID.

6b.

Marks	0	1	2	Average
%	50	18	32	**0.8**

Only a small number of students were able to adequately give a reason why a random file was better than a serial file in this instance. Random access files allow direct access to required records/data, so every record does not need to be read to find it as is the case with a serial file.

Question 7

Marks	0	1	2	3	4	5	6	7	8	Average
%	22	7	11	16	14	6	12	2	10	**3.3**

deadlineTime	Expected outcome	Line of code	Reason
1259	*Overstay message*	*If currentTime > deadlineTime Then*	*To see if the system responds correctly to an overstay.*
1300	*No message*	*If currentTime > deadlineTime Then*	*To see if the system responds correctly to values on the boundary.*
1301	*No message*	*If currentTime > deadlineTime Then*	*This checks to see if the car is able to stay for its allowable time (that is the comparison between the current time and the time allowed is working).*
−1	*No message*	*If deadlineTime<> −1 Then*	*Need to check to see if there is no value in the deadlineTime (meaning that there is no car in that parking bay) then no message is sent.*

In this question students needed to identify key boundary conditions that would test the algorithm logic. Many students confused the variables deadlineTime with currentTime. An overstay message should occur if the deadline time was prior to 1300 (1.00 pm).

Students should be given the opportunity to demonstrate these skills in testing tables throughout the year. Creating their own test tables for assessment is not sufficient; sample algorithms with and without errors and practice questions from past papers should be completed where appropriate to ensure students are well prepared for these types of questions.

Question 8

Marks	0	1	2	3	4	Average
%	13	8	26	33	20	**2.4**

The majority of students were able to identify queue as the correct data structure. It was clear that students had covered this material well as they were able to articulate the fundamental difference between queues and stacks, that being the order is which data is handled – first in first out (FIFO) for queues versus last in first out (LIFO) for stacks. In this case the tickets needed to be processed as they were received, so a queue was required.

The following is an example of a high-scoring response.

Choice: A queue structure should be chosen by Kristen

Justification: Kristen should choose a queue structure because it operates in a FIFO (first in first out) nature. Therefore the first message which will be sent to the officers mobile will be the first which is processed and dealt with which enable officers to deal with the infringements in the order in which they occur, as opposed to always having the first infringement processed last (like the operation of the stack) as offenders could never be punished as they are gone by the time the officer makes it on site.

Question 9

The majority of students found this question challenging. Algorithms and testing are both covered in two of the four Areas of Study and students need to develop their understanding of each. Students should practise these types of questions either in classroom activities using past examination papers or in assessment where appropriate.

9a.

Marks	0	1	2	3	4	Average
%	73	4	6	14	3	**0.7**

Test	Test Data	Expected Outcome	Actual Outcome
1	ABC123	*No Message or blank*	*Invalid number plate message*
2	*ABC	*Invalid number plate message*	*Invalid number plate message*
3	123AB&	*Invalid number plate message*	*Invalid number plate message*

When completing a testing table, students should ensure that the expected outcome and actual outcome are based directly on the algorithm in the case study. Many students wrote words such as 'true' or 'invalid', which showed understanding but did not reflect the messages displayed by the algorithm.

9b.

Marks	0	1	Average
%	60	40	**0.4**

The algorithm had one error based on the testing table: it does not check the length of the number plate correctly. A number of students responded with 'logical error'; however, the question required a description of the error shown by the test data.

9c.

Marks	0	1	Average
%	51	49	**0.5**

The line of the algorithm that has caused the error was: ***If*** *length(numberPlate) >0* ***And*** *length(numberPlate)<6* ***Then***

This question asked students to write the line of the algorithm with the error. Students are encouraged to write the whole line of the algorithm, rather than parts of the line or creating line numbers for the algorithm.

9d.

Marks	0	1	Average
%	56	44	**0.5**

Possible corrections for this line include (one of):

- ***If*** *length(numberPlate) >0* ***And*** *length(numberPlate)<7* ***Then***
- ***If*** *length(numberPlate) >0* ***And*** *length(numberPlate)<=6* ***Then****.*

Question 10

Marks	0	1	2	3	4	Average
%	9	2	39	4	45	**2.8**

Students' familiarity with mobile phones was in some cases a limitation to them providing accurate responses to this question. A number of students simply described a list of mobile phone safeguards – for example, a timed screen lock – rather than what should be built into the software to ensure the security of the data.

The following is an example of a high-scoring response.

Feature 1: Password authentication

Explanation: This would only enable the authorised people to access the data who knew the password. Therefore, the data could not be easily stolen.

Feature 2: Encryption

Explanation: Even if the phone was compromised the data would be unreadable to everyone except the person or people it is intended for eg by using public/private key authentication. This means that the data even if it is removed from the phones can't be accesses by unauthorised people. Therefore, only the council and parking inspectors need to be able to decrypt this data.

Question 11

Most students were able to show that a naming convention and internal documentation were essential elements for the maintainability of the code by the programmer or a future programmer, and that variable length had little, if any, impact on the efficiency of the software.

11a.

Marks	0	1	2	Average
%	20	58	22	**1**

Students needed to demonstrate an understanding of efficiency in their explanation. According to the study design glossary 'measures of an efficient solution include the speed of processing, the functionality of the solution, the ease of use of the solution …' Full marks were awarded to responses that focused on processing and ease of use.

The following is an example of a high-scoring response.

It is the processing of lines rather than reading variable and procedure names that take up processing time, so any efficiency gains would be too small to be measurable. Furthermore, single letter variables and procedure names make code hard to understand making development and maintenance more difficult.

11b.

Marks	0	1	Average
%	25	75	**0.8**

The following is an example of a high-scoring response.

Kristen should include meaningful internal documentation.

Question 12

Marks	0	1	2	Average
%	12	47	40	**1.3**

Some students failed to provide a detailed response to this question. Students should ensure that they read questions carefully and provide sufficient depth and detail in their responses to ensure the question is answered as asked. To gain full marks students needed to make reference to the legal obligation, namely intellectual property through copyright, and an action that could be taken in order to act legally such as seeking permission or paying a fee for copyright permission.

The following is an example of a high-scoring response.

As the module was created by the Fast Fines Company, it is legally protected by the Copyright Act. If she wishes to use the code she would have to contact the company and ask their permission, as well as most likely pay a cost to be able to use it.

Question 13

13a.

Marks	0	1	2	3	Average
%	28	22	31	19	**1.4**

Most students struggled to provide a detailed response, limiting their responses to statements about 'checking the system does what is intended'. In addition, many students confused user acceptance testing (UAT) with evaluation. User acceptance testing occurs in the development stage during testing activities, generally as the last testing step before implementation and user sign-off that the programming solution meets the requirements in the software Requirements Specifications (SRS). The UAT would then be evaluated for its effectiveness as part of an evaluation strategy.

For full marks students needed to address what is involved in user acceptance testing, James' role in this and how other staff would be involved.

The following are examples of high-scoring responses.

The user acceptance testing is done at the end of development and requires the Bigton City Council staff such as James to test the solution to make sure it operates in the intended manner. They will use numerous tests such as accuracy tests, response rate tests to make sure that it operates correctly before signing off on the solution.

A UAT is the process of finding out if the software meets the requirements and the expectations of the end user. The parking staff will be involved in testing the mobile software and each of the other staff members will test if their section functions correctly. Once testing is completed the staff will report back to Kirsten any problems.

13b.

Marks	0	1	Average
%	55	45	**0.5**

A variety of responses, including their form, were appropriate to this question. For example, some responses stated a criterion in terms of a question; others identified if the criterion was a measure of efficiency or effectiveness and then provided an example.

The following are examples of appropriate responses.

The PIMS must be able to send overstay data to the mobile phones of parking inspectors.

Effectiveness – more overdue cars are being found and more fines are being issued.

Does the system send the location of overstayed cars to a parking officer's mobile phone?

Question 14

Marks	0	1	2	3	Average
%	42	27	21	11	**1**

This question required students to suggest a strategy to evaluate the accuracy of the parking fine issued. A number of students missed the key word 'accuracy' and provided a general answer. As in previous years many students found it difficult to develop a strategy. A strategy is a method by which an activity is carried out; this would include a set of steps or procedures, i.e. What will be done? When does it happen? Who does it? etc. Evaluation questions can be found on previous exams and these questions should be used as appropriate in classwork and in assessments.

For full marks responses needed to consider what data needed to be collected, who was collecting it and from where, and what type of information was being generated to measure the accuracy of the solution.

The following are examples of high-scoring responses.

After approximately 6 months, Kirsten should attempt to collect data as to the accuracy of parking fines produced. To do this Kirsten should consult documents, or logs, letters, emails, telephone correspondence (possibly notes taken by the council when on the phone to clients). All of this information will show how many complaints there have been from customers over the last 6 months to determine how well Kirsten's solution is working. She could also survey customers to see if they notice improvements or agree with the accuracy of the fines. This could be done through the post or email or online survey.

Kirsten may wish to count the number of complaints from motorists in relation to being overcharged in their parking fines. If this number is lower than the previous system then it is an indicator of success although it should be noted that more parking fines are likely to be issued with the new system increasing error amounts.

Kirsten should review any documents relating to the public's complaints with regards to the fines that were issued. She could survey affected people as to whether the parking fine was accurate when they came to pay their fine, bearing in mind that some people will lie about whether they deserve parking fines. She should also interview some parking officers as the whether they have noticed inaccuracies in the new system

Question 15

15a.

Marks	0	1	2	Average
%	23	24	53	**1.3**

Most students were able to provide a reasonable response to this question. Student generally responded with, 'train the trainer' or 'onsite group training'; however, a range of responses were appropriate as long as they were applicable to the organisation.

15b.

Marks	0	1	Average
%	60	40	**0.4**

Suitable responses included a method of data collection (for example, a survey, interviewing, a written test or observing) and what was to be collected (for example, questions such as was the training sufficient or who was the data to be collected from – the parking inspector) or when this would occur (for example, at the conclusion of the training program).

Many students misread the question and assumed the word 'program' was the software implemented, not the training program discussed in 15a.

Question 16

Marks	0	1	2	Average
%	55	31	14	**0.6**

Most students found this question challenging, with many unable to clearly describe a conflict. An answer such as 'they may feel annoyed' was not sufficient.

The following is an example of high-scoring response.

Parking officers: The parking officers may resist the council's changes and be angry about the new system since they weren't warned or told why. This could result in for example, strike action or an increase in sick days.

Motorists will complain that the council is deliberately attempting to raise revenue from PIMS and that the software is unfair/unjust.