Vic Farrell Publishing
2023

SUPERVISOR TO ATTACH PROCESSING LABEL HERE

STUDENT NUMBER | | | | | | | | | Letter |

APPLIED COMPUTING: SOFTWARE DEVELOPMENT

Written examination

Tuesday 10 October 2023

Reading time: 1.30 pm to 1.45 pm (15 minutes)
Writing time: 1.45 pm to 3.45 pm (2 hours)

QUESTION AND ANSWER BOOK

Structure of book

Section	*Number of questions*	*Number of questions to be answered*	*Number of marks*
A	20	20	20
B	6	6	30
C	16	16	53
			Total 103

- *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 28 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 unauthorized 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 object-oriented programming, what is the primary distinction between functions and methods?

A. Functions are standalone blocks of code, while methods are associated with objects or classes.
B. Functions can only be used in functional programming languages, while methods are used in object-oriented languages.
C. Functions and methods are interchangeable terms, and there is no distinction between them.
D. Functions are used for mathematical calculations, while methods are used for data manipulation.

Question 2

A user interface that is described as being 'responsive' is:

A. One that is fast above all else
B. One that gives the user good instructions
C. One that is not only fast, but gives good feedback to the user
D. One that is able to print to a number of different network devices

Question 3

A local bookstore aims to enhance its customer experience by implementing a digital system. Which of the following functional requirements is unrelated to the bookstore's information system goal?

A. A. Track the number of books sold in each genre.
B. B. Maintain a database of customer reading preferences.
C. C. Organize books on the shelves based on their release date.
D. D. Monitor the store's monthly utility expenses.

Question 4

Which of the following is an example of a logical security measure?

A. Biometrics
B. Security cameras
C. Passwords and levels of access
D. Doors with swipe card locks installed

Question 5

In the context of database backup systems, what type of backup involves copying only the data that has changed since the last backup, minimizing the amount of data transferred or stored?

A. Full backup

B. Incremental backup

C. Differential backup

D. Snapshot backup

Question 6

Which of the following is NOT a component of usability?

A. Affordance

B. Marketability

C. Clarity

D. Accessibility

Question 7

Which of the following statements best describes the Privacy and Data Protection Act 2014?

A. the Privacy and Data Protection Act only applies the private sector

B. the Privacy and Data Protection Act only applies to small organizations

C. the Privacy and Data Protection Act only applies to government organizations in Victoria

D. the Privacy and Data Protection Act 2014 applies to all organization all over Australia

Question 8

In object-oriented programming (OOP), which data type is used to store a sequence of characters, and how is the data typically stored in memory?

A String; Stored as a single continuous block of memory.

B Integer; Stored as an array of individual characters.

C Double; Stored as a linked list of characters.

D Boolean; Stored in a binary tree structure.

Question 9

Which of the following best describes the difference between functional and non-functional requirements in software development?

A Functional requirement specify how the software should look and feel, while non-functional requirements define what the software should do.

B Functional requirements outline the user interface design, while non-functional requirements focus on the underlying code structure.

C Functional requirements describe what the software should do, while non-functional requirements define how the software should perform.

D Functional requirements address security and privacy concerns, while non-functional requirements focus on user experience enhancements.

Question 10

Sarah is leading a project to develop a new software tool for a team of graphic designers, most of whom have different design preferences and workflows. To gather their specific needs and requirements effectively, what approach should Sarah consider?

A Conduct a company-wide meeting to discuss the project and gather feedback from all employees.

B Analyze existing design tools and software available in the market.

C Hold individual interviews with the graphic designers to understand their unique preferences and workflows.

D Assign a usability expert to assess the designers' workspaces and provide recommendations.

Question 11

Which of the following actions is typically included in a comprehensive software security assessment?

A. usability test

B. a functional test

C. an existence test

D. a penetration test

Question 12

Julie has completed her Design Report for the mobile app and is ready to hand over her designs to the development team in the form of data dictionaries, object description tables and pseudocode. She has a detailed storyboard of the interface required. The project manager is not ready to hand it over to the programmers. What is the next step required?

A. Testing strategies

B. A list of evaluation criteria

C. A table of efficacies and effectiveness features

D. Clearly list of validation methods.

Question 13

What is a common technique for idea generation often used in brainstorming sessions?

A Analyzing historical data and trends.

B Narrowing down options to a single best idea.

C Encouraging participants to withhold their ideas until the end.

D Allowing participants to freely share any ideas that come to mind.

Question 14

'Drive' is a new social media app to assist people in managing their fuel costs on each vehicle they run.

This information is an example of

A. a objective of an information system

B. a goal of an information system.

C. A description of a marketing plan for an app

D. a strategy for data collection

Question 15

Which of the development models uses 'daily scrums'?

A. Waterfall

B. Agile

C. Spiral

D. Rapid Application Development

Question 16

```
1  count ← 0
2  sum ← 0
3  while count < 2
4      sum ← count + sum
5      count ++
6  print count
7  print sum
```

Which one of the following trace tables represents the algorithm shown above?

A.

Line	Count	Sum	Output	Condtion
1	0			
2	0	0		
3	0	0		TRUE
4	0	0		
5	1	0		
3	1	0		
4	1	1		
5	2	1		
3	2	1		FALSE
6	2	1	2	
7	2	1	1	

B.

Line	Count	Sum	Output	Condtion
1	0			
2	0	0		
3	0	0		FALSE
4	0	0		
5	1	0		
3	1	0		
4	1	1		
5	1	2		
3	1	2		TRUE
6	1	2	2	
7	1	2	1	

C

Line	Count	Sum	Output	Condtion
1	0			
2	0	0		
3	0	0		TRUE
4	0	1		
5	0	1		
3	0	1		
4	0	1		
5	2	1		
3	2	1		FALSE
6	2	1	2	
7	2	1	1	

D

Line	Count	Sum	Output	Condtion
1		0		
2	0	0		
3	0	0		TRUE
4	0	0		
5	1	0		
3	1	0		
4	2	1		
5	2	1		
3	2	1		FALSE
6	2	1	2	
7	2	1	1	

END OF SECTION A

Use the following information to answer Questions 17 and 18.

The algorithm shown below will be used for data entry.

```
Begin
Input quantity
If quantity != null Then
      amount = quantity * price
Else
      output "Enter quantity"
End If
End
```

Question 17

Which one of the following validation techniques is being applied in this algorithm?

A. A flag test

B. a type check

C. a range check

D. an existence check

Question 18

This algorithm makes use of

A. a function

B. a method

C. a selection statement

D. interation

Question 19

Kumiko is the project manager to re-develop an accounting package. Her team already have the working code of the current software.

The most appropriate development model for this project is

A. agile.

B. spiral.

C. waterfall.

D. build-and-fix.

Question 20

Data is stored in arrays containing 9 locations. Each array is named after a value between 1 and 4095 in hexadecimal (0001 – FFFF). Below are four arrays containing values that are stored in those locations after being hashed.

0A78(8)

0	1	2	3	4	5	6
70	15	51	24	4	75	83

0A79 (8)

0	1	2	3	4	5	6
42	8	30	66	74	40	20

0A7A (8)

0	1	2	3	4	5	6

0A7B (8)

0	1	2	3	4	5	6

Two more pieces of data are to be hashed and added to the arrays. They are:
(2682, 50)
(2683, 54)

Identify the correct Arrays and Indexes for these two

A. 0A7B(4) and 0A7A(6)
B. 0A7B(1) and 0A7A(4)
C. 0A7A(1) and 0A7B(5)
D. 0A7A(0) and 0A7B(3)

END OF SECTION A

SECTION B – Short-answer questions

Instructions for Section B

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

Question 1 (3 marks)

Below is an extract from an XML file.

```
<?xml version="1.0"?>
<catalog>
   <book id="bk101">
      <author>Gambardella, Matthew</author>
      <title>XML Developer's Guide</title>
      <genre>Computer</genre>
      <price>44.95</price>
      <publish_date>2000-10-01</publish_date>
      <description>An in-depth look at creating applications
      with XML.</description>
   </book>
   <book id="bk102">
      <author>Ralls, Kim</author>
      <title>Midnight Rain</title>
      <genre>Fantasy</genre>
      <price>5.95</price>
      <publish_date>2000-12-16</publish_date>
      <description>A former architect battles corporate zombies,
      an evil sorceress, and her own childhood to become queen
      of the world.</description>
   </book>
</catalog>
```

a) Identify the root tag.

---

b) Identify the use of an attribute.

---

c) Identify an entity

Question 2 (6 marks)

Franklin is preparing his team to develop a new update on the database software for their client. Below is the Gantt chart he has prepared.

TASKS	May 1-7	May 8 - 15	May 16 - 22	May 24 - 30	June 1 - 7	June 8 - 15	June 16 - 22	June 23 - 30	July 1 - 7	July 8 - 15
Review current system	■									
Investigate update requirements		■								
Design Prototype 1			■							
Client testing 1				■						
Review Client feedback 1					■					
Design Prototype 2						■				
Client testing2							■			
Review Client feedback 2								■		
Finalise System									■	■
Implement updated system										♦

a) Identify the development model used in the Gantt chart above. Justify your answer.

(2 Marks)

b) If the Design Prototype 1 successfully completed all the requirements for the update, identify which tasks could be removed from the critical path.

(3 Marks)

c) Identify ONE other milestone that could be included in the Gantt chart.

(1 Mark)

END OF SECTION B

Question 3 (2 marks)

You are the IT manager for a hospital that uploads all diagnostic test results onto a central server. All data needs to be available 24 hours per day every day of the year. It is important that the system is not slowed down by back up systems. If any threat undermines the data integrity of the system, the server must be back up on line as quickly as possible.

Recommend a backup strategy (incremental or differential) and justify your choice.

Question 4 (4 marks)

Buela works for the coast guard and is creating an application to add to her drone. She wants the drone to return to her large red landing pad on the boat to avoid losing it in the water.

Depending on the weather, the colour reflected from the landing pad can be anywhere from the bright red in overcast conditions (RGB 265, 0, 0) to (RGB 100, 0 ,0) in highly reflected sunshine. She has written an algorithm to search for the landing pad.

```
BEGIN
  IF (Return = TRUE) THEN
    red_low = (200, 0, 0)
    red_high = (255, 50, 50)

    FOR y in range(screen.height):
        FOR x in range(screen.width):
            pixel_color = screen.getpixel((x, y))
               IF pixel_color<= red_low OR pixel_color=> red_high:
                      Set target to (x,y)
                 ELSE
                      Turn 5° right
                      Turn 5° up
                      Turn 5° left
                      Turn 5° down
                 END IF
          Next x
     Next y
 END IF
END
```

a) Complete the test table below to identify the error in Buela's algorithm. 2 marks

Test data	Expected result	Actual result
pixel_color= (200, 0, 0)	Set target to (x,y)	Set target to (x,y)

END OF SECTION B

b) Identify the cause of the error in the algorithm. 1 mark

c) Suggest a change to the algorithm so that the correct output is produced. 1 mark

Question 5 (2 marks)

The WannaCry ransomware worm exploited a vulnerability in the first version of the Windows Server Message Block (SMBv1) resource sharing protocol. Describe how a worm can jeopardize data integrity.

Question 6 (3 marks)

What is the difference between a Constraint and a Non-Functional requirement in an SRS. Give an example.

SECTION C – Case study

Instructions for Section C

Please remove the insert from the booklet 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 (5 marks)

a) ParkEasy Solutions is setting up the foundations for the SmarkParking Management System.

Describe three data collection methods that ParkEasy Solutions could use to determine the needs of all the stakeholders. Identify the method and the related stakeholder.

3 marks

Method 1

Method 2

Method 3

b) After the list of features for the SmartParking System has been prepared, it is realised that there could be several issues with developing this software solution that are beyond the control of ParkEasy.

Identify a Technical and a Legal Constraint ParkEasy will need to consider. 2 marks

Technical _____

_____

_____

Legal _____

_____

_____

Question 2 (4 marks)

a) Refer to the data flow diagram (DFD) on the case study insert. The table below lists some of the features of the DFD. This is a high level (1) DFD and could be expanded to a lower level.

Identify which feature of the DFD could be further expanded to give more detail to support the analysis of the problem.

_____

(2 Marks)

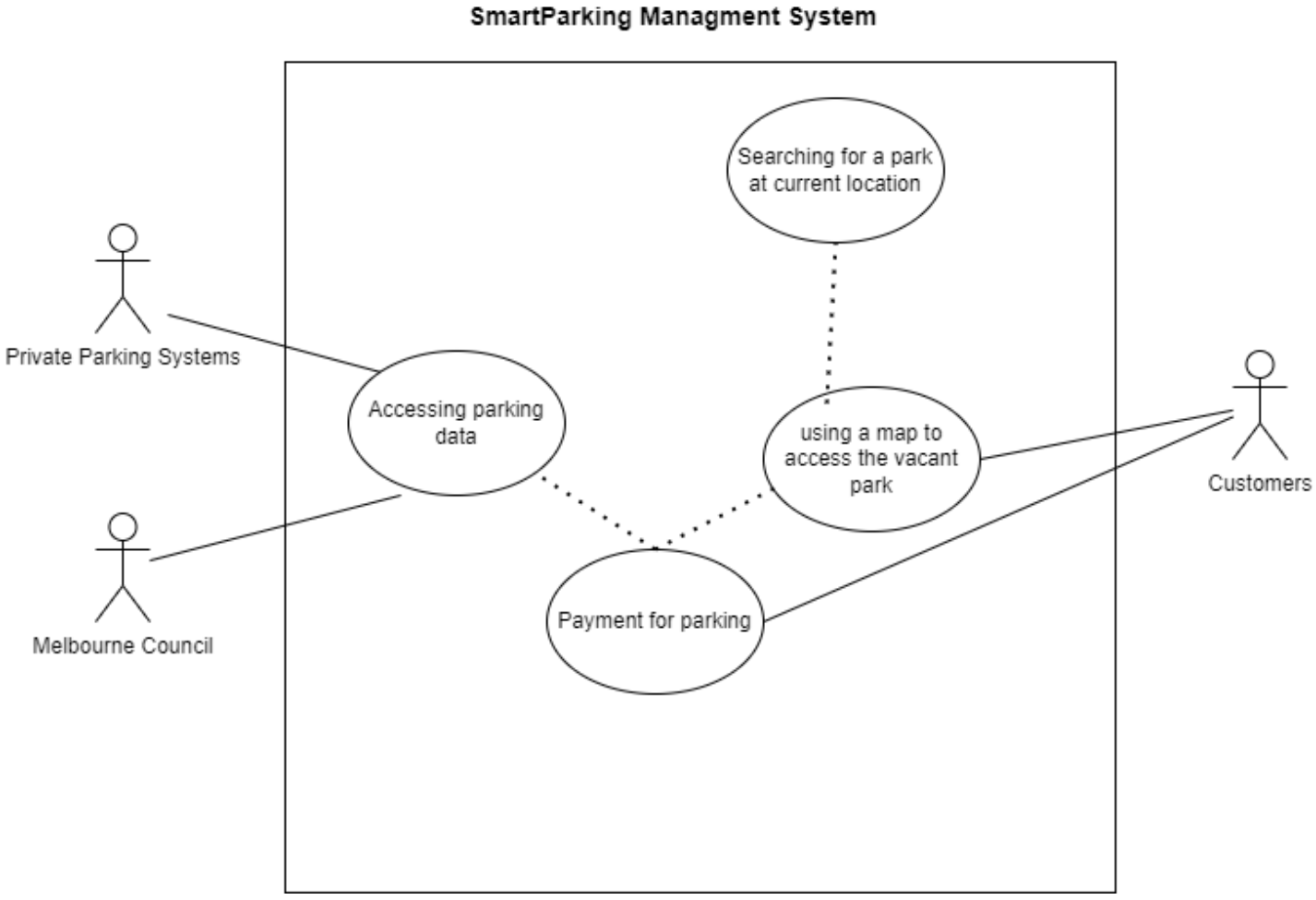
Identify the features of the DFD

(2 Marks)

Feature	Labeled example from the DFD Diagram
Data Store	
Data Flow	
Process	
Entity	

Question 3 (6 marks)

A use case diagram for the SmartPark System is shown below. Complete the diagram by correctly labelling the dotted lines. You can write and draw your response directly onto the diagram.



Question 4 (2 marks)

EasyPark has collected location details for each of the major carparks. Below is the data for one company 'Secure Parking' and their three parking lot locations. On the right is a sample of the data sent to Secure Parking about customers using their app to pay for their parking.

```
<P_Lots>
      <Secure Parking>
      <Secure lat="47.644548" lon="-122.326897">
        <TotalParks>400</ TotalParks >
        <Hourly_Fee>$8.90</Hourly_Fee>
      </Secure>
      <Secure lat="46.726354" lon="-123.927263">
        <TotalParks>640</ TotalParks >
        <Hourly_Fee>$10.00</Hourly_Fee>
</Secure>
      <Secure lat="46.543548" lon="-123.076523">
        < TotalParks>1000</ TotalParks>
        <Hourly_Fee>$12.00</Hourly_Fee>
      </Secure>
    </ Secure Parking >
 </P_Lots>
```

```
Customer;Identifier;TimeIn;TimeOut;Location;Paid
WXF837;12.32;14.30;"46.543548""-123.076523";$10.10
1F4SC3;07.12;16.02;"46.726354""-123.927263";$50.50
ADI762;09.25;13.26; "46.543548" "-123.076523";$40.40
16NF3K;10.45;11.41; "47.644548""-122.326897;8.90
```

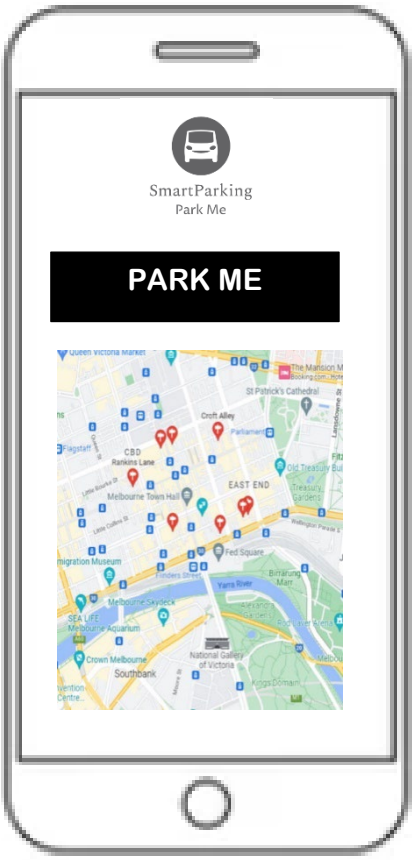
Complete the table below by identifying the data types stored in file samples above.

Variable	Data type	Description
Location[lat,lon]		The location of each car park.
Cust_Registration		The car registration of the customer used as a unique identifier.

Use the following information to answer Questions 5 and 6

MOCK UP A

MOCK UP B



Question 5 (2 marks)

Emily has developed two Mock Ups for the Customer Mobile App (see above)

a. Identify which Mock Up is the most suitable for the customer 1 mark

_____

_____

b. Justify your choice. 1 mark

_____

Question 6 (3 marks)

Three criteria for evaluating the mock-ups are provided in the table below.

Classify each evaluation criterion in terms of efficiency or effectiveness by writing the term 'efficiency' or 'effectiveness' in the spaces provided. 3 marks

Evaluation criterion	Efficiency or effectiveness
Is the app safe to use in a moving vehicle?	
How many 'clicks' are required to search for a park?	
Affordance supports the design of the interface	

Question 7 (2 marks)

Each of the privately-owned car parks has a system that identifies each vehicle by their registration plates via a camera monitor when the vehicle enters the parking lot. Identify a process required to ensure customers are not required to pay twice: once on the SmartParking App and once when they exit the parking lot.

Name the process and describe how it would work. 2 mark

_____

_____

_____

Question 8 (4 marks)

Melbourne Council has some security concerns about the implementation of the SmarkParking App. Identify two security concerns and what measures could be put in place to ensure data is kept secure.

Concern 1 _____

Security Measure _____

Concern 2 _____

Security Measure _____

Question 9 (3 marks)

SmartParking will organize customer booking data into a data structure. The data structure will hold the registration of the vehicle as an ID the time the customer parked their care, the time they removed their car from the parking lot, the location of the car park they have used, and the total cost of the fees for that booking. The data will be stored n a CSV file to be sent to the owner of the parking lot.

```
CustomerIdentifier;TimeIn;TimeOut;Location;Paid
WXF837;12.32;14.30;“46.543548""-123.076523";$10.10
1F4SC3;07.12;16.02;“46.726354""-123.927263";$50.50
ADI762;09.25;13.26; “46.543548" "-123.076523";$40.40
16NF3K;10.45;11.41; "47.644548""-122.326897;8.90
```

Identify the type of data structure used and justify your answer. 3 marks

Question 10 (4 marks)

Mary, Sarah and David will be involved in writing the code for the app. Each programmer has a different approach to writing the code. One programmer, David, argues that the naming conventions will slow down the development. Sarah, believes that naming conventions are as important as the code.

a. Which programmer – David or Sarah – has the more acceptable approach and why? 2 marks

_____

_____

_____

_____

b. Assume that internal documentation is to be used in the app.

Describe two characteristics of internal documentation. 2 marks

1. _____

_____

2. _____

Question 11 (6 marks)

One of the features of the customer app is to locate and guide the customer to the closest parking lot at Latitude 46.543548 and Longitude -123.076523. Below is an algorithm that David has written to solve that problem.

```
BEGIN
    Read current_lat
    Read current_Lot
    Cust_Location ← [current_lat, current_lon]

   FOR EACH P_Lot
      IF (Location[lat,lot] =< Cust_Location[current_lat + 0.22999, current_lon - 0.22999]) OR
                          Location[lat,lot] >= Cust_Location[current_lat - 0.22999, current_lon - 0.22999] THEN

         Display Location[Lat, Lot]
         Function_Map()

      END IF
   NEXT
END
```

a) Identify three sets of data for the customer location to test the algorithm into the trace table below.

(3 Marks)

Current_Lat	Current_Lon	Output
46.543548	-123.076523	Display Location on screen Call up the Map Function

b) Identify the error in the algorithm and write the correction,

(2 Marks)

c) Identify the type of search algorithm used in this example and justify your answer.

(1 Marks)

Question 12 (4 marks)

Secure Parking has agreed to be part of the trial of the first prototype. They have suggested that as a customer with the app is driving within 2 kms of a Secure Parking location, they get a notification on their phone.

a) Identify an ethical or legal issue with the Secure Parking suggestion. Justify your answer.

(2 marks)

b) How could ParkEasy provide this feature without creating a legal issue?

(2 marks)

Question 13 (4 marks)

After a prototype has been developed, John, the Project Manager approaches Mark to manage the Evaluation of the Customer app.

a) Suggest one strategy Mark could use to evaluate the effectiveness of the Customer App. Justify your answer.

(2 mark)

b) Identify one strategy Mark could use to investigate the efficiency of the data transfer to the parking lot companies.

(2 marks)

Question 15 (4 marks)

ParkEasy needs to ensure the integrity of the data that it uses.

a. Identify two relevant characteristics of data that has integrity. 2 marks

Characteristic 1

Characteristic 2

b. Select **one** of the characteristics identified in **part a.** Explain the impact on the SmartParking Management System if the integrity of data with that characteristic is not maintained. 2 marks

END OF QUESTION AND ANSWER BOOK

Insert for Section C – Case study

Please remove from the booklet during reading time.

CASE STUDY

John, a recent graduate with a degree in computer science, noticed a common problem in Melbourne CBD finding parking spaces was a time-consuming and frustrating task. Drivers often circled city blocks looking for parking, leading to traffic congestion and wasted fuel. John decided to leverage his skills to create a solution and founded a startup called ParkEasy Solutions.

ParkEasy Solutions aims to develop a SmartParking Management System that simplifies the process of finding and managing parking spaces in urban areas. The system will provide real-time information about available parking spots and allow users to reserve and pay for parking through a mobile app.

The system will include:

- Real-time parking spot availability updates.
- Mobile app for users to find, reserve, and pay for parking.
- Integration with various private parking lot parking systems and Melbourne city infrastructure.
- Secure online payment processing.
- Administration dashboard for parking facility operators.
- User-friendly interface and intuitive design.
- Reliable and scalable architecture.

Project Team:

Project Manager: John
Software Developers: Mary, David, and Sarah
UX/UI Designer: Emily
Quality Assurance Specialist: Mark

Data Flow Diagram of the SmartParking Management System