

STUDENT NUMBER           Letter

# COMPUTING: SOFTWARE DEVELOPMENT

## Written examination

**Thursday 15 November 2018**

**Reading time: 3.00 pm to 3.15 pm (15 minutes)**

**Writing time: 3.15 pm to 5.15 pm (2 hours)**

## QUESTION AND ANSWER BOOK

### Structure of book

| <i>Section</i> | <i>Number of questions</i> | <i>Number of questions to be answered</i> | <i>Number of marks</i> |
|----------------|----------------------------|---|------------------------|
| A              | 20                         | 20  | 20                     |
| B              | 5                          | 5   | 20                     |
| C              | 12                         | 12  | 60                     |
|                |                            |   | Total 100              |

- Students are permitted to bring into the examination room: pens, pencils, highlighters, erasers, sharpeners, rulers and one scientific calculator.
- Students are NOT permitted to bring into the examination room: blank sheets of paper and/or correction fluid/tape.

#### Materials supplied

- Question and answer book of 25 pages
- Detachable insert containing a case study for Section C in the centrefold
- Answer sheet for multiple-choice questions

#### Instructions

- Detach the insert from the centre of this book during reading time.
- 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 in English.

#### At the end of the examination

- Place the answer sheet for multiple-choice questions inside the front cover of this book.
- You may keep the detached insert.

**Students are NOT permitted to bring mobile phones and/or any other unauthorised electronic devices into the examination room.**

**SECTION A – Multiple-choice questions****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**

In a Gantt chart, the completion of hardware installation is often a milestone in a project.

A milestone shows that

- A. a major delay in a project has been avoided.
- B. a major point in a project has been reached.
- C. a dependency in a project has been completed.
- D. no further work can happen until another task is complete.

**Question 2**

Which one of the following is an example of a non-functional requirement for an online ordering system?

- A. Use case diagrams must be drawn for each function.
- B. Display to the user the number of records in a database.
- C. Online ordering must be available 24 hours a day, seven days a week.
- D. Automated emails should be sent within 12 hours of receiving an online order.

**Question 3**

Storing client data only on an external hard disk drive at the end of the financial year is a form of

- A. file disposal.
- B. data security.
- C. archiving data for future use.
- D. back up in case the data is corrupted.

**Question 4**

Jack is writing a software solution that will produce an invoice. The software solution regularly accesses a section of code that calculates the goods and services tax (GST) payable on each item.

This processing feature is referred to as

- A. a method.
- B. a function.
- C. a calculation.
- D. an instruction.

**Question 5**

```

i = 0
While (i <= 100)
    print i
    i = i + 21
EndWhile

```

How many times is the loop above executed?

- A. four times
- B. five times
- C. six times
- D. seven times

*Use the following information to answer Questions 6 and 7.*

The pseudocode below will take the current values in the array and then write the new values into the array.

**Begin**

```
Array[] = [3, 5, 0, 0, 0] //Initialise the array, index starts at 1
```

```
A ← Array[1]
```

```
B ← Array[2]
```

```
While B < 3 * A
```

```
    C ← A * B
```

```
    A ← A - 1
```

```
    B ← B + 2
```

```
EndWhile
```

```
//Write new values into the array
```

```
Array[1] = A
```

```
Array[2] = B
```

```
Array[3] = C
```

**End**

**Question 6**

Which array has the correct values after the pseudocode has been executed?

- A. Array = [1, 9, 9, 0, 0]
- B. Array = [2, 7, 14, 0, 0]
- C. Array = [3, 5, 15, 0, 0]
- D. Array = [2, 7, 15, 0, 0]

**Question 7**

Which control structure is used in the pseudocode?

- A. iteration
- B. selection
- C. function
- D. internal documentation

**Question 8**

Huy is writing a software solution to support administrative staff in a school. The software solution must store details about each student in the school.

The most appropriate data structure to store a student's first name, last name, date of birth, home address and telephone number is

- A. a string.
- B. an array.
- C. a record.
- D. a two-dimensional array.

**Question 9**

A local IT business has installed a home network for Maria. Maria asked the technician if she needed to set up encryption on the wi-fi router or whether the firewall would offer enough protection.

Which one of the following would be the most appropriate response from the technician?

- A. Up-to-date virus protection should be enough to keep out unwanted interference.
- B. Encryption does the same job as a firewall, so using both would only slow down network traffic.
- C. The firewall would be enough to protect the home network from intruders reading passwords and data if they gained unauthorised access to the network.
- D. Encryption protects the data traffic in the home network by making it unreadable to unauthorised scanning. The firewall mainly protects the network by scanning incoming packets, so it would be advisable to have both.

*Use the following information to answer Questions 10 and 11.*

Frankie copies his completed programming folio from a school computer's hard drive onto a USB flash drive. Two days later, Frankie returns to the computer only to find that his folio has been deleted from the hard drive.

**Question 10**

Which procedure for managing files was Frankie following?

- A. backup
- B. archiving
- C. duplicating
- D. redundancy

**Question 11**

Frankie's teacher reminds him that his folio is to be submitted that day.

Which is the most appropriate way for Frankie to submit his folio?

- A. Give the teacher the USB flash drive.
- B. Copy his files back onto the school computer's hard drive.
- C. Copy his files onto another USB flash drive and submit that USB flash drive.
- D. Copy his files onto the school computer's hard drive and submit his USB flash drive.

**Question 12**

Sophia works at a gym that operates for 24 hours a day, seven days a week. Each gym member is given an identification (ID) number that is used to unlock the gym door between 9 pm and 6 am. Sophia has designed an algorithm that can check each ID against a list of valid numbers.

Which one of the following validation techniques has Sophia used?

- A. type check
- B. check digit
- C. range check
- D. existence check

**Question 13**

In an attempt to help not-for-profit organisations clarify their obligations with regard to privacy legislation, the Australian Government has provided a range of scenarios on its website.

Which one of the following organisations would be exempt from the Australian Privacy Principles?

- A. Organisation A earns \$120 000 in revenue and collects the names and addresses of team participants for a local fun run.
- B. Organisation B has a turnover below the government threshold. It collects information from homeless youth and provides their contact details to local health services and legal aid centres.
- C. Organisation C has a turnover that is less than \$3 million. To maintain its income, the organisation has entered into a sponsorship deal and, as part of that sponsorship deal, it shares its customer list with the sponsor.
- D. Organisation D provides childcare services and activities. Its turnover is less than the government's designated minimum, and it collects, uses and stores information about children's allergies, disabilities and medical needs. Parental payments are reported to the federal government.

**Question 14**

A new software solution is being created for handheld devices. The requirements of the solution include that it be easy to use, must be able to work offline, but can occasionally connect for updates, and that any data required is stored on the device.

Which type of modern application architecture would be the most appropriate?

- A. mobile applications
- B. internet applications
- C. rich client applications
- D. peer-to-peer applications

**Question 15**

Maddie is setting up a file of records that need to be shared with a range of people with different operating systems and applications. Jono has suggested that she consider setting it up as an XML file.

What is the key reason why Jono has suggested that an XML file should be considered?

- A. It can be displayed as a web page.
- B. It provides a common structure for sharing data between applications.
- C. It is difficult to modify, so people will not be able to edit the file or lose data.
- D. It requires the same tags in each record, so the structure will be easy to read and to follow.

**Question 16**

A binary search is performed on the following array of 17 names.

|         |
|---------|
| Agapi   |
| Andrew  |
| Bonnie  |
| Cathy   |
| Dominic |
| Edward  |
| Huang   |
| Jordon  |
| Joshua  |
| Le      |
| Mason   |
| Ngor    |
| Oscar   |
| Tim     |
| Ursula  |
| Vicky   |
| Vinnie  |

How many comparisons need to occur to find the name 'Vinnie' in the array?

- A. 3
- B. 4
- C. 7
- D. 17

**Question 17**

Pierre has almost finished the development of a software solution for a client and has undertaken a range of tests. He knows he must also conduct usability testing.

Which one of the following statements best outlines usability testing?

- A. After the software solution is in place, survey the users, identify any concerns and modify the software solution as required.
- B. Construct a testing table with expected results, test the software solution, document the actual results and modify the software solution as required.
- C. Plan a set of tests for users to perform prior to implementation of the software solution, record the results and make any necessary modifications to the software solution after the tests.
- D. Show users two alternative mock-ups and ask them to consider the mock-ups and comment on the mock-ups, then modify the mock-ups as required.

**Question 18**

A large computer game development company has developed a number of apps. It stores data about users of these apps in a number of databases. The company regularly reviews this data to identify patterns and to make decisions about the next game to develop or what advertising to promote in the apps.

This practice is referred to as

- A. data mining.
- B. source data.
- C. data validation.
- D. analysis of primary and secondary data.

**Question 19**

Aditya has a blog that helps gamers with hacks. The blog has over a thousand subscribers. Each subscriber provides general contact details, including email addresses, when they subscribe. Aditya has had a marketing company contact him and request access to his database. The marketing company will identify the interests of the subscribers and provide targeted advertisements that Aditya can add to his emails. He agrees and will be paid for the service.

Aditya has been emailing his subscribers once a week and now includes the targeted advertising. Some of his subscribers have started to complain; one even suggested that Aditya was breaking the law.

Which legislation is Aditya's subscriber referring to when suggesting that Aditya was breaking the law?

- A. *Spam Act 2003*
- B. *Privacy Act 1988*
- C. *Copyright Act 1968*
- D. *Privacy and Data Protection Act 2014*

**Question 20**

One method of representing a software design is using a data dictionary, which

- A. contains the data used in the software solution.
- B. defines all the variables used in the software solution.
- C. defines each data element, including name, description, type and format.
- D. shows the mock-up of all data entry screens for a software solution, with data elements identified.

**SECTION B – Short-answer questions****Instructions for Section B**

Answer **all** questions in the spaces provided.

**Question 1** (3 marks)

Genna has designed a function to be incorporated into a software solution to record test scores for a class. The function is called `Average_mark`.

The marks are entered into an array called `classmarks`. `Classmarks` can hold up to a maximum of 30 student test scores. The index number of the first element is 0.

Each year the number of students in the class will change, so Genna needs to allow for a range of up to 30 students in the class.

The algorithm is shown below.

```
Function Average_mark(classmarks, class_size)
    count ← 0
    sum ← 0
    avemark ← 0
    While count < class_size
        sum ← sum + classmarks[count]
        count = count + 1
    EndWhile
    avemark = sum / class_size
    return avemark
End Function
```

In the space provided below, construct a trace table for a class of three students to check that the function meets the design specifications. The students have the following results: 52, 89, 21.



**Question 2** (8 marks)

A programmer has been asked to improve the processing speed of a software application. He decides to read the records from a stored text file into RAM. The size of the text file is approximately 500 KB.

- a. Explain how reading the records into RAM could improve the performance of the software application. 2 marks

---



---



---

- b. Before the software application can be closed, the software application must save the records from RAM back to the text file. The record structure is shown below.

|                         |                        |                         |                       |                          |
|-------------------------|------------------------|-------------------------|-----------------------|--------------------------|
| Customer_ID<br>(unique) | Customer_<br>Givenname | Customer_<br>Familyname | Customer_<br>Postcode | Customer_<br>Phonenumber |
|-------------------------|------------------------|-------------------------|-----------------------|--------------------------|

The records will be stored in a text file with one line per record. Storing the data in a text file will have an impact on any changes to the software application.

- Explain this impact in terms of the compatibility of records if the number of fields changes. 2 marks

---



---

- c. Within the software application, Customer\_Phonenumbe (03) 8484 5555 is stored as a string data type. However, there has been a suggestion that it should be stored as an integer, which could have an impact on the speed of the software application.

- i. State the characteristics of the following two data types. 2 marks

String \_\_\_\_\_

Integer \_\_\_\_\_

- ii. Select and justify the most appropriate data type for storing Customer\_Phonenumbe in this software application. 2 marks

---



---



---



---

**Question 3** (3 marks)

A small company has asked its programmer, Phuong, to write a software solution that will record the hard copy technical reports borrowed by staff members.

Phuong has suggested using an associative array as an abstract data type to hold the data. There are two data values to be recorded – the staff member’s name and the title of the report.

The limitations are as follows:

- There is only one copy of each technical report but the total number of reports is about 300.
- Each staff member is allowed to borrow more than one report.
- Phuong has only a short time to design and write the software solution.

In a meeting, Phuong’s manager has asked her to give the reasons for suggesting to use an associative array instead of a one-dimensional array.

Explain why Phuong has suggested using an associative array rather than a one-dimensional array for this software solution.

---

---

---

---

---

---

---

---

**Question 4** (3 marks)

A linear search of a file of 5000 records does not require the records to be sorted.

Outline a more efficient searching technique. Justify why this technique is more efficient.

---

---

---

---

**Question 5** (3 marks)

The function `countDuplicates` counts any instance of a value being repeated in an input array and displays the duplicate count as an integer.

Assume `inputArray` is a sorted array.

**Test case 1**

Input: 10, 10, 12, 13, 13, 13, 14, 15, 15  
duplicate\_count: 4

10 is repeated once.

13 is repeated twice.

15 is repeated once.

The total number of duplicates is four.

**Test case 2**

Input: 1.0, 1.1, 1.1, 2.5, 2.5, 3.0  
duplicate\_count: 2

**Test case 3**

Input: "Apple", "Apple", "Banana", "Orange", "Orange"  
duplicate\_count: 2

Complete the pseudocode below for the function `countDuplicates`.

```
function countDuplicates (inputArray)
```

```
  Begin
```

```
    duplicate_count ← 0
```

```
    counter ← 1
```

```
    array_length ← Len (inputArray)
```

---



---



---



---



---

```
  print duplicate_count
```

```
End
```

**SECTION C – Case study**

**Instructions for Section C**

Please remove the insert from the centre of this book during reading time.  
 Use the case study provided in the insert to answer the questions in this section. Answers must apply to the case study.  
 Answer **all** questions in the spaces provided.

**Question 1** (8 marks)

There are many tasks to complete before RoboDel’s system can implement the EasyDel delivery app at RedGumGrove Shopping Centre.

Bruce has been appointed head of the project management team and the team has begun to identify some of these tasks.

| Task   | Duration |
|--|----------|
| Research available systems.                          | 5 days   |
| Trial one system.                                    | 12 days  |
| Design EasyDel app.                                  | 10 days  |
| Develop EasyDel app.                                 | 10 days  |
| Set up webserver.                                    | 1 day    |
| Create and fill database.                            | 1 day    |
| Develop process for stores to add items to database. | 3 days   |
| Stores to begin to add items for sale.               | 3 days   |
| Develop local control system for robots.             | 10 days  |

Bruce has shared this first step with RedGumGrove Shopping Centre’s management. Management is unhappy because, from its point of view, it would appear to take 55 days before the system can be implemented.

Bruce has to explain why it will take fewer than 55 days. Bruce and his team, Kylie and Lani, prepare the Gantt chart shown on page 13.

- a. Outline two reasons, with evidence from the Gantt chart, that will help Bruce explain to management why the project will take significantly fewer than 55 days. 4 marks

1. \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

2. \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

|  |                 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 |  |
|--|-----------------|---|---|---|---|---|---|---|---|---|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|--|
| Task   | Duration (days) |   |   |   |   |   |   |   |   |   |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |  |
| Research available systems.                          | 5               | █ | █ | █ | █ | █ |   |   |   |   |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |  |
| Trial one system.                                    | 12              |   |   |   |   |   | █ | █ | █ | █ | █  | █  | █  | █  | █  | █  | █  | █  |    |    |    |    |    |    |    |    |    |    |    |  |
| Design EasyDel app.                                  | 10              |   |   |   |   |   |   |   | █ | █ | █  | █  | █  | █  | █  | █  | █  | █  |    |    |    |    |    |    |    |    |    |    |    |  |
| Develop EasyDel app.                                 | 10              |   |   |   |   |   |   |   |   |   |    |    |    |    |    |    |    |    | █  | █  | █  | █  | █  | █  | █  | █  | █  | █  |    |  |
| Set up webserver.                                    | 1               |   |   |   |   |   |   |   |   |   | █  |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |  |
| Create and fill database.                            | 1               |   |   |   |   |   |   |   |   |   | █  |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |  |
| Develop process for stores to add items to database. | 3               |   |   |   |   |   |   |   |   |   |    | █  | █  | █  |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |  |
| Stores to begin to add items for sale.               | 3               |   |   |   |   |   |   |   |   |   |    |    |    |    |    | █  | █  | █  |    |    |    |    |    |    |    |    |    |    |    |  |
| Develop local control system for robots.             | 10              |   |   |   |   |   |   |   | █ | █ | █  | █  | █  | █  | █  | █  | █  | █  |    |    |    |    |    |    |    |    |    |    |    |  |

Management wants the project to be completed in the shortest possible time.

b. Bruce is concerned about two tasks possibly not meeting their deadlines.

For each task listed below, describe the consequences for the project if the task takes longer than planned.

2 marks

- Design the EasyDel app.

---



---



---

- Stores to begin to add items for sale.

---



---



---

c. Kylie suggests that Bruce add some milestones to help convince management that the project will proceed as planned.

Indicate, using the diamond symbol (◆), **two** milestones on the Gantt chart above.

2 marks

**Question 2** (2 marks)

Bruce wants Lani and Kylie to create a software requirements specification (SRS) document to provide the team with a clear scope for the project and to provide direction for the design and development of the EasyDel app.

The following two statements have been collected from key stakeholders:

- Statement 1  
Deliveries will initially be limited to no more than 2.5 km from the centre.
- Statement 2  
RedGumGrove Shopping Centre's management wants the EasyDel app to have the same colour scheme as all of the shopping centre's branding.

Identify from the list below which section of the SRS will consider each statement.

|       |             |                         |                             |
|-------|-------------|-------------------------|-----------------------------|
| scope | constraints | functional requirements | non-functional requirements |
|-------|-------------|-------------------------|-----------------------------|

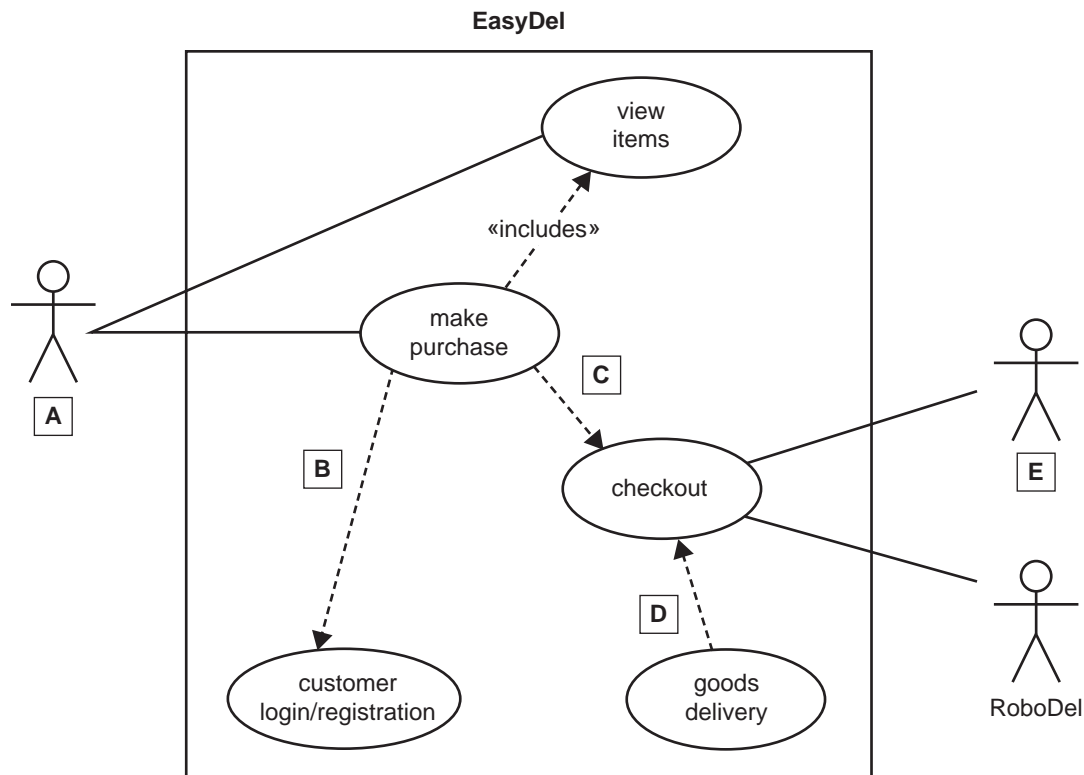
Statement 1 \_\_\_\_\_

Statement 2 \_\_\_\_\_

**CONTINUES OVER PAGE**

**Question 3** (10 marks)

Lilianna is the adviser to the technical engineering team. She has been given a draft use case diagram of the purchase process for the customer. She has also been provided with some general guidelines as to how the system will operate.



A customer can either view items or log in to the app. This can be done either via the EasyDel app or by accessing the website directly. If the customer wants to make a purchase, then the customer must either log in or register.

‘View items’ could be used by a customer if they only want to search and view items. This use case is also used as a part of the ‘Make purchase’ option.

‘Customer login/registration’ allows a customer to register. The authentication system will verify the customer as a valid customer.

‘Checkout’ is part of ‘Make purchase’.

At checkout, the customer’s credit card must be verified and details passed to the bank. A decision must also be made as to how the items will be delivered. The customer can select delivery by RoboDel or collect in-store.



- a.** What are the stick figures shown in the use case diagram on page 16 referred to as? 1 mark

---

- b.** Complete the use case diagram that the team has started by writing the correct labels for A, B, C, D and E in the spaces provided below. 5 marks

| <b>Label</b> |  |
|--------------|--|
| <b>A</b>     |  |
| <b>B</b>     |  |
| <b>C</b>     |  |
| <b>D</b>     |  |
| <b>E</b>     |  |

- c.** Explain the difference between the terms ‘extends’ and ‘includes’. Use examples from the use case diagram on page 16 where appropriate. 4 marks

---



---



---



---



---



---



---



---



---



---



---

**Question 4** (3 marks)

Lilianna is working on the most appropriate way to communicate with the fleet of robots.

To communicate with the robots, Lilianna is considering using radio signals. The robots must have a transmitter to send messages and a receiver to get messages. The technical engineering team is considering two possible methods of communication and control – bluetooth and 4G.

Arlen, a member of the team, says that bluetooth would not be a suitable method to control the robots.

- a. State why Arlen has rejected bluetooth as a means of communication to control the robots. 1 mark

---

- b. Lilianna has asked Arlen to investigate setting up wireless communication between the robot and a mobile device. She has decided to use credit-card-sized computers to control communications. The engineers can build the credit-card-sized computer into each robot.

Identify **one** technical feature of the credit-card-sized computer that will be essential to establish wireless communication. Justify your response. 2 marks

---

---

---

---

**Question 5** (5 marks)

Before a customer can complete a purchase, there are two important checks that must be completed. The distance (`delivery_distance`) that the robot must travel for delivery must be less than or equal to 2.5 km and the order cannot include any fragile items (`fragile ← false`). If both of these conditions are met, the order will be processed as ‘order valid’. If either of these conditions is not met, then the order will be considered ‘order invalid’.

The following pseudocode is used to check these conditions.

```

If delivery_distance >= 2.5 and fragile = True
    print("order valid")
Else
    print("order invalid")
EndIf

```

- a. Complete the following test table so that this pseudocode is fully tested, and include expected and actual results. 3 marks

| Test no. | delivery_distance (km) | fragile | Expected result | Actual result |
|----------|------------------------|---------|-----------------|---------------|
| 1        | 3                      | True    | order invalid   | order valid   |
| 2        | 2.5                    | True    | order invalid   | order valid   |
| 3        | 1                      | False   | order valid     | order invalid |
| 4        |                        |         |                 |               |
| 5        |                        |         |                 |               |
| 6        |                        |         |                 |               |

- b. What is the error in the pseudocode that would cause some of the ‘Actual result’ column results to be different from the ‘Expected result’ column results in the test table? 1 mark

---



---



---

- c. Rewrite the pseudocode so that it works correctly. 1 mark

---



---



---



---



---

**Question 6** (5 marks)

The EasyDel app needs to authenticate credit cards. As part of the authentication, the program implements the following algorithm to help verify whether a credit card number is correct.

**Algorithm**

- Read the credit card number into a variable.
- Multiply each of the second, fourth, sixth and eighth digits by 2.
  - In each case if the number is greater than 10, subtract 9 from it.
- Add up all the other digits plus the results of the previous step.
- Check the result. If the remainder when the total is divided by 10 is 5, 6 or 7 (found by using the mod operator) then the card is a fake.

Note: The mod operator only keeps the remainder of the division. For example,  $9 \bmod 2$  is 1 because 1 is the remainder.

**Begin**

```
//store each digit as it is entered
//initialise variables
//note that dashes are ignored when characters are read
counter ← 1
```

**Repeat**

```
    creditnum[counter] ← digit
    counter ← counter + 1
```

**Until** digits finished

```
validcard ← false
creditnumtotal ← 0
```

```
For counter ← 1 to len(creditnum) //not all credit cards are 16 digits
```

```
    If (counter mod 2) = 0 then
```

```
        //it is one of the every second digit
```

```
        If (2 * creditnum[counter]) <= 10 then
```

```
            creditnumtotal ← creditnumtotal + 2 * creditnum[counter]
```

```
        Else
```

```
            //subtract the 9 as written in the algorithm
```

```
            creditnumtotal ← creditnumtotal + (2 * creditnum[counter] - 9)
```

```
        EndIf
```

```
    EndIf
```

```
EndFor
```

```
If creditnumtotal mod 10 < 5 or creditnumtotal mod 10 > 7 then
```

```
    validcard ← true
```

```
Else
```

```
    validcard ← false
```

```
    print "Warning"
```

```
EndIf
```

```
End
```

- a. Shown below is the extract from the data dictionary, listing variable names and explaining how the variables will be used in development.

From the following list of data types and data structures, select the most appropriate data type or data structure for each variable and its accompanying description. Write your selection in the spaces provided in the table below.

2 marks

integer    floating point    Boolean    character    string    array    record

| Variable name | Data type or structure | Description   |
|---------------|------------------------|---|
| validcard     |                        | a value that represents the validity of the credit card |
| creditnum     |                        | the credit card number of the customer, 0000-0000       |

- b. What type of validation is being implemented with this algorithm?

1 mark

---

- c. Use the following credit card number to check the algorithm.

2 marks

|   |   |   |   |   |   |   |   |
|---|---|---|---|---|---|---|---|
| 4 | 6 | 9 | 4 | 3 | 7 | 0 | 1 |
|---|---|---|---|---|---|---|---|

creditnumtotal \_\_\_\_\_

validcard \_\_\_\_\_

**Question 7** (3 marks)

Lilianna has recognised the need to keep the EasyDel app up to date with information on special bargains and stock changes. This could be time consuming if reformatting or structural changes are required. To reduce costs, Lilianna has asked her team to design the EasyDel app screen so that the data can be updated on a regular basis without the need to edit the format or structure of the screen. Each store must supply the data to be used in the EasyDel app. XML has been suggested as the most appropriate file type.

- a.** Identify how the software in the EasyDel app would differentiate an XML file from other types of text files. 1 mark

---

---

- b.** Explain how an XML file would be used by the EasyDel app to display data in the correct format on the screen. 2 marks

---

---

---

**Question 8** (6 marks)

Lilianna has decided to develop a backup strategy that includes backing up the customer data and database changes each day. She thinks the stored data should be encrypted. Arlen has suggested that an effective backup strategy is all they need and they do not need to consider encrypting the stored data.

Compare the purpose of a backup strategy and data encryption, and recommend, with justification, what Lilianna should implement.

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

**Question 9** (4 marks)

The RedGumGrove Shopping Centre server will store the personal data that customers enter to register for deliveries.

Bruce has decided that one criterion for the EasyDel app is that data must be kept secure. Lilianna has decided to implement two security measures to keep customer data secure.

Explain how each security measure below will help Bruce to achieve this criterion.

- Firewall on the central server \_\_\_\_\_

---

---

- Encryption of signal used for robots \_\_\_\_\_

---

---

**Question 10** (4 marks)

RedGumGrove Shopping Centre is offering stores the opportunity to pay a subscription to access the EasyDel app’s customer data, including email addresses.

- a. Liliana has commented about possible breaches of privacy if sharing data.

Describe what must be contained in the EasyDel app to ensure that the centre meets its responsibilities regarding the privacy of customer data.

2 marks

---

---

---

- b. Once all privacy issues have been addressed, access is provided to the stores. Christos, the owner of the electronics store in the centre, intends to use the data to email customers regularly.

Outline what Christos must do to ensure he is not breaching the *Spam Act 2003*.

2 marks

---

---

---

**Question 11** (4 marks)

After RoboDel’s system is fully implemented, RedGumGrove Shopping Centre’s management will outsource the storage of the software solution’s data. The data involved is restricted by legislation, so the company will need to be in Australia but will not be based in the shopping centre. For security purposes, the storage company will use a virtual private network (VPN).

Explain how a VPN provides security and justify why it is appropriate in this situation.

---

---

---

---

---



**Question 12** (6 marks)

RedGumGrove Shopping Centre's management wants to evaluate the success of the delivery system before committing to buying another 20 robots.

A number of evaluation criteria have been written to evaluate the efficiency and effectiveness of the software solution.

Two of these criteria are as follows:

- 98% of customers received the items they ordered.
- Delivery of 80% of purchased items occurred within two hours of the order being completed.

Describe a suitable evaluation strategy and explain how the data collected will be used to evaluate each criterion.

| Criterion  | Strategy | Explanation |
|--|----------|-------------|
| 98% of customers received the items they ordered.  |          |             |
| Delivery of 80% of purchased items occurred within two hours of the order being completed. |          |             |

**Insert for Section C – Case study**

Please remove from the centre of this book during reading time.

RedGumGrove Shopping Centre is a suburban shopping centre. Customers can currently order items from most stores online, but they must come into the centre to collect their items. Management has recognised that one of the key features of online shopping that the centre is missing is the delivery of items to customers' homes. However, as a small local shopping centre, management is unable to provide high-cost delivery trucks. In response to customer demand for delivery, RedGumGrove Shopping Centre has set up an in-house logistics department, RoboDel. RoboDel has employed a team of people to undertake the analysis, design and development of a software solution.



Source: Graphical\_Bank/Shutterstock.com

RoboDel is trialling a fleet of six-wheeled self-driving robots designed and manufactured by Safe Robots. These robots are designed to deliver items ordered online to customers' homes in the local area. If Safe Robots is awarded the contract, RoboDel will purchase 20 delivery robots to pick up and deliver items purchased online from stores at RedGumGrove Shopping Centre to customers living within a 2.5 km radius of the centre.

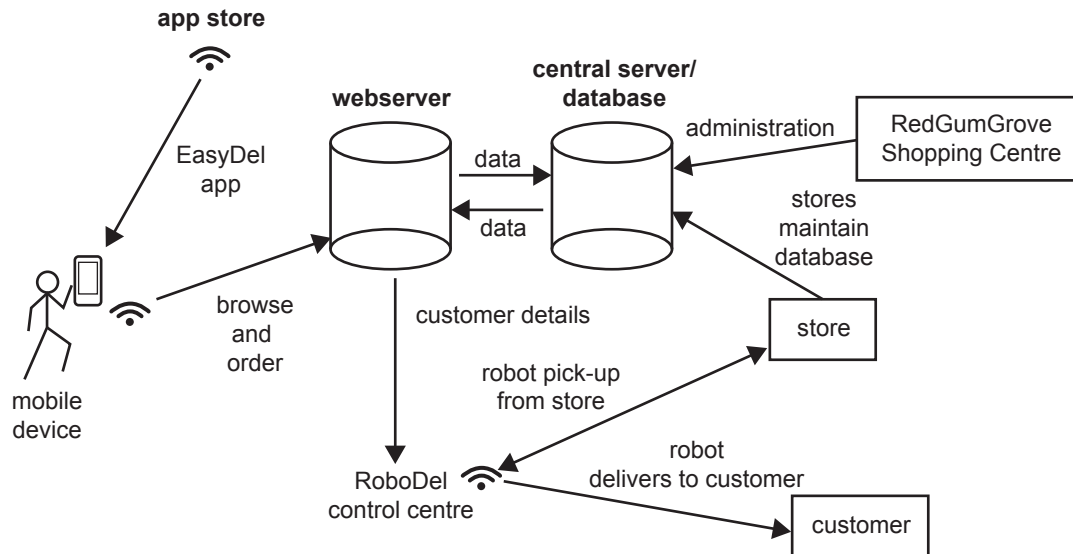
The self-driving delivery robots are about the size of a large dog and move at approximately 5 km/h (walking speed).

The delivery robot is able to navigate its way along footpaths to the nominated address. It recognises boundaries and avoids obstacles by using sensors. These sensors measure the distance to objects in the robot's path by illuminating those objects with a pulsed laser light and measuring the reflected pulses with a sensor. Differences in laser return times and wavelengths can then be used to make digital three-dimensional representations of the surroundings.

Communications with the delivery robot use the same technology that is used in a mobile device. The delivery robot also comes equipped with a loudspeaker and a microphone to communicate with pedestrians.

Each trip by the delivery robot involves a single delivery and then a return to RedGumGrove Shopping Centre.

### Outline of the process



### The RoboDel system

A webservice on the central server has access to a database that contains a list of the items for purchase. The inventories of each of the centre's stores are uploaded to the database by the individual stores.

A registered customer or a person browsing via the EasyDel app can access items in the database on a mobile device or on a computer.

To use the RoboDel service, the customer must download the EasyDel app on their mobile device:

- The customer searches the catalogue of items provided by the stores at RedGumGrove Shopping Centre.
- A potential customer must register as a customer before they can order.
- Selected items are added to the customer's virtual cart.
- Items are then ordered and paid for via credit card through EasyDel.
- Ordered items are removed from the catalogue/database item totals.
- The RoboDel central server receives a notification with the customer's order and address details.
- A delivery robot is dispatched to the selected store or stores to pick up the ordered items.
- As the last item is entered, the lid on the delivery robot is remotely locked.
- The delivery robot travels to the customer's address with the ordered items.
- The customer can monitor and track the delivery robot's movements from RedGumGrove Shopping Centre to the provided address in real time through the EasyDel app.
- The customer receives a notification from EasyDel when the delivery robot arrives at its destination.
- On delivery, only the registered customer with a code provided through the EasyDel app can unlock the lid and retrieve their items.

RoboDel has a technician monitoring the route. The technician is able to intervene should the delivery robot require assistance.

**END OF INSERT**