

DLTV Resource Kit

For use with the VCE Computing 2016-2019 Study Design

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| Software DevelopmentSample Examination 2016 |

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**STUDENT NUMBER Letter**

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| **Figures** |  |  |  |  |  |  |  |  |  |
| **Words** |  |  |  |  |  |  |  |  |  |

**COMPUTING: SOFTWARE DEVELOPMENT
Sample Examination 2016**

**Reading time: 15 minutes
Writing time: 2 hours**

**QUESTION AND ANSWER BOOK**

**Structure of book**

|  |  |  |  |
| --- | --- | --- | --- |
| *Section* | *Number of questions* | *Number of questions to be answered* | *Number of marks* |
| A | 15 | 15 | 20 |
| BC | 614 | 614 | 2060 |
|  |  |  | Total 100 |

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| * Students are permitted to bring into the examination room: pens, pencils, highlighters, erasers, sharpeners, rulers, an approved graphics calculator (memory cleared) and/or one scientific calculator.
* Students are NOT permitted to bring into the examination room: blank sheets of paper and/or white out liquid/tape.

**Materials supplied** * Question and answer booklet of 14 pages.
* Answer sheet for multiple choice questions.

**Instructions** * Write your **student number** in the space provided above on this page.
* Check that your **name** and **student number** as printed on your answer sheet, for multiple-choice questions are correct, **and** sign your name in the space provided to verify this.
* All written responses must be English.
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| **Students are NOT permitted to bring mobile phones and/or any other electronic communication devices into the examination room.** |

**SECTION A – Multiple Choice Questions**

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| **Instructions for Section A**Answer **all** questions in pencil on the answer sheet provided for multiple choice questions. Choose the response that is **correct** or that **best answers** the question. A correct answer scores 1, an incorrect answer scores 0. Marks will **not** be deducted for incorrect answers. No marks will be given if more than one answer is completed for any question. |

**Question 1**

Determining strategies for measuring the extent to which solutions meet the needs of users occurs during which stage of the problem-solving methodology?

1. design
2. analysis
3. evaluation
4. development

**Question 2**

An advantage of using a binary search over a linear search is

1. that a binary search would be more efficient and effective.
2. that a binary search requires only 0s and 1s to work.
3. that a binary search would be more effective.
4. that a binary search would be more efficient.

**Question 3**

XML is a software- and hardware-independent language that is used for storing and transporting data.

What does XML stand for?

1. Extensible Markup Language
2. Xylophone Markup Language
3. Extensible Marking Language
4. Extra-long Marking Language

**Question 4**

The following values are stored within a one-dimensional array:

0, 1, 1, 2, 3, 5, 8, 13, 21, 34

The value 8 is stored at which index?

1. 6
2. 7
3. 8
4. 10

**Question 5**

Individual lines of code are best described as

1. functions.
2. procedures.
3. instructions.
4. control structures.

**Question 6**

Internal documentation is most effective when

1. it is succinct.
2. it helps the code run faster.
3. it describes the functionality of the program.
4. all of the above.

**Question 7**

In context diagrams, lines with arrowheads are used to depict data flows. What do lines with arrowheads depict in use case diagrams?

1. actors
2. processes
3. data flows
4. interactions

*Use the following information to answer Questions 8 and 9*

Jerry has produced a Gantt chart to monitor a building project that he is working on. He asks his friend George (an experienced project manager) about whether he could use better utilise the tool. The diagram below is an excerpt from Jerry’s Gantt chart.

|  |  |
| --- | --- |
|  | **Months** |
| **Task** | **1** | **2** | **3** | **4** | **5** | **6** |
| Design building |  |  |  |  |  |  | **** |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Get building permits |  |  |  |  |  |  |  |  |  |  |  |  |  | **** |  |  |  |  |  |  |  |  |  |  |
| Excavate site |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Install preliminary plumbing |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Lay foundations |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | **** |  |  |  |

**Question 8**

On the Gantt chart provided, what are the diamonds representative of?

1. tasks
2. milestones
3. dependencies
4. the critical path

**Question 9**

Jerry asks George how he could record and monitor the long-term progress of his project.

George should suggest which of the following to Bill?

1. test the usability of the project plan
2. annotate his Gantt chart or keep a project log
3. generate alternative project plan ideas and determine the best project plan
4. all of the above

**Question 10**

One technique that software developers can include in their programs to protect sensitive data and information is

1. testing.
2. validation.
3. evaluation.
4. authentication.

**Question 11**

A recent article about modern application architectures made the following claims:

1. The peer-to-peer architecture allows users to share resources, such as processing power and storage.
2. The peer-to-peer architecture requires a server to perform processing on behalf of a number of connected clients.

Which of the claims are true?

1. claim 1 only
2. claim 2 only
3. claim 1 and 2
4. neither claim 1 or 2

**Question 12**

Compatibility of hardware and user expertise are examples of which types of constraints?

1. technical, legal
2. technical, useability
3. technical, technical
4. technical, economic

**Question 13**

A server hosts the website for a large learning organisation in Melbourne. The website hosts a large number of files, which are frequently accessed by its users from across the world. Overall, the server stores approximately 50GB of various file types (including videos) and requires bandwidth of around 500GB. It is almost reaching capacity and the server administrators have decided to upgrade the storage capacity of the server.

Which of the following storage media options would be the best option in this situation?

1. a 128GB USB Hard Disk Drive (HDD) to be used in conjunction with the current 64GB HDD
2. a RAID array of HDDs (totalling 500GB) to replace the current 64GB HDD
3. a 500GB Solid State Drive (SDD) to replace the current 64GB HDD
4. a 500GB HDD to replace the current 64GB HDD

**Question 14**

Associative arrays are comprised of what type of pairs?

1. key/value
2. key/counter
3. field/value
4. field/counter

**Question 15**

The algorithm below is for a function that is to be used in a range of software modules.

|  |  |
| --- | --- |
|  | **Start** |
|  | **Input** a, b |
|  | **While** b < a |
|  | c 🡨 b \* a |
|  | **If** c > 15 **Then** |
|  |  a 🡨 a – 2 |
|  |  b 🡨 b – 2 |
|  | **End If** |
|  |  **End While** |
|  | **Finish** |

Lines 5 – 8 are best described as

1. a function
2. sequential instructions
3. a selection control structure
4. a repetition control structure

**Question 16**

Firewalls are used to protect

1. the data and information held by and the systems used by organisations from disgruntled workers.
2. the data and information held by and the systems used by organisations from external sources.
3. individuals from natural disasters.
4. the Internet.

*Use the following information to answer Questions 17 - 19*

BiggerSoft is a global software development organization. In 2016, BiggerSoft’s Board of Management decided that the company needed to grow its market share, while still producing high-quality software. They also want the company to be more profitable for shareholders. BiggerSoft recently announced that they were beginning development on a new operating system called BiggerBetterOS. BiggerSoft hopes that their new operating system will provide a better user experience than its competitors by including more out-of-the-box features, such as universal media playback, customisable security settings and an in-built productivity suite.

**Question 17**

BiggerSoft’s aim for its new operating system to provide a better user experience than its competitors by including more out-of-the-box features is an example of

1. an organisational goal.
2. an organisational objective.
3. an information system goal.
4. an information system objective.

**Question 18**

The employees at BiggerSoft often use data from their customer and product usage databases to make decisions about improvements to upcoming software releases. This is an example of

1. ideation.
2. data mining.
3. validation of data.
4. data management.

**Question 19**

John is an administrative manager with BiggerSoft. He has recently disagreed with several other team managers about the company’s review of their network, specifically about the need for greater security on BiggerSoft’s file servers. He decides to move some folders and files around to try and prove his point to the other managers, who don’t believe that greater security is necessary.

This type of threat to the integrity and security of data can be described as

1. events-based.
2. accidental.
3. deliberate.
4. minimal.

**Question 20**

An information system receives hourly data from a number of weather stations situated around Melbourne and the system processes that data using a complex algorithm. It then generates detailed forecasts for different areas of the metropolitan area.

In relation to the weather stations, the hourly data is an example of what type of interaction?

1. a process
2. an output
3. an input
4. storage

**SECTION B – Short Answer Questions**

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| **Instructions for Section B**Answer **all** questions in the spaces provided. |

**Question 1** (3 marks)

Bill has recently employed a software developer to produce dashboard software for his marketing company that will display a range of metrics about his organisation. The developer has asked whether John would like his new software package to be portable or interoperable. John isn’t sure of the difference between the two.

Explain the difference between interoperability and portability.

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**Question 2** (2 marks)

A veterinarian’s clinic plans to store animal records in a software application. Each record is estimated to contain approximately 5 megabytes (MB) of information. The clinic has asked the software developer how much storage they will require on their system if they currently have 5000 records and anticipate this number to grow to 7000 over the next 3 years. The records will be stored in a single file.

What would be the minimum expected file sizes (in GB) for the clinic’s current and future needs?

|  |
| --- |
| Current minimum expected file size |
|  |
|  |
| Future minimum expected file size |
|  |
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**Question 3** (4 marks)

Madeline is a network administrator for a large office building in Melbourne. Recently, she hired a high school student for two weeks of work experience. As part of the student’s orientation to the network, Madeline takes him through some network essentials.

1. Select **one** of the listed network devices and describe its potential function within the network.

2 marks

|  |  |  |  |
| --- | --- | --- | --- |
| router | switch | wireless access point | proxy server |
|  |
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One week into the work experience program, the student thinks that he has reasonable understanding of the network systems and how they operate. He asks Madeline for full permissions to the network to perform some additional duties.

1. Justify why Madeline should not provide the student with additional permissions. 2 marks

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**Question 4** (2 marks)

Johnny is the IT manager of a small business in Melbourne. He is currently in the process of deciding whether to upgrade the wireless router that is used to connect up to 4 laptops and 6 smart phones.

Identify two important factors that Johnny will have to consider when purchasing a new wireless router.

|  |
| --- |
| Factor 1 |
| Factor 2 |

**Question 5** (4 marks)

When discussing data structures, programmers use the terms ‘one-dimensional array’ and ‘record’.

1. What is a one-dimensional array? In your response, include an example of an array. 2 marks

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1. What is a record? In your response, include an example of a record. 2 marks

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**Question 6** (5 marks)

A program requires three numbers to be input into a program (A, B and C). While A is less than the sum of B and C, A is doubled and both B and C are increased by 1. Once A is greater than or equal to the sum of B and C, all three values are output to the screen.

Write this as pseudocode. You may introduce other variables if necessary.

**Begin**

|  |
| --- |
| Input A, B, C |
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|  |
|  |
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**End**

**SECTION C – Case Study**

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| **Instructions for Section C**Answer **all** questions in the spaces provided. Use the case study provided and read **all** the information provided before you answer these questions. Answers must apply to the case study. |

**Question 1** (3 marks)

SMPH has recently set a number of goals and objectives that they plan to meet over the next 12-24 months. The table below outlines some of the goals and objectives that were set by the hospital board, based on the SMPH Key Values (Diagram 1)

Complete the table by deciding upon the type of goal or objective that has been set by hospital management. An example has been provided.

|  |  |  |
| --- | --- | --- |
| **Key Value** | **Goal/Objective** | **Type** |
| Excellence | Deliver excellence in healthcare | Strategic |
| Excellence | Nurses will be allocated to patients fairly and according to their capabilities and experience  |  |
| Excellence | Enhance community and stakeholder support |  |
| Excellence | Elective surgery waiting list times are kept to a minimum (target ≤ 3 months) |  |

**Question 2** (4 marks)

State **two** appropriate data collection methods that could be employed to determine solution requirements and justify why using these techniques would be advantageous for Rachel.

|  |
| --- |
| Data collection method 1 |
| Justification |
|  |
|  |
| Data collection method 2 |
| Justification |
|  |
|  |

**Question 3** (3 marks)

From the data collection, Rachel has identified that the EPMS will have a number of functional and non-functional requirements. This information will be included in a Software Requirements Specification (SRS).

Identify **three** important functional requirements.

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**Question 4** (6 marks)

Rachel decides to diagrammatically represent the current admissions and discharges process using a context, data flow and use case diagram. She has finished the context diagram and is now working on the data flow and use case diagrams.

1. Based on the case study, including the data flow diagram, complete the context diagram for Rachel. 3 marks

Nurses

Medical\_ information

1. Based on the case study, complete the use case diagram to represent the system correctly on the incomplete diagram below. 3 marks

<<includes>>

<<includes>>

Ward Secretary

Patient

Nurse

**Question 5** (3 marks)

Rachel has a number of application architecture options which she may choose from. Hospital management has indicated that they do not intend on simplifying the diverse range of devices (PCs, Macs, hybrid notebooks, smart phones) and platforms (Windows, OS X and iOS) that are currently used across the hospital in the foreseeable future.

Select the most appropriate application architecture from the list provided and justify your selection.

|  |  |  |
| --- | --- | --- |
| internet | mobile | peer-to-peer |
| Application architecture |
| Justification |
|  |
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**Question 6** (4 marks)

Rachel, in consultation with Hugh, has written a data dictionary to list all of the variables that will be used in the Patient Admissions module of the EMPS. A sample of this data dictionary is provided.

For each variable in the table below, state the **most appropriate** data type and a description of what it is used for. An example has been provided.

**Data types: character, string, Boolean, integer, floating point**

|  |  |  |  |
| --- | --- | --- | --- |
| **Data** | **Description** | **Type** | **Reason** |
| first\_name | the first name of the patient | string | names only require alphabetical characters to be stored |
| date\_of\_birth | the patient’s date of birth in dd-yy-mmmm format |  |  |
| smoker | the smoker status of the patient stored as true or false |  |  |
| patient\_weight | the weight of the patient at admission |  |  |
| patient\_height | the height of the patient at admission, stored in cm |  |  |

**Question 7** (5 marks)

John, an interface designer for MedSoft, has been busy generating a number of design ideas for the Patient Notes and Charts module of the EPMS. He knows that the nurses and doctors at SMPH will need to make life and death decisions (at times) based on the information provided on screen. This makes the user interface very important as the hospital’s doctors and nurses will need to make clinical decisions quickly.

He has decided to present the following two designs to Hugh and a working group of doctors and nurses at the hospital.

|  |  |
| --- | --- |
| C:\Users\jvella\AppData\Local\Temp\fla7602.tmp\Snapshot.png | C:\Users\jvella\AppData\Local\Temp\fla5185.tmp\Snapshot.png |
|  **Option A****Visual-based interface** | **Option B****Text-based interface** |

1. Outline **two** criteria that could be used by Hugh to determine which design could be selected. 2 marks

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1. Which option should Hugh use? Justify your answer with reference to both options and the criteria outlined in a. 3 marks

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| --- |
| Choice |
| Justification |
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**Question 8** (6 marks)

As part of the design of the Admissions/Discharges module of the EPMS, Rachel has written an algorithm that will calculate the duration of the patient’s stay, which is to be included in the patient discharge summary.

**Procedure** calculateStayDuration

**Begin**

**Read** admissionDate **From** patient\_records

stayDuration = currentDate – admissionDate

**If** stayDuration ≥ 0 **Then**

 **Return** error

**Else**

 **Return** stayDuration

**End If**

 **End**

1. To check this algorithm before coding, the data in the test table below was generated. For testing purposes, the discharge date will be set to 25/11/16, however, it would normally be set by the system.

Complete the table by filling in both the expected and actual values. 3 marks

|  |  |  |  |
| --- | --- | --- | --- |
| **Test no.** | **Admission date** | **Expected output** | **Actual output** |
| 1 | 23/11/16 |  |  |
| 2 | 25/11/16 |  |  |
| 3 | 27/11/16 |  |  |

1. Outline the major error in this algorithm. 1 mark

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1. Write new lines of code to correct the error. 2 marks

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**Question 9** (4 marks)

Rachel has started to identify the required inputs and outputs for the Patient Discharge process that will be required to be completed within the EPMS when the system goes live.

Based on the case study, identify the key inputs and outputs required by the Discharge module for the EPMS in the table below.

|  |  |
| --- | --- |
| **Inputs** | **Output**s |
|  |  |

**Question 10** (3 marks)

Jessica, a member of the working group, has suggested that administration staff be able to sort patient lists by surname, given name, admission/next appointment date or discharge/last appointment date for a range of purposes. She has also suggested a search function be included in the EPMS so that receptionists can easily direct visitors to the right wards.

1. Given the need to be able to sort the data held by the system, what type of search should the system use? 1 mark

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Hugh has concerns that given the large number of patients staying in and visiting the hospital on any given day (up to 400), the time taken to sort the patient lists will take too long. Hugh has suggested a selection sort be implemented, while Rachel has suggested a quick sort be used.

1. Should Rachel implement a selection sort or quick sort? Justify your choice. 2 marks

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**Question 11** (4 marks)

The SMPH Legal team has some concerns over the security of the data being held by the system. Nicole has assured them that the software will meet all necessary legislative requirements.

1. State the **two** laws that the software will have to be made compliant with? 2 marks

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1. Briefly explain why each of the laws are relevant to this particular piece of software, with reference to the case study. 2 marks

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**Question 12** (5 marks)

Hugh has suggested that implementation of the new software be limited to a single ward (Ward A) within the hospital to ensure that any issues with the software are corrected before the wider implementation across the hospital. Some members of the working party have suggested that this could be an issue if patients are transferred between wards, or when replacement staff from other wards are sent to Ward A to provide additional nursing support.

1. State **one** conflict that may occur. 1 mark

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1. For the stated conflict, identify the stakeholders affected. 2 marks

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1. Suggest two techniques that could be used to minimise the identified conflict. 2 marks

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**Question 13** (6 marks)

The hospital working group has decided that it would like to test the useability of the new system with its nursing staff before a wide scale implementation.

Propose a strategy that could be used to test the useability of the new software.

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**Question 14** (4 marks)

After a few weeks of being implemented, SMPH suffers a serious breach in data security. It has been determined that the source of the breach was external to SMPH. The hospital’s firewall firmware required a critical update and was required to be restarted as part of the process. After looking through the firewall logs, it has been found that the firewall failed to restart after the update was applied and was not active for 6 hours.

1. State the role that a firewall plays in network security. 1 mark

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1. Identify the type of threat to the security of the hospital’s data as a result of the update process. 1 mark

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1. What could IT Services at SMPH have done differently to prevent this from happening again? 2 marks

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| **CASE STUDY INSERT FOR SECTION C**Please remove from the centre of this book during reading time |

**Case Study**

The South Melbourne Private Hospital (SMPH) is a private hospital, which provides a range of healthcare services to the public. They have a number of specialists that are based within the hospital to operate clinics and perform surgeries on a daily basis.

Recently, hospital management reviewed their mission statements and they came up with the following key values that would guide planning and decision-making processes:

**Diagram 1: SMPH Key Values**

|  |  |
| --- | --- |
| **Respect** | We respect the rights of all and treat people with respect |
| **Integrity**  | We believe that how we work is as important as the work we do |
| **Unity**  | We work as a team and in partnership with our stakeholders |
| **Excellence** | We are committed to achieving our goals and improving patient outcomes |

Hugh McClelland, the Director of Nursing Services, has been working on a project that has been investigating the use of electronic patient records and how they could be used at SMPH. He has been speaking to the management at other similarly sized hospitals around the country that utilise electronic records in their practice. Hugh recently received approval from the hospital board to proceed with finding a software developer to produce the Electronic Patient Management System (EPMS). It is intended that the EPMS will revolutionise healthcare within the hospital by making it more efficient and less prone to error.

Hugh has selected a small software development called MedSoft, which is also based in Melbourne, to develop the EPMS. In consultation with Hugh, Rachel Proffitt, the lead software developer at MedSoft, has suggested that development of Stages 2 and 3 should only take place once SMPH has successfully implemented Stage 1 and Stage 2 respectively (as outlined in the diagram below):

**Diagram 2: Development and implementation timeline**

|  |
| --- |
|  **3 months 12 months 18 months** |

Currently, the admissions process can take some time due to a range of factors such as language barrier, nurse workload, transcription errors and hospital beds being unavailable at peak care times. Hugh, who in conjunction with a working group of doctors and nurses, has determined a streamlined process that they would like the EPMS to follow.

**Diagram 3: Data flow diagram for the proposed admissions process**

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Hospital management has decided to also incorporate their discharges process into the EPMS. Currently, the hospital provides a discharge summary and educational materials to patients based on the medical condition that they were admitted for.

The discharge summary includes patient admissions information, a summary of care while at the hospital (including the duration of their stay), a list of all medications that were administered during their stay and prescriptions for medications that they will need to take after they leave the hospital. It is Hugh’s intention that the EPMS will generate the report automatically when a patient is flagged to be discharged. The educational materials will also be attached and generated at this time.