2015 VCE Software Development examination report

General comments

The 2015 VCE Information Technology: Software Development examination comprised three sections: Section A contained 20 multiple-choice questions (worth a total of 20 marks), Section B had five short-answer questions (worth a total of 20 marks) and Section C was a case study with 15 questions (worth a total of 60 marks). Teachers and students should refer to the *VCE Information Technology Study Design 2011–2015* and the 2015 written examination paper while reading this report. Teachers and students should refer to the *VCE Computing Study Design 2016–2019* while preparing for the 2016 examination.

Section A was answered well by many students. Section B required students to demonstrate sound theoretical knowledge and to provide detailed and accurate responses. In Section C students' responses were expected to refer to the case study. The key weakness in many responses in this section was a lack of detail and depth of understanding.

During the examination, students should:

- endeavour to use correct technical terminology
- discuss all options when asked to justify a choice or compare one option with another
- respond to key instructional terms, such as 'state', 'explain' and 'describe'
- re-read each question and their response to ensure that the question has been answered
- remove the case study insert from the question and answer book, and refer to it when completing Section C
- read the case study and questions carefully, and underline or highlight key words
- demonstrate their knowledge of the subject and apply that knowledge to the case study as general responses often resulted in low or no marks; knowledgeable, clear and appropriate responses received high marks.

Specific information

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

This report provides sample answers or an indication of what the answers may have included. Unless otherwise stated, these are not intended to be exemplary or complete responses.

The statistics in this report may be subject to rounding errors resulting in a total less than 100 per cent.

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	21	75	1	2
2	57	26	2	15
3	3	33	15	49
4	22	12	55	11
5	5	12	66	17
6	0	9	4	87
7	16	28	38	17
8	6	88	4	2
9	56	1	32	11
10	6	83	2	9
11	86	2	8	4
12	5	2	92	1
13	34	12	16	38
14	6	5	19	71
15	83	6	5	6
16	4	7	79	10
17	12	75	12	2
18	10	6	2	82
19	64	6	8	21
20	1	97	1	1

Section B – Short-answer questions

Question 1a.

Marks	0	1	2	Average
%	11	43	46	**1.4**

Most students were able to provide two reasons to support the addition of internal documentation, with many mentioning that this assists with readability and maintainability.

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

> *Internal documentation will aid the company in the future in maintaining or repairing the code, as whoever is reading and editing it can understand its purpose.*
>
> *Internal documentation is beneficial as it provides meaningful comments which may help Annalie understand Sam's code. As they are both working on the project together, this is necessary.*

Question 1b.

Marks	0	1	2	3	Average
%	28	13	32	27	**1.6**

Although students had an understanding of naming conventions many did not fully answer the question. The question contained three instructional terms 'describe', 'explain' and 'give (an

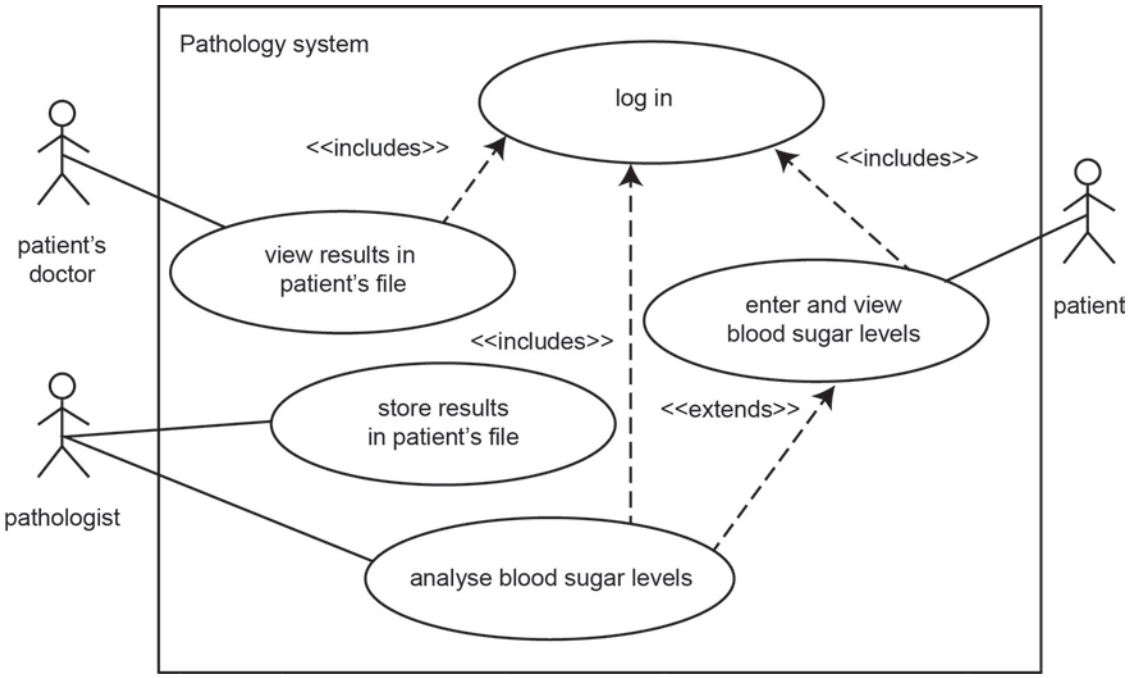
example)' and each of these parts needed to be addressed. However, often students only answered one part or two parts of the question, with many not providing examples.

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

> *One naming notation is Hungarian notation such as 'btnExit', in which the first letters are what the object is, such as button (btn) or textbox(txt) and the second half describes the purpose of the it. For example, in btnExit, the 'Exit' is the purpose of the button. This makes programming better as the developers will be able to understand what the object is and its purpose, so they can code it more efficiently and will less errors.*

Question 2

Marks	0	1	2	3	4	Average
%	77	1	5	16	1	**0.7**



Most students struggled to indicate the four required relationships. A common error was showing the relationship as a solid line, rather than dotted lines, and arrowheads were often at the wrong end or at both ends.

Question 3a.

Marks	0	1	Average
%	4	97	**1**

The correct response was 28.

Question 3b.

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

Many students were able to read the array correctly and provide the index values for i and j in Results [i,j]. The index values were [2,3]; however, a number of students incorrectly provided [3,2].

Question 3c.

Marks	0	1	Average
%	19	81	**0.8**

Most students were able to identify that the sum of each row was required to perform the calculation described.

Question 3d.

Marks	0	1	2	Average
%	52	38	10	**0.6**

A number of possible reasons were accepted; however, more commonly students identified that it was easier to add scores and more efficient (easier) programming.

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

An individual separate test scores can be easily referenced or summed.

All the data is found within one structure making it easier to manage the code.

Question 4

Marks	0	1	2	Average
%	39	35	26	**0.9**

Students were asked to describe a test that could be carried out to see if students were able to access teachers' computers on the network. A number of students incorrectly wrote the statement 'do a penetration test', and failed to follow the instructional term 'describe'.

The following is an example of a possible response: A teacher or an administrator could be given a student login and attempt to access the restricted teacher data on their computer or network folder. Folder and individual file access should be checked. Results should then be reported to appropriate IT personnel.

Question 5

Marks	0	1	2	3	4	Average
%	25	18	32	15	10	**1.7**

Students answered this question with varying degrees of success. It was important for students to explain how error logs could measure the reliability and maintainability of a network; for example, that a large number of errors in an identified period of time may suggest that the network was unreliable.

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

Reliability is how long the network can operate in its intended environment. Error logs could be used to analyse the number and length of breakdowns and downtimes in the network. If the error logs show that the network has been down often it is not reliable.

Maintainability is the effort, time and cost required to keep the network running and also how easily it can be upgraded or fixed. Error logs can be used to identify how many breakdowns there were and how long each one took to fix. If the network was down for a long time it shows that the network has low maintainability as it is hard to fix errors and keep it running.

Section C – Case study

Question 1

Marks	0	1	2	Average
%	26	52	21	1

The study design indicates that the 'software requirements specifications fulfils the purposes of breaking down the problem into component parts, providing input to the designing stage and serving as a reference point for further stages of the problem-solving methodology'. 'It documents the key tasks associated with the analysing stage of the problem-solving methodology. The software requirements specifications (SRS) fully describes the functional requirements (what it is required to do) and non-functional requirements of the solution (solution attributes)… the conditions affecting the solution (constraints) and the parameters of the solution (scope).'

Students responded with varying levels of knowledge, from very vague comments ('documents what the solution will be like') to clear and detailed responses. Students were expected to show depth of understanding in their response.

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

The SRS is written after the proposed solution has been analysed and contains the solution requirements, the scope, constraints and its intended operating environment. The purpose of the SRS is to provide direction to the developers so they clearly understand what the solution must do, what to include, what not to include and it helps them focus on the project.

Question 2

Marks	0	1	2	3	4	Average
%	27	9	33	9	22	1.9

A number of non-functional requirements could have been discussed in response to this question; however, the most common responses were user friendliness/ease of use and reliability. It was not appropriate in this scenario to discuss maintainability.

The following are examples of high-scoring responses.

Ease of use – with so many voters of different ages and levels of technical ability, the system must be easy to understand, navigate and use.

User friendliness of the voting system- as thousands of residents will be voting (many of which may be inexperienced with IT) voting needs to be a quick and simple process to avoid large queues and waiting times.

The voting software must be 100% reliable – the software store the voters add their votes for transfer to the main server and must be able to operate with not breakdowns or all the important data will be lost and must be recollected

Question 3a.

Marks	0	1	2	Average
%	9	3	88	1.8

The two entities involved were voters and council, and most students were able to identify them correctly.

Question 3b.

Marks	0	1	2	Average
%	16	7	76	**1.6**

The two processes required in the DFD were:

- 1. Process C – Check voter eligibility and record votes
- 2. Process A – Allocate votes to candidates.

Question 3c.

Marks	0	1	2	Average
%	38	19	43	**1.1**

Students should be encouraged to use the data flow diagram to assist in formulating accurate responses, particularly with respect to labelling conventions. The two data flows were:

- 3. Voting_ data
- 4. Election_results.

Question 4a.

Marks	0	1	2	3	Average
%	66	2	3	29	**1**

Many students struggled with this question – many had the correct expected values but did not provide the correct actual values. The use of trace tables/desk checks is encouraged as a method of checking the logic and flow of an algorithm; students are able to draw and write on and around the algorithm to aid the checking process.

Record number	Age	Medical	Expected value of NumberEligible	Actual value of NumberEligible
1	*81*	*False*	*1*	*1*
2	*75*	*True*	2	2
3	*75*	*False*	2	2
4	*85*	*True*	3	4

Question 4b.

Marks	0	1	Average
%	41	59	**0.6**

Many students were able to identify that the error occurred because the value of NumberEligible is increased by 1 when the person's age is over 80 and increased again when they have a medical condition, i.e. an increase of 2 rather than 1.

Question 4c.

Marks	0	1	2	Average
%	49	8	43	**1**

Below is one way of correcting the error in the algorithm.

```
Begin
    NumberEligible ← 0
    While Not End of File
        Read Age, Medical
        If Age >=80 or Medical = True Then
                NumberEligible ← NumberEligible +1
        EndIf
        Display NumberEligible
    EndWhile
End
```

Question 5

Marks	0	1	2	3	4	Average
%	7	6	15	38	35	2.9

Students were generally aware of the appropriate data type; however, a number failed to provide sufficient information in the description. For example, a number of students indicated that 'NumberEligible' was the number eligible for voting, where the key was that they were eligible for mobile voting.

Variable name	Type	Description
Name	*string*	*stores the names of all those eligible to vote*
NumberEligible	Integer	stores the number of those eligible for mobile voting
Medical	Boolean	indicated T/F if the voter has a diagnosed medical condition

Question 6

Marks	0	1	2	Average
%	25	34	41	1.2

Description	Data structure
storage of **all** of **one** voter's details	record
storage of all voters' surnames in RAM	one-dimensional array

Question 7

Marks	0	1	2	3	4	Average
%	11	41	36	7	4	**1.5**

Most students had difficulty with providing technically accurate information or responses were generic statements without depth. The question required a response that addressed the advantages to the council, not just the advantages of a VPN. There was also an expectation that students considered the advantages when compared to HTTP or HTTPS. One key advantage being the encryption provided between the polling booth and the council, which was essential for security of data as well as privacy of voting information.

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

> *One advantage of the VPN will be that it will not require the council to build any new infrastructure to facilitate the sending of data as a VPN will utilise already made networks. A VPN will also be more secure than internet using HTTP or HTTPS. One reason for this is that a VPN will require users to login with a username and password, which only approved council workers will possess. The data will also be encrypted in a VPN so that if it is intercepted it still cannot be read, and is therefore more secure than a standard HTTP or HTTPS.*

Question 8

Marks	0	1	2	3	Average
%	6	15	37	42	**2.2**

Most students were able to discuss accessibility issues, with many providing a range of considerations for design. For example:

- visual impairments: consideration of font size
- reading disabilities: use of pictures or diagrams, limiting text
- physical disabilities: the use of buttons, and alternative input methods, such as voice, the size of objects within the interface, etc.

Question 9a.

Marks	0	1	Average
%	40	60	**0.6**

A majority of students were able to identify validation as the technique described.

Question 9b.

Marks	0	1	2	3	4	5	Average
%	4	1	3	9	29	53	**4.2**

Most students were able to provide a range of test data; however, a number of students tested the same thing on more than one occasion.

The following is a set of possible tests. There was a range of accepted tests.

Test no.	Test data	Expected output
1	*Smith*	*Valid Name*

2	smith	Invalid Name
3	O'Connor	Valid Name
4	'OConnor	Invalid Name
5	Smith.	Invalid Name
6		Invalid Name

Question 10

Marks	0	1	2	Average
%	37	39	24	**0.9**

A number of students concentrated on the inefficiency of the postal service or people's inability to remember to bring the guide with them as the main disadvantages of a printed quick start, rather than the concerns with the content or format of this form of documentation.

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

> *Users will need to read through the quick start guide to find the area they are struggling with, whereas in-built user documentation would give users specific help at the section they are up to in the voting process.*

Question 11

Marks	0	1	2	Average
%	68	14	18	**0.5**

Students often provided responses such as train-the-trainer or a centralised training session; however, due to the travel distances required and the time to complete this while still engaged in other employment, these options were, in general, unreasonable. The most appropriate low-cost strategy was an online training strategy.

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

> *The council could provide online training which requires all of the election officials to complete a course on the new voting software online via videos or online tutorial. The council could give each official an account to track if they have completed the training or not. The benefit of this is that it is very cheap, the officials can do it in their own time so that it doesn't interfere with their jobs, and they can repeat parts of the online training that they didn't understand the first time.*

Question 12

Marks	0	1	2	3	4	Average
%	28	18	30	12	13	**1.7**

Students struggled to provide clear and technically accurate responses to this question. Many simply stated back up the data and send later, without including any specific details. The question asked students to describe a method by which data could make it to the main server if the internet

connection was lost, so students needed to provide a procedure or a number of steps that would be followed to accomplish this task.

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

The data on the polling booth file server could be automatically backed up and written to on-site hard drives, meaning that any lost votes can still be accessed and sent once the internet connection is available.

The voting data on the mobile devices could be saved to the phone itself if an internet connection is not available. Users can then be notified that once they are connected to the internet again must send this data.

Question 13a.

Marks	0	1	2	Average
%	44	16	40	**1**

This question required students to calculate the likely file size in gigabytes. A number of students struggled with this question, in particular with ensuring the value was in gigabytes. The file size was 1.5 GB, and calculations using 1024 bytes were also accepted. As the file was 1.5 GB it would easily fit onto a device with 32 GB of storage.

Question 13b.

Marks	0	1	Average
%	35	65	**0.7**

The majority of students were able to identify that the whole file cannot be held in RAM at the same time, so processing will be slower as the records will need to be read each time they are required from storage and not just from the faster RAM. This meant that more time would be required for this reading and writing back to stored file each time.

Question 14a.

Marks	0	1	2	Average
%	39	37	25	**0.9**

Students had difficulty expressing what conflicts may occur in this situation. Most common were concerns with overloading the council website, causing frustrated users, and concerns that IT staff may be overworked.

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

1. The council's IT department may become angry due to increased demands on the council website and server, and on their time for increased maintenance and problem solving.

2. Website users may become frustrated at slower connection speeds

Question 14b.

Marks	0	1	2	Average
%	56	22	22	**0.7**

If students were able to identify a conflict, they were generally able to identify the appropriate stakeholders. For example, Question 14a., students most often identified the IT department staff and their immediate superiors or bosses as the key stakeholders. This conflict exists due to

changes in working conditions and additional demands on their time to monitor and maintain the election system even though it is not part of the council's network.

Question 14c.

Marks	0	1	2	Average
%	63	24	12	**0.5**

Students gave a range of techniques that could be used to minimise the conflict with IT staff, including hiring extra staff while voting is occurring, paying higher wages when working overtime and providing bonuses for the two-week period. A range of responses was accepted based on the conflict identified; however, most students did not score on this question.

Question 15

Marks	0	1	2	3	4	5	6	Average
%	19	7	8	11	16	22	18	**3.4**

Students are reminded to read the question carefully as many students read and displayed the same data set. Alternative ways of performing the procedure were accepted, but students are encouraged to consider the most efficient option.

```
Begin
    Repeat
        Read Surname, GivenName, StreetAddress, Suburb, Postcode, Voted
        If Voted = False Then
        Display Surname, GivenName, StreetAddress, Suburb, Postcode
        EndIf
    Until EndOfFile
End
```