

Digital Learning and Teaching  
Victoria

# DLTV Resource Kit

For use with the VCE Applied Computing 2020–2024 Study Design

## Applied Computing: Software Development

Units 3 and 4 Trial Examination 1 for 2020

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**Note:**

The questions in this exam are based on *the VCE Applied Computing: Data Analytics Adjusted Study Design for 2020 only*.

While this is a trial examination, teachers are still encouraged to make some modifications to it before use.

STUDENT NAME \_\_\_\_\_

# Applied Computing: Software Development

## Trial Written Examination 1: 2020

Reading time: 15 minutes

Writing time: 120 minutes

### 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	30
C	9	9	50
			Total 100

#### Allowed resources

- 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 21 pages
- Answer sheet for multiple choice questions
- Section C: Case study

#### Instructions

- Write your **student name** in the space provided above on this page.
- Write your **name** in the space provided on your answer sheet for multiple-choice questions
- All written responses must be English.

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

## Section A: Multiple choice

### 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.

No marks will be given if more than one answer is completed for any question.

*Choose the best response from the choices given*

#### Question 1

According to the Australian Privacy Principles in the *Privacy Act 1988*, which of the following is **not** something an organisation would be required to do?

- A. protect data from misuse
- B. be open and transparent about their policies
- C. disclose a person's data without their consent
- D. correct inaccurate data if a user requests it be corrected

#### Question 2

Two types of risks to web applications are cross-site scripting (XSS) and SQL injection attacks. What do these two types of attack have in common?

- A. they allow the user to view the source code of the page
- B. they involve a vulnerability in the use of drop-down boxes
- C. they provide a link that says one thing, but leads you to a different website
- D. they exploit a vulnerability in the web application by injecting extra code in the user input

#### Question 3

Accuracy, authenticity and reasonableness are characteristics that contribute to what quality of data?

- A. integrity
- B. efficiency
- C. confidence
- D. effectiveness

#### Question 4

Peta receives a notification on her iPhone that a new software update is available. When is the best time for Peta to allow this update to take place?

- A. any time would be fine
- B. she should do this without delay to prevent viruses
- C. when she is not using her iPhone for any other purpose
- D. when her iPhone is connected to an unmetered Internet connection and charging

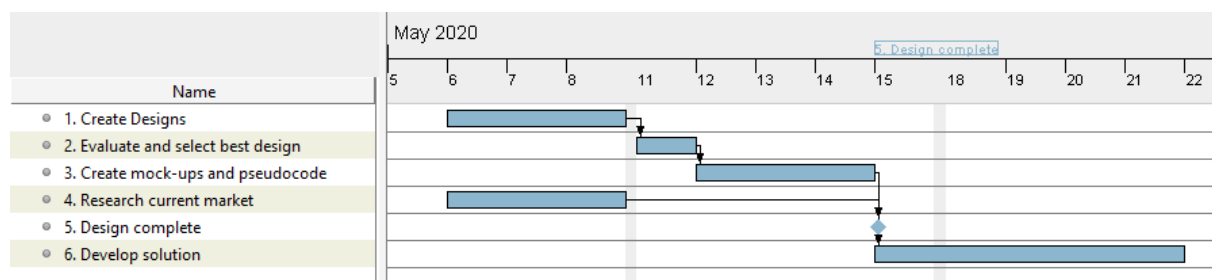
#### Question 5

Surveys and focus groups take place during which phase of the problem-solving methodology?

- A. development
- B. evaluation
- C. analysis
- D. design

*Use the following segment of a Gantt chart and information to answer Questions 6 to 8.*

The following is an excerpt from a larger project plan for a typical software project. The project begins on 6 May 2020 and has two resources available. Staff do not work on weekends, as shown.



#### Question 6

The diamond symbol in the Gantt chart represents:

- A. a resource.
- B. a milestone.
- C. a dependency.
- D. the critical path.

#### Question 7

Task 6 is directly dependent on the completion of:

- A. task 4.
- B. tasks 3 and 4.
- C. tasks 1, 2 and 3.
- D. all preceding tasks.

**Question 8**

If task 4 took eight working days to complete instead of three, what impact would this have on the start of development?

- A. development would start one day later
- B. there would be no effect on the project
- C. development would start three days later
- D. development would start one day earlier

**Question 9**

Lee is creating an application that will be used mostly by elderly people. When selecting a preferred design for a user interface, which aspects of effectiveness would be most relevant?

- A. timeliness and relevance
- B. accessibility and accuracy
- C. completeness and accuracy
- D. accessibility and readability

**Question 10**

What is the difference between a function and a procedure, in terms of programming?

- A. A function returns a value but a procedure does not.
- B. A procedure can be significantly longer than a function.
- C. A procedure can take parameters, but a function cannot.
- D. A function can take parameters, but a procedure cannot.

**Question 11**

The following array of integers is to be sorted into ascending order using a selection sort.

23	4	11	99	98	2
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How many swaps will be required to sort the array?

- A. 1
- B. 2
- C. 3
- D. 4

**Question 12**

In a use case diagram (UCD) the external items that provide assistance to the system are known as:

- A. use cases.
- B. processes.
- C. primary actors.
- D. secondary actors.

### Question 13

A system objective should be:

- A. long-term and abstract.
- B. cost effective and timely.
- C. measurable and narrow in scope.
- D. complete and comprehensive in itself.

### Question 14

Haqim, a project manager, has just finished the design of a new software system. The software requirements specification (SRS), and hence the scope of the project, has been completed and the customer has signed off on the design so that development can proceed. However, during development, difficulties arose, which have put at risk the success of the project and in order to ensure success the scope must be reduced.

Which of the following areas does the project manager have **least** control over in achieving this outcome?

- A. budget
- B. requirements
- C. legal constraints and regulatory concerns
- D. capability, qualifications and experience of staff

### Question 15

Which of the following would be included in a software requirements specification (SRS)?

- A. budget
- B. constraints
- C. evaluation criteria
- D. available resources

### Question 16

Which of the following Acts applies exclusively to the Victorian Government and related public authorities?

- A. *Copyright Act (1968)*
- B. *Health Records Act (2001)*
- C. *Privacy Amendment Act (2012)*
- D. *Charter of Human Rights and Responsibilities Act (2006)*

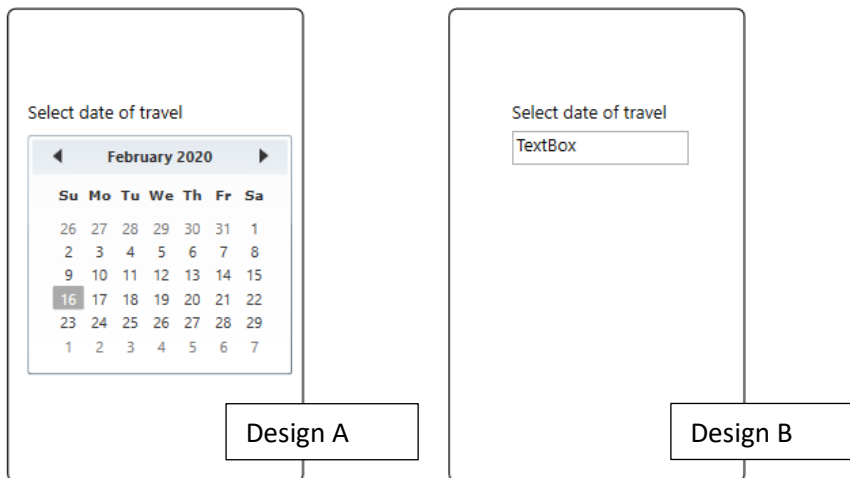
### Question 17

If a user enters a character, such as the letter 'G' in a text box that is expecting a number between 2 and 200, what type of validation check would detect this error?

- A. type
- B. range
- C. existence
- D. reasonableness

### Question 18

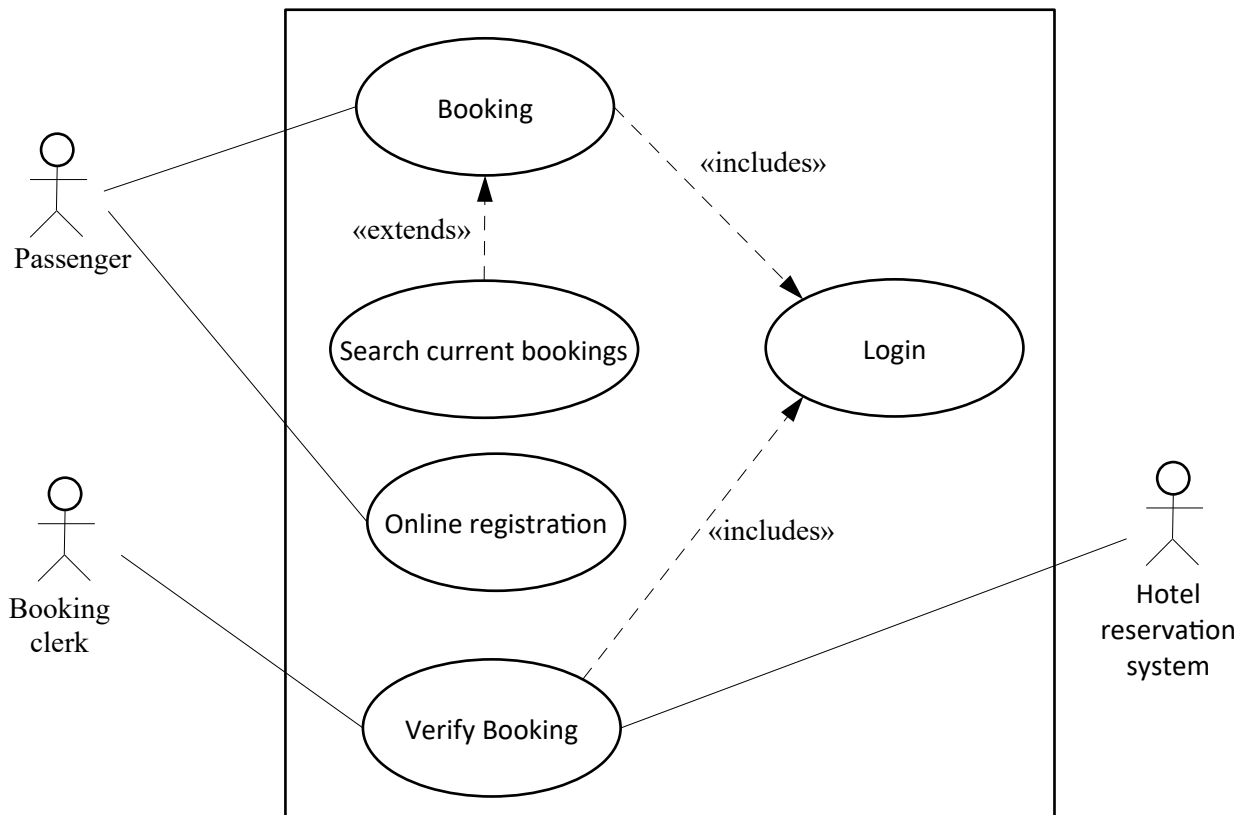
Consider the following designs that require the user to select from a number of options. Which effectiveness criteria would be most suitable for choosing the best design?



- A. robustness and accuracy
- B. accessibility and usability
- C. accessibility and robustness
- D. accessibility and readability

Use the following use case diagram to answer Questions 19 and 20

**Question 19**



A true statement about the use case diagram would be:

- A. the booking clerk is a secondary actor.
- B. logging in is compulsory for the passenger.
- C. logging in is optional for the booking clerk.
- D. logging in is optional for the hotel reservation system.

**Question 20**

A false statement about the use case diagram would be:

- A. passengers are required to search current bookings to proceed with a booking.
- B. booking clerks and hotel reservation systems can verify bookings.
- C. hotel reservation systems cannot search current bookings.
- D. only passengers can do online registration.

**END OF SECTION A**



## Section B: Short-answer questions

### Instructions for Section B

Answer all questions in the spaces provided.

#### Question 1 (4 marks)

Beau Forest Beauty Co. is an Australian company that provides beauty products via online sales. Beau Forest boasts some high-profile clients who would not want their home addresses to become public. Consequently, Beau Forest takes data security very seriously. To gain access to the orders system, employees are required to logon using a username and password. In addition, all data stored on the company hard disks are encrypted.

- a. How do the following measures help to protect the data? 2 marks

User authentication

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Encryption

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- b. Identify and describe an improvement to the user authentication process that could be implemented to further enhance Beau Forest's data security. 2 marks

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**Question 2** (6 marks)

The following XML file contains errors. Circle and number up to three errors and explain why each is an error.

```
<xml>
<schedule>
  <days>
    <day name="Monday" sequence="1">
      <appointment time="11:00AM" location="office">
        <invitees>
          <invitee name="John Smith" extension="355"/>
          <invitee name="Michaela Jones" extension="209"/>
          <invitee name="Olive Garden" extension="213">
        </invitees>
      </appointment>
    </day>
    <day name="Tuesday" sequence="2">
      <appointment time="2:00PM" location="cafe">
        <invitees>
          <invitee name="Sebastian Fritz" extension="103"/>
        </invitees>
      </day>
    </days>
  </schedule>
```

Error 1

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Error 2

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Error 3

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**Question 3** (8 marks)

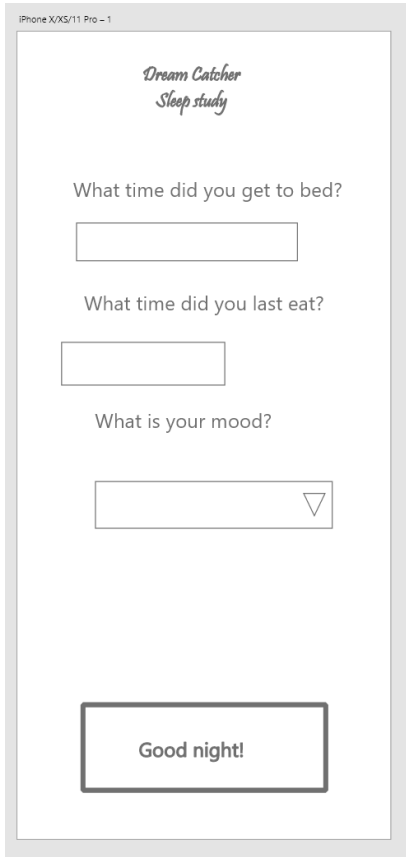
Two designs are shown on page 12 for a system to capture sleep data for a study investigating why some participants sleep poorly. The data is input via a mobile phone app for convenience and participants enter required data last thing at night and first thing in the morning.

There was a time constraint on the development team, so the screens were designed by different developers, Adam (who did the night-time interface) and Beatrice (who did the morning interface). Due to this time constraint, Adam and Beatrice had no time to collaborate.

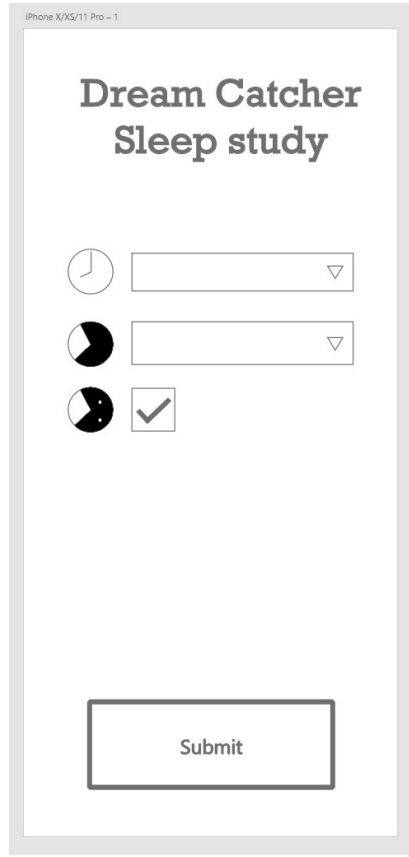
The study will shortly enter the next phase and an opportunity has arisen to take the best aspects of each screen and combine them into one.

Adam used textboxes for the first two inputs and a dropdown for the third that contained 'moods'—happy, sad, angry and despondent.

Beatrice used 'time pickers' for the first two inputs and a check box for the third to capture 'time on rising', 'time asleep' and if the subject woke up during the night.



Adam



Beatrice

a. Select **one** good design feature for each design and justify each selection. 4 marks

Adam

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Beatrice

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- b.** Choose **one** feature of each design and comment on why it contributes to the effectiveness of the design. 2 marks

Adam

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Beatrice

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- c.** Choose **one** feature of each design and comment on why it does not contribute to the effectiveness of the design. 2 marks

Adam

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Beatrice

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**Question 4** (8 marks)

The following pseudocode is designed to remove all integers from an array whose square is greater than 225 and shuffle the remaining integers up. The array begins at index 0.

```
1   BEGIN
2   MyNumbers <- [12, 13, 15, 3, 20, 1]
3   FOR I <- 0 TO ARRAY LENGTH - 1
4     IF MyNumbers[I] * MyNumbers[I] > 225 THEN
5       FOR J <- I TO ARRAY LENGTH - 1
6         MyNumbers[J] <- MyNumbers[J + 1]
7       END FOR
8     END IF
9   END FOR
10  END
```

The pseudocode is converted into a programming language and run; however, it crashes.

a. At which line will a run time error occur? 1 mark

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b. Rewrite the line of code that caused the crash so that the program will work as expected. 2 marks

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c. Complete the table below to show the state of the array after the corrected program has been run. 2 marks

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- d. A new requirement is added, namely, that the array elements that have had their number 'shuffled' out are to be set to zero. Modify and rewrite the pseudocode to meet this requirement in the most elegant way possible. 4 marks

BEGIN

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END

**Question 5** (3 marks)

In the following table, indicate if each statement is a functional requirement (FR) or non-functional requirement (NFR).

The system shall allow the user to enter up to four choices for their preferred holiday destination.	
The system shall calculate the trajectory of a missile to within 0.2° of accuracy.	
The system shall be fault tolerant providing an uptime of not less than 99.9%.	

**END OF SECTION B**

## Section C: Case study

### Instructions for Section C

You will be provided with the case study for Section C in a separate document.  
Use the case study to answer the questions in this section. Answers must apply to the case study.  
Answer **all** questions in the spaces provided.

#### Question 1 (6 marks)

Employees are expected to follow all company procedures including the sign-out process, yet at least half the staff are not.

- a. What methods could be used to gather information to determine the reasons for this office trend? 2 marks

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- b. What ethical dilemma could arise by gathering this information from employees? 2 mark

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- c. How could the information gathered to explain the office trend assist in the development process? 2 marks

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**Question 2** (4 marks)

Based on the case study, identify **two** functional requirements (FR) and **two** non-functional requirements (NFR).

FR 1

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FR 2

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NFR 1

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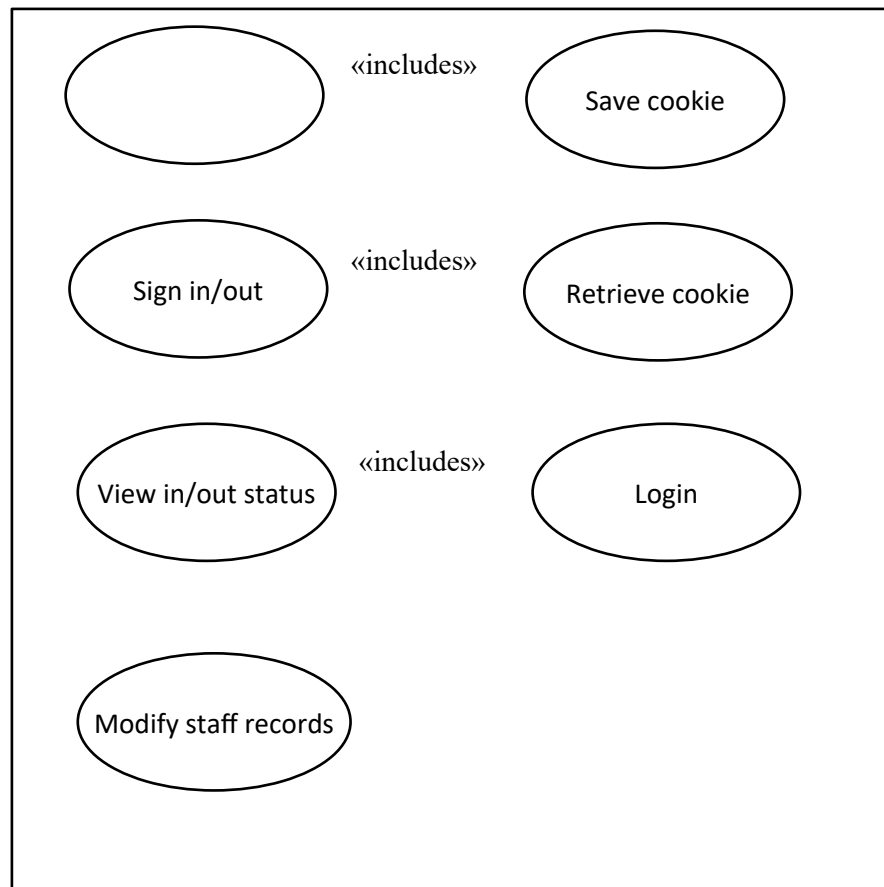
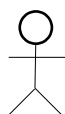
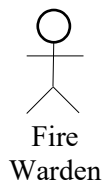
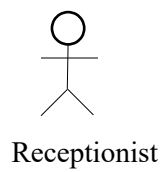
NFR 2

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**Question 3** (6 marks)

Complete the use following use case diagram to represent the proposed system, using the case study as your guide.



**Question 4** (6 marks)

Employees connect to the system via their mobile phones. Data is transmitted in plain text across the internet.

- a. What security measure could be put in place to protect against malicious attacks? 1 mark

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- b. How could this security measure assist in making the system more secure? 2 marks

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- c. Discuss the implications if data transmission is not protected? 3 marks

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**Question 5** (4 marks)

State and describe **two** evaluation criteria that could be used to measure the effectiveness of the system.

Criterion 1

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Criterion 2

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**Question 6** (4 marks)

After the system is deployed for trial, Quinn has an idea: 'When staff leave the building, their GPS location will show them offsite'. He presents this idea to Jake suggesting that the next version of the software might remove the sign-in/sign-out button altogether since the system will be able to detect when staff are offsite by reporting back their GPS position to the company.

With reference to legislation, explain how this potentially breaches the rights of the employees.

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**Question 7** (6 marks)

In terms of comments and coding standards, Marlene and Quinn have different opinions. Marlene believes in 'self-documenting' code where the naming of variables and functions tells the story. She also adds references to the external documentation so that the original source can be found easily rather than long comments within the internal documentation, restating the source.

Quinn, by contrast, uses long variable names and Hungarian notation e.g. `boolDatabaseChanged`, and instead of referencing the external documentation, adds commentary in his internal documentation about the problem being solved, as well as explaining difficult code.

- a. Identify **two** examples of internal documentation. 2 marks

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- b. Identify **two** examples of external documentation. 2 marks

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c. Define the term 'coding standard' and state why is it important.

2 marks

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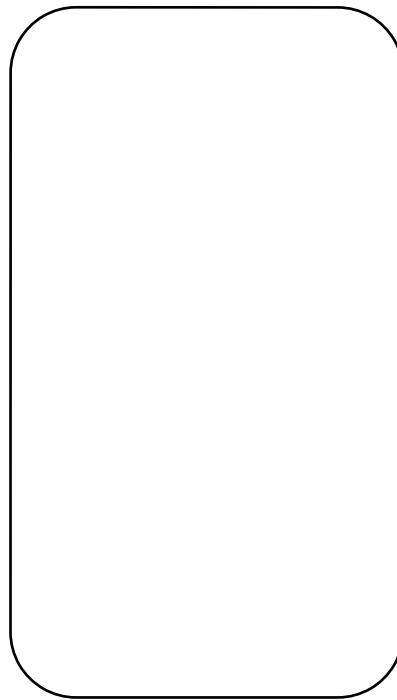
**Question 8** (6 marks)

In the space provided, draw a suitable user interface for the registration screen and the sign-in/sign-out screen from the elements presented below. Keep in mind the requirements of effective design and annotate your designs with the particular criterion it addresses.

a. Registration screen

3 marks

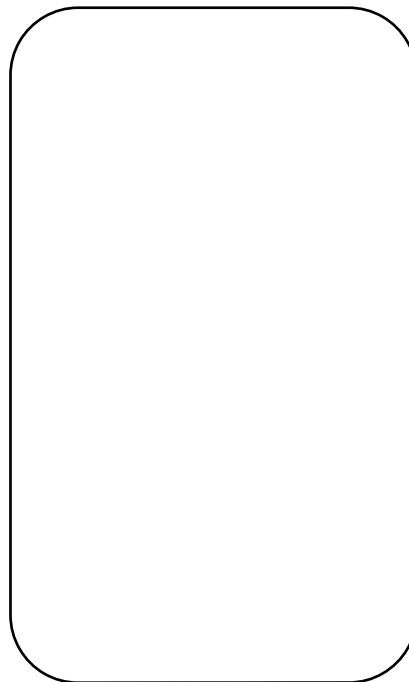
- Title block
- User's initials
- Mobile number
- Organisation code
- Submit button



b. Sign-in/sign-out screen

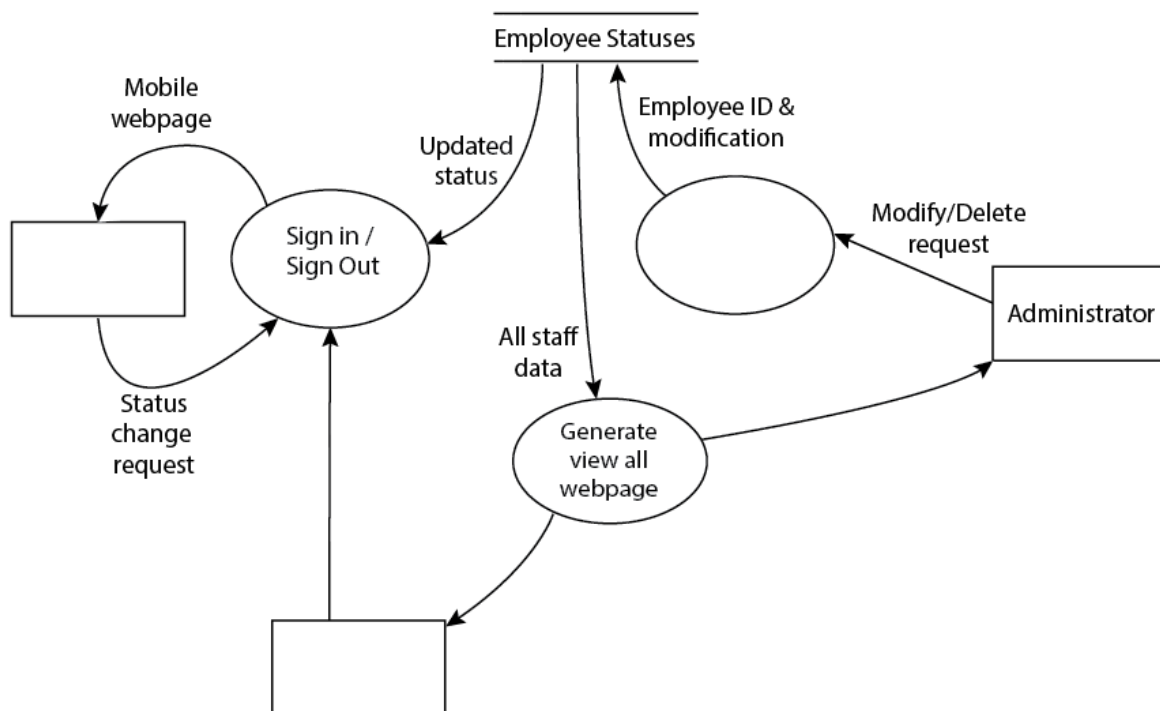
3 marks

Title block  
Sign in/Sign out button



**Question 9** (8 marks)

Jake began the data flow diagram at the beginning of the project; however, he was distracted before finishing it. Drawing on the case study, complete the data flow diagram below to represent the design.



**END OF QUESTION AND ANSWER BOOK**

### Insert for Section C: Case study (Examination 1)

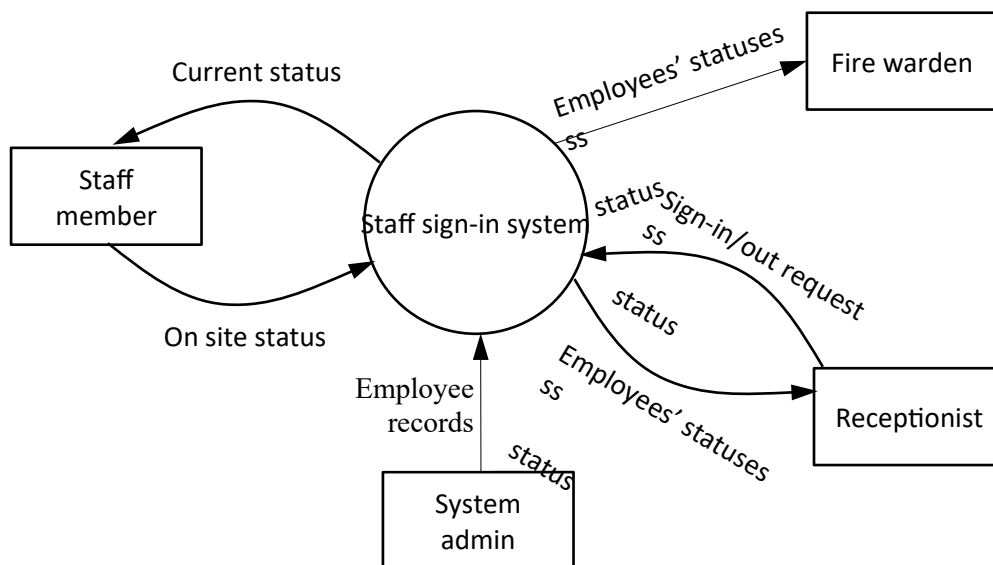
Delphinium Devices is a company that produces business software to aid organisations in their day-to-day processes. A new customer, Herring Investments, has approached Delphinium to assist it solve a problem through a new software product. Herring employs around 100 staff and is located in a Melbourne office building spanning four floors.

The issue for Herring is that staff are often (legitimately) offsite with customers or meeting with colleagues in a more relaxed environment. The procedure for Herring Investments is for an employee to sign out in a logbook, which is held at reception, and then sign in again when they return. However, because the office spans four floors of its office building, many employees find it inconvenient to stop off at reception on the way out and then again upon their return, and so the logbook is often inaccurate regarding staff movements. Employees can call reception and ask the receptionist to sign them out or in; however, this is causing extra work for the receptionist who is sometimes very busy with clients.

Recently, a suspected gas leak prompted an emergency evacuation of the premises. Fortunately, the company had a robust emergency plan and evacuated the building safely and quickly. Staff gathered in the designated area as requested; however, when the safety warden went around to check that everyone had evacuated safely, many employees were missing. The receptionist had collected the sign-in register as part of her emergency duties, but when checked, it was not accurate, and no one could be sure as to whether the employees were offsite or still in the building.

Herring has a rough idea for a mobile application to solve the problem but has left all the details to Delphinium to determine.

Delphinium considered the problem and put together a small team to create a solution for Herring Investments. Jake Swift is appointed to head the team, with Marlene Simpkins and Quinn Farrow as the developers. They put together a context diagram as a high-level view of the system.



The system users are identified as the staff members themselves and the fire warden. The receptionist will continue to sign staff in and out manually if needed, and the administrator is available to add, delete and modify the staffing records as new staff come and go.

Two approaches are being considered.

In the first approach, the user will self-register through their phone on a mobile website, providing their initials, mobile number and a secret organisation code, which will be provided to give them access. Using a cookie stored on their phone, they can then sign in and sign out by a single click. The registration will be a once-only procedure after which the user can sign on and sign out by merely opening the website as the cookie will identify them to the system.

In the second approach, the administrator will receive a request from the employee and create a database record. The user will then be provided with a login username and password to access the system before signing in and signing out in essentially the same way.

The second approach was determined to be far less convenient than the first approach, as the employee has to login every time to then sign in or sign out, so the first method has been chosen for implementation. The database on the web host will keep track of the last state of the employee (onsite or offsite).

The solution will be built on a web server, which will provide an interface to the employees through their mobile devices, and separate interfaces for the receptionist, fire warden and administrator.

The receptionist and administrator will access the website through a personal computer, so will login entering a username and password. The fire warden will have a tablet with mobile access so that he can check the status of all employees in the evacuation area. The receptionist, administrator, warden and each employee accesses the website through a variety of devices, so it is important that the website renders properly on the mobile and fixed devices, and is responsive (i.e. adjusts for the different sizes of screen).

After a long white board design session, Jake, Marlene and Quinn settle on how the software will work.

When an employee registers, the solution will first check to see if the organisation code supplied matches that in the system. If it does, it creates a record in the database with the details supplied—initials and mobile number. Once registered, the user's device uses the cookie to remember them so that it is easier next time to sign in and sign out. The next time the employee accesses the site, the cookie identifies them to the system and they are then presented with a sign in screen. If they are signed in, it displays a 'Sign out' button, but if the database indicates that they are signed out, it displays a 'Sign in' button.

The receptionist can access a different webpage, which requires a login and has limited functionality. It provides a page with the status of all registered employees and the ability to change the state of anyone.

The fire warden can only access a page to show the list of the employees' statuses, while the administrator can access, alter and delete records. He cannot add them though, as this is the function of each employee.