

---

# 2023 HSC

## Information Processes and Technology

### Marking Guidelines

#### Section I

##### Multiple-choice Answer Key

Question	Answer
1	D
2	C
3	D
4	B
5	C
6	D
7	B
8	C
9	C
10	B
11	B
12	D
13	A
14	B
15	A
16	A
17	C
18	A
19	B
20	A

## Section II

### Question 21 (a)

Criteria	Marks
• Describes the role of a network administrator	3
• Outlines the role of a network administrator	2
• Provides some relevant information	1

**Sample answer:**

The role of a network administrator is to manage communication systems. It can include adding new users to the network by creating their usernames and passwords. Another role of a network administrator includes assigning users to printers. Printers are often shared on a network. However, users must be assigned access to certain printers on a network.

**Answers could include:**

- Giving users file access rights
- Installation of software on individual nodes on the network
- Ensuring users are familiar with logon and logoff procedures
- Installing network-based applications on servers for distribution on individual nodes.

### Question 21 (b)

Criteria	Marks
• Compares the use of thin clients and fat clients on client server networks	3
• Outlines features of thin clients and fat clients	2
• Provides some relevant information	1

**Sample answer:**

A thin client is a device on a network that has no processing or storage capability. There is minimal software stored on a thin client. The thin client cannot operate unless the server(s) it is connected to are online/operational. A fat client is a device on a network that has processing and storage capability and can also be connected to a web, file and print server. The fat client has its own software installed locally on its permanent storage device (usually a hard disk drive). Fat clients can continue to operate if any server is not operational on the network.

### Question 21 (c)

Criteria	Marks
• Describes handshaking in the scenario	3
• Outlines handshaking and may make reference to the scenario	2
• Provides some relevant information	1

**Sample answer:**

Handshaking is the process whereby, during the initial phase of communication between two devices, the protocols are established and agreed upon to allow the transmission to be successful. In this scenario, the handshaking takes place in two places, between step 2 and 3 when the user chooses the appropriate wireless network and between steps 3 and 4 when the user successfully connects to the wireless network.

### Question 22 (a) (i)

Criteria	Marks
• Describes the scheduling and economic risks that should be considered	3
• Outlines the scheduling and/or economic risks that should be considered	2
• Provides some relevant information	1

**Sample answer:**

**Scheduling** – In one month, the ISP will need to create multiple components of this system such as the customer log in and may run out of time to adequately test. The ISP may not have enough time to design, develop and test the system before it is released.

**Economic** – There is a risk of the project exceeding the allocated budget due to increased needs of the project and unforeseen IT costs. The rapid development of the different components of the system may require outsourcing and contracting of expert skills.

### Question 22 (a) (ii)

Criteria	Marks
• Explains how a requirements report could help the internet service provider develop the system	4
• Describes how a requirements report could help the internet service provider develop the system	3
• Outlines components of a requirements report	2
• Provides some relevant information	1

**Sample answer:**

A requirements report contains the goals, objectives and needs of the new system being implemented by the internet service provider. This information could help the internet service provider understand the purpose and context of the system, how it should be designed to meet their needs and those of their customer as well as the subprojects which make up the whole system and the timeframe to complete them. The requirements report will contain the purpose of the messaging system, daily customer usage data and information required. The subprojects will enable the internet service provider to manage the timeframe for developing and implementing the new system. This information helps them understand what the system needs to do and how it should be designed to accomplish those tasks.

All this information can be used to ensure that the system is developed to meet the needs of the internet service providers needs within a nominated timeframe and help identify any potential issues or problems that may arise during development.

### Question 22 (b)

Criteria	Marks
• Compares traditional and iterative system development approaches	3
• Outlines traditional or iterative system development approaches	2
• Provides some relevant information	1

**Sample answer:**

A traditional system development approach, also known as the ‘waterfall’ method, is linear and sequential, progressing through distinct phases, such as understanding the problem, planning, designing, implementing and testing, evaluating and maintaining. Each phase must be completed before the next one can begin, and there is little or no overlap between phases.

An iterative system development approach, on the other hand, is more flexible and adaptive whereby development progresses through multiple cycles (iterations) of planning, design, implementation and evaluation. The goal is to deliver a working product or system as soon as possible, and to continue refining and improving it through successive iterations.

### Question 23 (a)

Criteria	Marks
<ul style="list-style-type: none"> <li>Identifies field sizes and data types for SenderPhone and MessageRead with justifications for the data types</li> </ul>	3
<ul style="list-style-type: none"> <li>Provides some of the information required</li> </ul>	2
<ul style="list-style-type: none"> <li>Provides some relevant information</li> </ul>	1

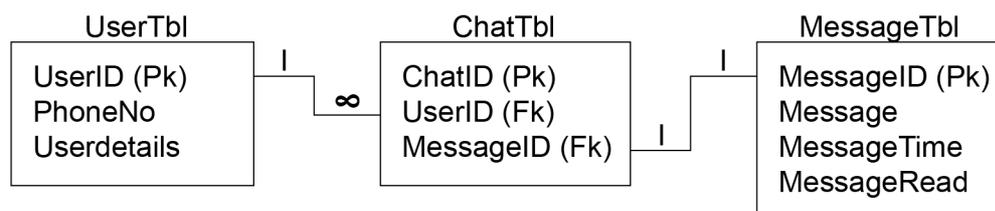
**Sample answer:**

Field	Field size	Data Type	Justification for choosing the data type
SenderPhone	12	Text	The data stored includes a leading '0' and spaces
MessageRead	1	Boolean	The tick would represent a true or false for the message having been read or not

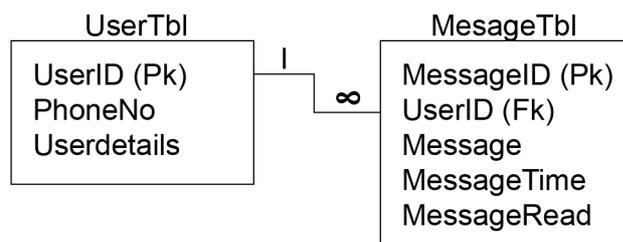
### Question 23 (b)

Criteria	Marks
<ul style="list-style-type: none"> <li>Draws a schematic diagram that shows a sound understanding of how the database can be normalised</li> <li>Includes labels, primary keys, foreign keys and relationships</li> </ul>	3
<ul style="list-style-type: none"> <li>Draws a schematic diagram that shows some understanding of the organisation of the data</li> <li>Includes some relevant fields</li> </ul>	2
<ul style="list-style-type: none"> <li>Provides some relevant information</li> </ul>	1

**Sample answer:**



Or a two-table alternative



**Question 23 (c)**

Criteria	Marks
• Describes ethical and technical issues resulting from the enhancement of the messaging system	4
• Outlines ethical and technical issues resulting from the enhancement of the messaging system	3
• Outlines an issue relating to the messaging system	2
• Provides some relevant information	1

**Sample answer:**

The enhancements of the messaging system will create an ethical issue around privacy, whilst also creating a technical issue of data transmission and storage.

The ethical issue of privacy arises as a result of the ability to send and receive images of people, locations and property where permission has not been sought. This could result in an image of a person being shared and published without their permission.

The technical issue of storage and transmission also results from the enhancement as the ability to transmit images and attached files will affect the storage requirements of the receiving device. It increases the amount of data required to transmit a message far beyond the small amount required for a text message.

**Answers could include:**

Viruses, copyright, ownership

**Question 24 (a)**

Criteria	Marks
• Explains why CRC will find the error and check sum will not	3
• Outlines CRC or check sum to detect errors	2
• Identifies a feature of error detection	1

**Sample answer:**

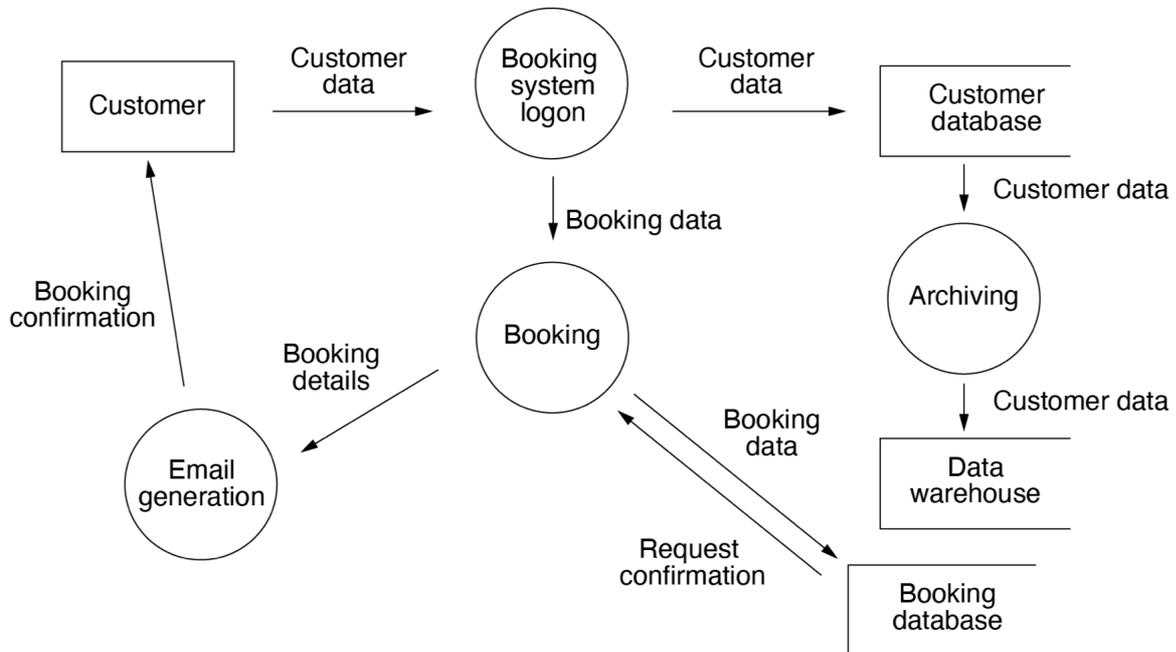
CRC will find an error on receipt of the data packets because the combined value of the data packets will differ and will change the checking value when calculating the CRC remainder. This means that an error in transmission will be detected. Check sum generates a sum value of the individual packets to use as the checking value. As the packets are the same values, only in reverse order, the sum value of the packets will be the same, hence no error will be detected.

The check sums will be the same for the sent and received data packets as the values are added and will therefore not find an error. A CRC check will identify the error because the order of data bits is important. While the check sums for the data packets are the same, the CRC values will differ.

### Question 24 (b) (i)

Criteria	Marks
• Draws a correct data flow diagram with all symbols and logic	3
• Draws a mostly correct data flow diagram	2
• Shows some understanding of data flow diagrams	1

**Sample answer:**



### Question 24 (b) (ii)

Criteria	Marks
<ul style="list-style-type: none"> <li>Explains how the data stored in the data warehouse can be used by both the technology company and their customers</li> </ul>	5
<ul style="list-style-type: none"> <li>Describes how the data stored in the data warehouse can be used by both the technology company and their customers</li> </ul>	4
<ul style="list-style-type: none"> <li>Outlines how the data stored in the data warehouse can be used by the technology company and/or their customers</li> </ul>	3
<ul style="list-style-type: none"> <li>Outlines features of data warehousing</li> </ul>	2
<ul style="list-style-type: none"> <li>Provides some relevant information</li> </ul>	1

**Sample answer:**

The technology company can mine the data for trends and make more informed business decisions by accessing accurate and timely information on customers, products, sales and operations.

The technology company can also analyse the data stored, including how often a customer uses their services and what devices require servicing, to determine the reliability of their hardware and the efficiency of their services. By analysing customer data, companies can personalise their offerings, improve customer service and build stronger relationships with customers.

The technology company can use this data to improve the reliability of their hardware devices, which will improve the company's reputation with customers. This benefits both the company, who may get increased sales, and customers, who can feel confident buying the company's hardware knowing it will be more reliable.

Customers can review their previous purchases and service history. They may use the historical data in their account to inform future purchases. The technology company can also make personalised product recommendations based on the customer's past history.

The data warehouse provides customers with improved data security and up-to-date access to historical information. The data warehouses can provide valuable insights into customer preferences and behaviour. Customers can benefit from new products that better meet their needs.

## Section III

### Question 25 (a)

Criteria	Marks
<ul style="list-style-type: none"> <li>Describes why secure on-site and off-site storage are important when backing up transaction data, with the use of an example</li> </ul>	3
<ul style="list-style-type: none"> <li>Outlines the use of secure on-site and off-site storage for backing up data</li> </ul>	2
<ul style="list-style-type: none"> <li>Provides some relevant information</li> </ul>	1

**Sample answer:**

Secure on-site and off-site storage are important when backing up transaction data. Secure on-site storage allows data to be stored locally (ie within the premises of the information system). For example, a back-up hard drive can be stored in a fireproof safe within the local premises on which a disaster such as fire or flood will have minimal impact. Secure off-site storage is a type of data backup where the data is stored in another location from the local premises of the information system. An example of secure off-site storage includes a third party company providing storage of backup data in an overseas location and allowing the backup data to be accessed over an internet-based portal.

### Question 25 (b) (i)

Criteria	Marks
<ul style="list-style-type: none"> <li>Describes the information technology required for the transaction processing system</li> </ul>	3
<ul style="list-style-type: none"> <li>Outlines the information technology required for the transaction processing system</li> </ul>	2
<ul style="list-style-type: none"> <li>Provides some relevant information</li> </ul>	1

**Sample answer:**

This transaction processing system would require hardware with large amounts of storage and processing power to connect to all of the different car manufacturer websites and then be able to process large amounts of transactions at the same time. It would also require a high-speed internet connection and large storage and memory capabilities for the backup of transaction data. Software requirements would include an online database for storing car part and accessory data and also for transaction data.

### Question 25 (b) (ii)

Criteria	Marks
<ul style="list-style-type: none"> <li>Explains the importance of data quality and data integrity for the transaction processing system</li> </ul>	4
<ul style="list-style-type: none"> <li>Describes the importance of data quality and data integrity for the transaction processing system</li> </ul>	3
<ul style="list-style-type: none"> <li>Outlines the importance of data quality or data integrity in a transaction processing system</li> </ul>	2
<ul style="list-style-type: none"> <li>Provides some relevant information</li> </ul>	1

**Sample answer:**

Data quality refers to how accurate, reliable, and relevant the data is for its intended purpose including the data being free from error and duplication. In this scenario, customers and the car manufacturers rely on the data being accurate to ensure that the parts being ordered are available for purchase and can be delivered to the customer promptly. If the data is not useful it will not have quality and therefore the website will not fulfil its intended function for its customers.

Data integrity refers to the overall completeness and consistency of the data. This again is important as the car manufacturers must ensure that the information about each part is complete in order for customers to be able to make informed decisions about which part they wish to purchase.

### Question 25 (c)

Criteria	Marks
<ul style="list-style-type: none"> <li>Describes an example where an online analytical processing (OLAP) and online transaction processing (OLTP) would be used together</li> </ul>	4
<ul style="list-style-type: none"> <li>Describes an example of online analytical processing (OLAP) or online transaction processing (OLTP)</li> </ul>	3
<ul style="list-style-type: none"> <li>Outlines online analytical processing (OLAP) and/or online transaction processing (OLTP)</li> </ul>	2
<ul style="list-style-type: none"> <li>Provides some relevant information</li> </ul>	1

**Sample answer:**

An example of where online analytical processing (OLAP) and online transaction processing (OLTP) systems would be combined is in an e-commerce platform. The OLTP system would handle the real-time transactions, such as processing orders and updating inventory levels, while the OLAP system would be used for data analysis and reporting, such as analysing sales data to identify trends and making business decisions. The two systems would be integrated, with the OLAP system utilising data from the OLTP system to provide real-time insights and analytics.

## Question 25 (d)

Criteria	Marks
<ul style="list-style-type: none"> <li>• Demonstrates a comprehensive understanding of how data security can be managed within the system</li> <li>• Includes detailed reference to the identified information processes</li> </ul>	6
<ul style="list-style-type: none"> <li>• Demonstrates a thorough understanding of how data security can be managed within the system</li> <li>• Includes reference to the identified information processes</li> </ul>	5
<ul style="list-style-type: none"> <li>• Demonstrates a sound understanding of how data security can be managed within the system</li> <li>• Includes reference to some of the identified information processes</li> </ul>	3–4
<ul style="list-style-type: none"> <li>• Demonstrates some understanding of how data security can be managed within the system</li> </ul>	2
<ul style="list-style-type: none"> <li>• Provides some relevant information</li> </ul>	1

### **Sample answer:**

The food truck owner must ensure that they collect, store and retrieve data securely to prevent any data breaches.

The data collection process involves the hardware device reading the information from the card using RFID technology. The owner must ensure that the hardware device is secure and that it has encryption measures to protect customer data. This ensures that it is not vulnerable to RFID hacking.

Additionally, the owner must ensure that they do not collect or store any customer data on their personal mobile phone or any other non-secure device that may be vulnerable to hacking. Collecting any personal customer data without permission is also not permitted by law.

Any non-identifiable customer data that is stored (ie transaction data) must be kept secure using either encryption processes or through a secure logon process. Physical storage devices must be kept in a secure location away from any public access.

The data retrieval process involves the owner accessing the transaction history. The owner must ensure that they have strong security in place to prevent any unauthorised access to this sensitive information. Additionally, the owner must ensure that they only access this information when necessary and that they do not share it with any unauthorised third parties.

Data security in the transaction processing system is managed through measures such as secure hardware devices, encrypted transactions, secure bank accounts, and strong password protection.

The owner must ensure that they comply with relevant data protection laws and regulations and take all necessary steps to protect customer data.

**Question 26 (a)**

Criteria	Marks
• Describes why structured decision making does not require a decision support system, with the use of an example	3
• Outlines why structured decision making does not require a decision support system	2
• Provides some relevant information	1

**Sample answer:**

A structured decision-making scenario does not need a DSS because decisions are automated based on the data provided. For example, a library will send overdue notices automatically when books are overdue. There is no human-based decision making required.

**Question 26 (b)**

Criteria	Marks
• Describes the role of the inference engine in an expert system that helps doctors diagnose patients	3
• Outlines the role of the inference engine and/or expert system that helps doctors diagnose patients	2
• Provide some relevant information	1

**Sample answer:**

The role of an inference engine in an expert system is to process the knowledge base and user queries to generate deductions and make informed decisions. An inference engine is the decision-making component of an expert system. It processes the knowledge base, user inputs, and rules to generate logical deductions and provide recommendations based on the expert knowledge data in the system.

In a doctor's surgery, the expert system will reference a large database of medical conditions (the knowledge base) and their symptoms on file. Doctors can query the system with patient information and medical history for the inference engine to make a diagnosis.

### Question 26 (c)

Criteria	Marks
<ul style="list-style-type: none"> <li>• Designs formulae for cells C10, E11 and F11 so they can be copied across multiple cells</li> </ul>	4
<ul style="list-style-type: none"> <li>• Provides TWO substantially correct formulae</li> </ul>	3
<ul style="list-style-type: none"> <li>• Provides ONE substantially correct formula</li> </ul> OR <ul style="list-style-type: none"> <li>• Shows some understanding of the development of formulae involving multiple operators and/or use of a LOOKUP</li> </ul>	2
<ul style="list-style-type: none"> <li>• Recognises a feature of a formula</li> </ul>	1

**Sample answer:**

C10: = VLOOKUP(B10, \$A\$3:\$B\$6, 2)

E11: = C11+D11

F11: = B11\*\$E\$3

### Question 26 (d)

Criteria	Marks
<ul style="list-style-type: none"> <li>• Explains why the use of neural networks in the chatbot's learning affects its ability to converse with humans</li> </ul>	4
<ul style="list-style-type: none"> <li>• Describes why the use of neural networks in the chatbot's learning affects its ability to converse with humans</li> </ul>	3
<ul style="list-style-type: none"> <li>• Outlines why the use of neural networks in the chatbot's learning affects its ability to converse with humans</li> </ul>	2
<ul style="list-style-type: none"> <li>• Provides some relevant information</li> </ul>	1

**Sample answer:**

Neural networks use pattern matching to support decision making. In the chatbot, pattern matching is used in the training phase of the neural network to identify the best answers to a variety of inputs. The effectiveness of the chatbot's learning depends on the quality and diversity of the data its neural network was initially trained on and the feedback it receives. If the training data is not diverse enough, the chatbot may not be able to understand and respond to a wide range of questions. If the feedback is not representative of the questions the chatbot will encounter in the real world, it may not be able to improve its performance and consistency in a meaningful way.

The chatbot's ability to seek feedback on its responses is an important aspect of its learning process, as it allows the neural network to identify and correct errors in its understanding of the information it was initially taught. This improves the performance and consistency of the chatbot's responses over time. The neural network will use the feedback provided to improve pattern matching which will result in an improved quality of chat comment by the chatbot to its user.

## Question 26 (e)

Criteria	Marks
<ul style="list-style-type: none"> <li>• Demonstrates a comprehensive understanding of how the use of a geographical information system in the scenario allows for the analysis of unstructured situations</li> <li>• Includes detailed reference to analysing and displaying</li> </ul>	6
<ul style="list-style-type: none"> <li>• Demonstrates a thorough understanding of how the use of a geographical information system in the scenario allows for the analysis of unstructured situations</li> <li>• Includes reference to analysing and displaying</li> </ul>	5
<ul style="list-style-type: none"> <li>• Demonstrates a sound understanding of how the use of a geographical information system in the scenario allows for the analysis of unstructured situations</li> <li>• Includes reference to analysing and/or displaying</li> </ul>	3–4
<ul style="list-style-type: none"> <li>• Demonstrates some understanding of how the use of a geographical information system in the scenario allows for the analysis of unstructured situations</li> </ul>	2
<ul style="list-style-type: none"> <li>• Provides some relevant information</li> </ul>	1

### **Sample answer:**

The use of a Geographical Information System (GIS) provides a tool for managing and visualising complex data sets in an easy-to-read map. Unstructured decision support systems assist in making decisions in complex and ambiguous situations where there is a lack of well-defined processes or structured data such as this.

Weather and environmental conditions can change rapidly and provide little consistency in the data provided from reading to reading, thus presenting the data in a logical and easy to read overlay to the map data will assist bushwalkers plan their movements.

For example, a GIS can be used to identify areas that are prone to flooding when there is a lot of rain, or higher risk areas for bushfires in times of drought. This gives bushwalkers solid data to assist when planning walks. By integrating real-time data such as weather conditions and booking information, the GIS can determine the status of trails and facilities at any given time. This analysis helps bushwalkers plan their trips and make informed decisions about which trails to choose. Through maps, charts, and interactive interfaces, the GIS can present the analysed information to users in a comprehensible and user friendly manner.

### Question 27 (a)

Criteria	Marks
<ul style="list-style-type: none"> <li>Describes the process of converting analog data into digital data in an AMS, including an example of a device that does the conversion</li> </ul>	3
<ul style="list-style-type: none"> <li>Outlines features of converting analog data to digital data and may make reference to an AMS</li> </ul>	2
<ul style="list-style-type: none"> <li>Provides some relevant information</li> </ul>	1

**Sample answer:**

In an AMS system, a sensor such as a light sensor collects data from the environment and enters it into the system in analog form. This data needs to be converted from an analog format into a digital format through the use of an analog to digital converter (ADC) device. This device reads in the continuous analog waveform signal from the light sensor, samples it at a defined rate, converts each sample into a binary value which are encoded into a digital value that is then sent through to the control unit to be used.

### Question 27 (b)

Criteria	Marks
<ul style="list-style-type: none"> <li>Uses an example to describe how the integration of sensors into manufacturing machinery can automate processing</li> </ul>	3
<ul style="list-style-type: none"> <li>Outlines features of integrated sensors</li> </ul>	2
<ul style="list-style-type: none"> <li>Provides some relevant information</li> </ul>	1

**Sample answer:**

In a robotic arm, sensors are integrated into the function of the arm to collect data from the environment, and to create a control loop that assists in automating the data feed and decision making for the control of the actuators by the processor of the robotic arm. This control loop allows for the movement of the robotic arm to be tracked in real-time, for the control unit to analyse the collected data, and then for the control unit to process the data and form instructions for the actuators of the robotic arm to move. The integration of the sensors into the robotic arm allows for effective automation to occur that ensures successful and accurate fulfilment of the designed task.

**Answers could include:**

Conveyor belts

**Question 27 (c)**

Criteria	Marks
• Compares the use of a solenoid and a relay as an actuator	4
• Describes the use of a solenoid and/or a relay as an actuator	3
• Outlines the use of a solenoid or a relay	2
• Provides some relevant information	1

**Sample answer:**

A solenoid and a relay are two different types of electrical actuators that are used for controlling electrical circuits. The choice between using a solenoid or a relay depends on the specific requirements of the application.

A solenoid is a type of electromagnet that can be used as an actuator to control a valve or switch. Solenoids are best suited for applications that require fast, forceful and precise movements. They are commonly used in automotive, industrial and medical applications as valves that control the flow of liquids or gases.

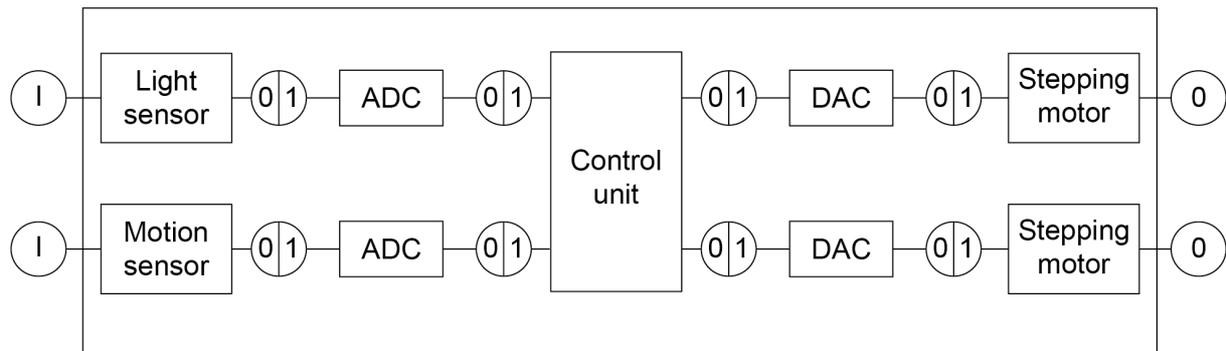
A relay is an electrically operated switch that can be used to control a large current or voltage circuit with a smaller current or voltage signal. Relays are best suited for applications where high-current circuits need to be controlled by a low-current signal. They are commonly used in control systems, telecommunication systems, and in applications where multiple devices need to be controlled simultaneously.

### Question 27 (d) (i)

Criteria	Marks
<ul style="list-style-type: none"> <li>• Outlines the functions of the sensors, controller and actuators for the automated solar system</li> <li>• Draws a labelled block diagram that shows the interactions between the components of the system</li> </ul>	4
<ul style="list-style-type: none"> <li>• Outlines a function of a sensor, controller and actuator for the automated solar system</li> <li>• Draws a mostly correct block diagram that shows the interactions between some of the components of the system</li> </ul>	3
<ul style="list-style-type: none"> <li>• Identifies a sensor, controller and actuator for the automated solar system</li> </ul> <p>AND/OR</p> <ul style="list-style-type: none"> <li>• Outlines elements of a block diagram for the components of the system</li> </ul>	2
<ul style="list-style-type: none"> <li>• Provides some relevant information</li> </ul>	1

**Sample answer:**

The automated solar energy system would require light sensors to detect the location of the sun, motion sensors to track the movement of its panels, and stepping motors to make controlled movements of the solar panels in both the X and the Y axis whilst tracking the sun. The interaction of these components is represented by the block diagram below.



### Question 27 (d) (ii)

Criteria	Marks
<ul style="list-style-type: none"> <li>• Demonstrates a comprehensive understanding of how the issues of <i>precision</i> and <i>acceptable tolerance range</i> are managed within the system</li> <li>• Includes detailed reference to analysing and displaying</li> </ul>	6
<ul style="list-style-type: none"> <li>• Demonstrates a thorough understanding of how the issues of <i>precision</i> and <i>acceptable tolerance range</i> are managed within the system</li> <li>• Includes reference to analysing and displaying</li> </ul>	5
<ul style="list-style-type: none"> <li>• Demonstrates a sound understanding of how the issue of <i>precision</i> or <i>acceptable tolerance range</i> is managed within the system</li> <li>• Includes reference to analysing and/or displaying</li> </ul>	3–4
<ul style="list-style-type: none"> <li>• Demonstrates some understanding of how <i>precision</i> and/or <i>acceptable tolerance range</i> is managed within the system</li> </ul>	2
<ul style="list-style-type: none"> <li>• Provides some relevant information</li> </ul>	1

**Sample answer:**

Precision and acceptable tolerance range are critical issues in the solar energy system and can be managed through the information processes of analysing and displaying. In this system, precision refers to the position and movement of solar panels to maximise energy production by having the panels facing the sun. An acceptable tolerance range allows for the analysis of the light entering the sensors and corresponding movement of the solar panels to face the sun more directly. This will help to reduce the wear and tear on the actuators.

During the operation of the solar energy system, the information processes of analysing and displaying need to be planned and tested as the effective processing of the data collected by sensors will directly affect the accuracy of display when the actuators are told where to move. During the processing, the data from a number of sensors could be analysed to determine the current position and movement of the sun. This information can be further used by the control unit to make decisions of when and where to move the angles of the solar panels to directly face the sun. This movement of the panels is the result of the display information process and is managed by the stepping motor actuators.

This helps the system adjust accordingly to maintain optimal performance. Managing precision and acceptable tolerance range in the solar energy system is designed to extend the life of the system as a result of reducing the constant active time that actuators are working, hence reducing wear.

### Question 28 (a)

Criteria	Marks
• Describes the role of a storyboard when designing a multimedia product, with the use of an example	3
• Shows some understanding of the features of a storyboard	2
• Provides some relevant information	1

**Sample answer:**

A storyboard is used to represent how a user navigates the multimedia product. For example, when designing an interactive website, a non-linear storyboard could be used to show the level of interactivity a user has. Navigation from the home screen to any page and between any page of the website would be shown with directional arrows and different hyperlink features such as buttons. The storyboard would show the various interfaces (screens), as well as the links between them. The representation of each interface would be detailed enough for the reader to identify the purpose, contents and design elements.

### Question 28 (b)

Criteria	Marks
• Justifies the use of .Wav and .MPG file types to store audio and video data in this application	3
• Outlines the use of .Wav or .MPG file types to store audio or video data	2
• Provides some relevant information	1

**Sample answer:**

.Wav is an uncompressed format, which means it retains the highest quality of the original audio recording. This is important for virtual reality applications where high-quality audio is crucial for creating a realistic and immersive experience.

.MPG files are a widely used video format that are known for their high compression while maintaining quality, which makes them a good choice for video content that needs to be delivered over the internet or stored on devices with limited storage capacity.

In virtual reality applications, .MPG files can be used to create video-based content that can be played within the virtual reality environment.

**Question 28 (c)**

Criteria	Marks
<ul style="list-style-type: none"><li>Describes advantages and disadvantages of presenting the advertisement in printed and multimedia versions</li></ul>	4
<ul style="list-style-type: none"><li>Outlines an advantage and a disadvantage of presenting the advertisement in printed and multimedia versions</li></ul>	3
<ul style="list-style-type: none"><li>Outlines an advantage and/or a disadvantage of presenting the advertisement in printed and/or multimedia formats</li></ul>	2
<ul style="list-style-type: none"><li>Provides some relevant information</li></ul>	1

**Sample answer:**

Printed advertisements for magazines are static and two-dimensional. They can be produced in large quantities, but their design and content are limited to the physical space of the printed magazine. Printed pages of a magazine can be viewed offline and do not require a device to access and therefore can be effective for reaching a large audience depending on where they are published and could be a cost-effective alternative to a multimedia version.

Multimedia advertisements, on the other hand, often feature digital and animated content, and can be displayed on high-resolution, large displays such as those required for electronic signs on the side of a building. These advertisements can include a variety of elements, such as video, audio, text, and graphics, and can be interactive and engaging to the viewer. Electronic signs can be updated frequently and remotely, allowing for greater flexibility. The high cost of producing and distributing a multimedia version of the advertisement may be a disadvantage for smaller companies. Electronic signs are not available in all locations making access to the advertisement limited.

**Question 28 (d)**

Criteria	Marks
<ul style="list-style-type: none"><li>Explains how video data and frame rates can affect the processing required by this application</li></ul>	4
<ul style="list-style-type: none"><li>Describes how video data and frame rates can affect the processing required by this application</li></ul>	3
<ul style="list-style-type: none"><li>Outlines how video data and/or frame rates can affect processing</li></ul>	2
<ul style="list-style-type: none"><li>Identifies a feature of video data</li></ul>	1

**Sample answer:**

To create the interactive display, customer's uploaded images will need to be of a medium to high resolution and contain at least 16-bit colour to make the interactive video. These components will also affect the file size of the video and the processing required. A good quality video will also require a high frame rate (the number of frames that are displayed per second). The higher the frame rate, the more processing power is required to analyse each frame. For example, a video with a frame rate of 60 frames per second will require twice as much processing power as a video with a frame rate of 30 frames per second.

For the application to process such large video files, it will require a machine with large storage and processing capacity. The application will also need to be able to compress the video to ensure it plays smoothly for the customer and retains the quality of the images uploaded. This gives a realistic impression to the customer when they add furniture or other features from the furniture company's stock. Compression of files will help ensure time required to transmit over a network is also minimised.

**Question 28 (e)**

Criteria	Marks
<ul style="list-style-type: none"> <li>• Demonstrates a comprehensive understanding of how authoring software can be used to organise and display the 3D avatar in this system</li> <li>• Includes detailed reference to the effects bit depth and the representation of colour data</li> </ul>	6
<ul style="list-style-type: none"> <li>• Demonstrates a thorough understanding of how authoring software can be used to organise and display the 3D avatar in this system</li> <li>• Includes reference to the effects bit depth and the representation of colour data</li> </ul>	5
<ul style="list-style-type: none"> <li>• Demonstrates a sound understanding of how authoring software can be used to organise and display the 3D avatar in this system</li> <li>• Includes some reference to bit depth and/or the representation of colour data</li> </ul>	3–4
<ul style="list-style-type: none"> <li>• Demonstrates some understanding of how authoring software can be used to organise and/or display the 3D avatar in this system</li> </ul>	2
<ul style="list-style-type: none"> <li>• Provides some relevant information</li> </ul>	1

**Sample answer:**

When authoring software is used to create an avatar for a user, the bit depth is a key component of the representation of colour data. Bit depth refers to the amount of data allocated to the storage of the required colour range. A higher bit depth means that more information can be stored about the colours to create the image, resulting in a more detailed and accurate representation of the image.

When organising data to create an avatar, users upload images of themselves. These images will then be used as a reference for the avatar creation process. The quality of the images, including its resolution and bit depth, will affect the final quality of the avatar. Higher quality images will provide a more accurate representation of the user's features. When creating the avatar, the authoring software organises the images into layers to build the final 3D image. Each layer of the 3D image contains different aspects of the person. For example, a layer of the avatar could be the person's head inclusive of facial features such as eye colour. Another layer could contain a person's torso which will enable customisation of the displayed avatar.

During the display process, the avatar is rendered on a screen, which is made up of a grid of pixels. The more pixels there are in the screen, the higher the resolution of the image will be. Higher resolutions allow for more detail and smoother curves in the avatar. However, higher resolutions also require more data to be processed, resulting in a larger file size and potentially slower loading times.

In terms of bit depth and the representation of colour data, the authoring will use different techniques to represent the user's features in the avatar. For example, facial recognition algorithms may be used to analyse the uploaded image and extract data points for the avatar's facial features.

The quality of the data collected and the way it is represented can affect the result. Higher quality images and higher resolutions can result in more detailed and accurate avatars but can also result in larger file sizes and slower loading times.

# 2023 HSC Information Processes and Technology Mapping Grid

## Section I

Question	Marks	Content	Syllabus outcomes
1	1	9.1 Project management approaches	H6.2
2	1	9.1 Communication techniques	H1.1
3	1	9.1 Project management tools	H5.1
4	1	9.3 Wireless networks	H1.2
5	1	9.1 Operational feasibility	H1.2
6	1	9.3 Network topology	H1.1
7	1	9.2 Operation of a search engine	H4.1
8	1	9.1 Documentation	H7.1
9	1	9.1 Test data	H1.2
10	1	9.3 Satellite and infrared	H1.1
11	1	9.3 Current and emerging trends in communications	H1.1, H4.1
12	1	9.3 Ethernet	H1.1
13	1	9.3 HTTP and SSL protocols	H1.1, H2.1
14	1	9.2 Database screen input element	H6.1
15	1	9.3 Synchronising data	H1.1, H2.1
16	1	9.1 Project management planning	H5.1
17	1	9.1 Decision table	H5.1, H7.1
18	1	9.2 SQL	H2.2
19	1	9.3 Network devices and communication levels	H1.1
20	1	9.3 Network devices – switch and router	H1.1

## Section II

Question	Marks	Content	Syllabus outcomes
21 (a)	3	9.3 Network Administrator	H1.1, H1.2
21 (b)	3	9.3 Client–server architecture	H1.1, H1.2
21 (c)	3	9.3 Handshaking	H1.1, H1.2
22 (a)	3	9.1 System development approaches	H1.1, H6.2
22 (b) (i)	3	9.1 Effect on users	H3.1
22 (b) (ii)	4	9.1 Requirement report	H4.1, H5.1, H7.1
23 (a)	3	9.2 Database file types	H2.2, H5.1
23 (b)	3	9.2 Schematic diagram	H2.1, H2.2
23 (c)	4	9.2 Ethical and technical issues	H3.1
24 (a)	3	9.3 Error checking	H1.1
24 (b) (i)	3	9.1 Data flow diagrams	H5.1, H6.2
24 (b) (ii)	5	9.2 Data warehouse	H1.1, H4.1

**Section III**

<b>Question</b>	<b>Marks</b>	<b>Content</b>	<b>Syllabus outcomes</b>
25 (a)	3	9.4.1 On-site and off-site backup	H1.1, H1.2
25 (b) (i)	3	9.4.1 IT requirements	H1.1, H1.2
25 (b) (ii)	4	9.4.1 Data quality and integrity	H1.1, H1.2
25 (c)	4	9.4.1 OLAP and OLTP	H1.1, H3.1
25 (d)	6	9.4.1 Data security, collecting, storing and retrieving	H1.1, H1.2, H3.1
26 (a)	3	9.4.2 Structured decision making	H1.1, H1.2
26 (b)	3	9.4.2 Inference engine	H1.1, H1.2
26 (c)	4	9.4.2 Spreadsheet	H1.1, H1.2, H3.1
26 (d)	4	9.4.2 Neural network analysing and displays	H1.1, H1.2
26 (e)	6	9.4.2 Geographical Information Systems (GIS)	H1.1, H1.2, H4.1
27 (a)	3	9.4.3 Converting from analog to digital data	H1.1, H1.2
27 (b)	3	9.4.3 Integration of sensors in manufacturing	H1.1, H1.2
27 (c)	4	9.4.3 Actuators – solenoid and relay range analysing and displaying	H3.1
27 (d) (i)	4	9.4.3 Block diagram and outline components	H1.1, H1.2
27 (d) (ii)	6	9.4.3 Precision and acceptable tolerance	H1.1, H1.2
28 (a)	3	9.4.4 Storyboards	H1.1, H3.1
28 (b)	3	9.4.4 File types	H1.1, H1.2
28 (c)	4	9.4.4 Printed and multimedia versions	H1.1, H1.2
28 (d)	4	9.4.4 Video data and frame rate	H1.1, H1.2
28 (e)	6	9.4.4 Bit depth and representation of colour, data, organising and displaying	H1.1, H3.1, H3.2