NSW Education Standards Authority

2024 HIGHER SCHOOL CERTIFICATE EXAMINATION

Information Processes and Technology

General Instructions
- Reading time – 5 minutes
- Working time – 3 hours
- Write using black pen
- Draw diagrams using pencil
- Write your Centre Number and Student Number at the top of this page

Total marks: 100

Section I – 20 marks (pages 2–10)
- Attempt Questions 1–20
- Allow about 40 minutes for this section

Section II – 40 marks (pages 11–14)
- Attempt Questions 21–24
- Allow about 1 hour and 10 minutes for this section

Section III – 40 marks (pages 15–20)
- Attempt TWO questions from Questions 25–28
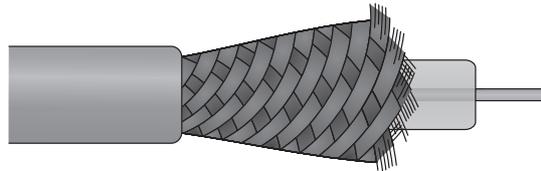- Allow about 1 hour and 10 minutes for this section

Section I

20 marks
Attempt Questions 1–20
Allow about 40 minutes for this section

Use the multiple-choice answer sheet for Questions 1–20.

1 The diagram shows a transmission cable.

Which type of transmission cable is this?

A.   Coaxial

B.   Telephone

C.   Fibre optic

D.   Twisted pair

2 A system developer wants to ensure that 200 000 users can use the system simultaneously with fast response times.
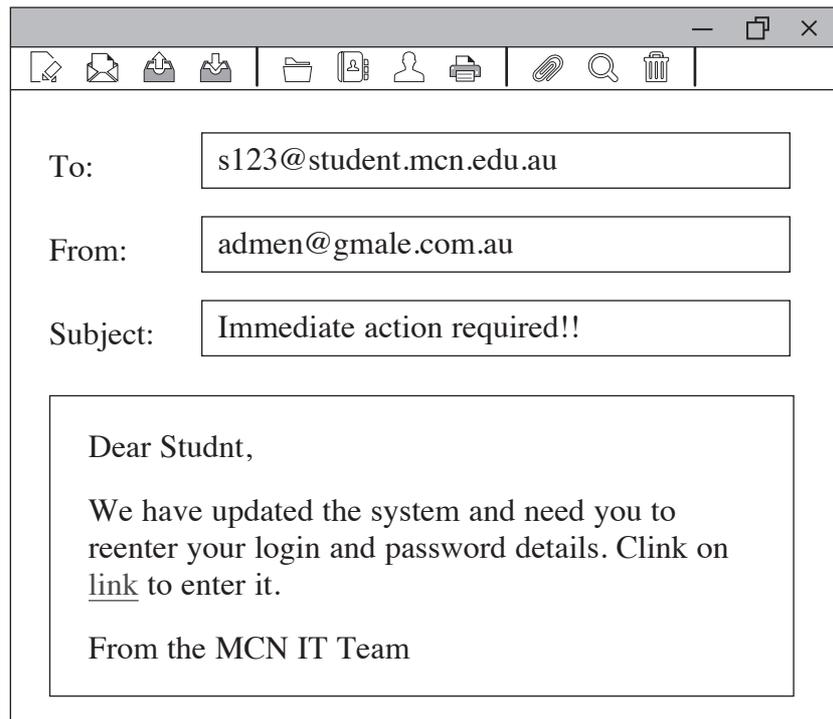
What type of test data is the most suitable for testing this requirement?

A.   Live

B.   Volume

C.   Simulated

D.   User acceptance

3 A database is used to store customer information, including mobile phone number.

What is the best data type for the MobilePhoneNumber field?

A.   Text

B.   Integer

C.   Number

D.   Date/time

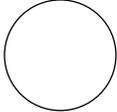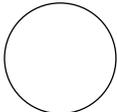**4**   A student at a school receives the following email.

What is the most appropriate action for the student to take?

A.   Forward the email to another student

B.   Report the email as a potential fraud attempt

C.   Ignore the email, assuming it is a routine communication

D.   Click on the link to verify their login credentials as instructed

5   During a feasibility study, an analyst interviews managers to better understand how the proposed solutions will affect their employees.

Which of the following constraints is the analyst considering?

A.   Schedule

B.   Technical

C.   Economic

D.   Operational

6   Which row of the table shows the correct symbols for *Process* and *External entity* in a context diagram?

	Process	*External entity*
A.	(circle)	(open-ended rectangle)
B.	(trapezoid)	(open-ended rectangle)
C.	(circle)	(rectangle)
D.	(trapezoid)	(rectangle)

7   Which of the following best defines *metadata*?

A.   Schema for a database

B.   Data that describes data

C.   HTML tags for a web page

D.   Data that has been processed

8   Which document would specify the training needs required for a participant of a new system?

A.   Storyboard

B.   Operation manual

C.   Implementation plan

D.   Requirements report

9   Which of the following best describes the role of a 'client' in a client-server network?

A.   To request services from a server

B.   To manage and control network resources

C.   To maintain the overall network infrastructure

D.   To provide services and resources to other devices

10 A new system is to be developed.

Which of the following is required at the planning stage?

A. Detailing the time frame for the project

B. Identifying problems with the existing system

C. Detailing procedures for the participants to follow

D. Identifying the purpose of the new system and analysis of the current system

11 Encryption is one way of securing data stored on a file server.

Which of the following statements best describes this process of encryption?

A. Compressing the data for fast retrieval to minimise storage

B. Decoding the stored data so it can be used by authorised users

C. Preventing unauthorised users from accessing files on the server

D. Modifying the stored data so that it is unusable by an unauthorised user

12 The following addresses are each stored in a single field in a database.

| 12 Black Street |
| 4 Green Street |
| 91 Brown Street |
| 104 Orange Street |

When the addresses are sorted in ascending order, what will be the result?

A.

| 4 Green Street |
| 12 Black Street |
| 91 Brown Street |
| 104 Orange Street |

B.

| 12 Black Street |
| 91 Brown Street |
| 4 Green Street |
| 104 Orange Street |

C.

| 104 Orange Street |
| 91 Brown Street |
| 12 Black Street |
| 4 Green Street |

D.

| 104 Orange Street |
| 12 Black Street |
| 4 Green Street |
| 91 Brown Street |

13 A school is looking to upgrade its meal ordering system using a database management system as shown in the diagram.

Student canteen orders

Please complete and submit by 8 am each morning.

Date: 10 November 2024

Student Number ☐☐☐☐☐☐   Order Number ☐☐☐☐☐☐

First Name ☐☐☐☐☐☐☐☐   Surname ☐☐☐☐☐☐☐☐

Select ONE of the following for each meal.

Breakfast	*Lunch*
☐ B1. Egg and bacon roll	☐ L1. Tuna sandwich
☐ B2. Pancakes	☐ L2. Savoury muffin
☐ B3. Fruit and yoghurt	☐ L3. Salad roll

Students can order food such as 'B2. Pancakes' where B2 is the ItemNo and Pancakes is the ItemDescription.

What relational database solution would be most suitable for this system?

A. Surname and OrderNo as foreign keys in the Orders table

B. ItemNo in the Orders table and Firstname in the Student table as primary keys

C. StudentNo in the Student table and OrderNo in the Orders table as primary keys

D. ItemDescription as foreign key and OrderNo as primary key in the Student table

14 Which row of the table correctly describes a function of a router and a function of a gateway?

	Router	*Gateway*
A.	Broadcasts a message across a network	Checks for errors in a message
B.	Enables the least congested route across a network	Joins two networks of different protocols
C.	Allows a user to connect to a provider	Performs encryption on the transmitted data
D.	Converts digital to analogue signals	Joins segments with similar protocols

15 A family is searching for a new property to rent. The budget for rent is less than $500 per week and they need at least two bedrooms. They will be happy with either a house or a unit. Property data is stored in a database.

Which of the following SQL statements will list the most suitable results from the Properties table?

A.　SELECT Address, Suburb

　　FROM Properties

　　WHERE Type = "House" OR Type = "Unit"

　　AND Rent <= 500 AND Bedrooms < 2

B.　SELECT Address, Suburb

　　FROM Properties

　　WHERE Type = "House" AND Type = "Unit"

　　AND Rent <= 500 AND Bedrooms >= 2

C.　SELECT Address, Suburb

　　FROM Properties

　　WHERE Type = "House" OR Type = "Unit"

　　AND Rent < 500 AND Bedrooms >= 2

D.　SELECT Address, Suburb

　　FROM Properties

　　WHERE Type = "House" AND Type = "Unit"

　　AND Rent < 500 AND Bedrooms < 2

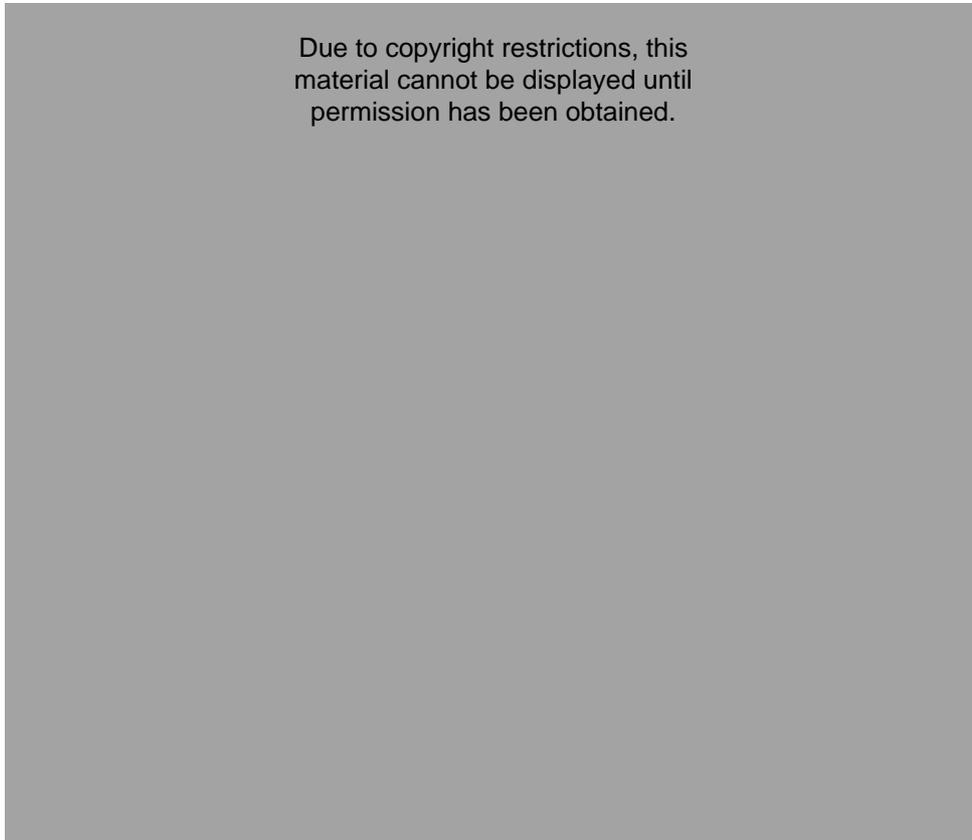**16** A large manufacturing company needs to combine all of its current information systems into a single solution, while maintaining confidentiality of highly sensitive data.

What is the most suitable development approach?

A.　Purchase a solution from an appropriate supplier

B.　Use a traditional approach to ensure a robust integrated system

C.　Use the participant development approach to build the new system to meet the company's specific needs

D.　Outsource the project to a third-party provider to develop the new system to meet the company's specific needs

17 Census data containing raw facts about each person in a particular country is stored in a database. The raw data includes age, gender, whether they are employed and if so, work location.

A software package is used to present information as shown.

Due to copyright restrictions, this material cannot be displayed until permission has been obtained.

Which of the following rows in the table correctly matches the component and the information process used?

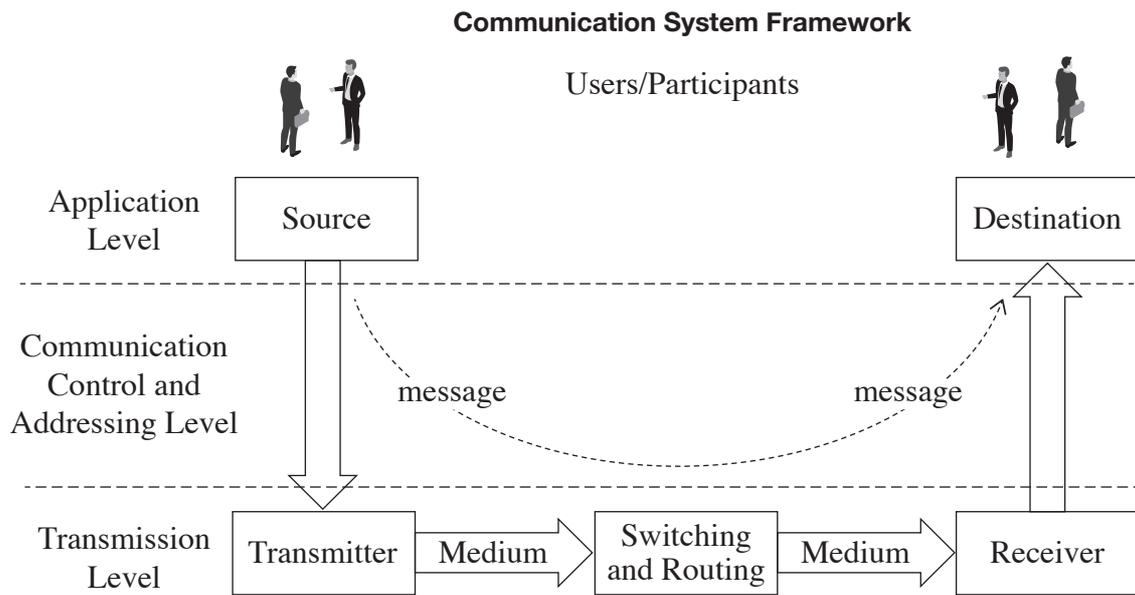|	Label	Component	Process
A.	1	Unemployment rate of labour force at age 15+	Processing
B.	2	Working from home	Storing
C.	3	Labour force at age 15+	Organising
D.	4	Total population 2020	Retrieving

18 The diagram shows an information system that has been developed for the publishing committee of a school-based magazine.
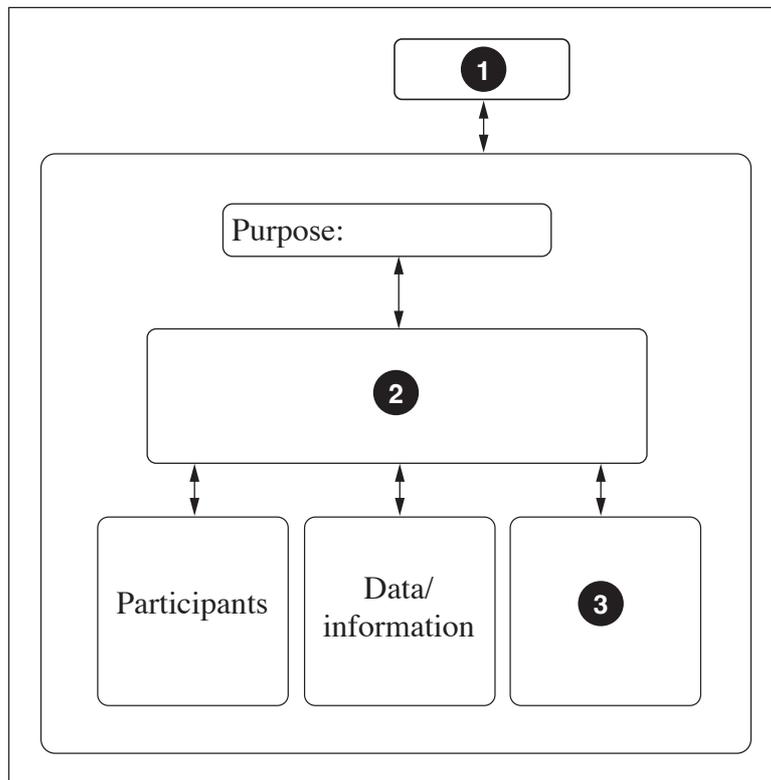
Which of the following rows in the table correctly reflects the contents of sections **1**, **2** and **3**?

	1	**2**	**3**
A.	Magazine editors	Editing text elements	Articles
B.	Student readers	Displaying formatted pages	Desktop-publishing software
C.	Student journalists	Previous magazine editions	File server
D.	Laser printer	Magazine editors	Capturing an image

Use the following diagram to answer Questions 19–20.

Communication System Framework

Users/Participants

Application Level	Source			Destination

Communication Control and Addressing Level

message   message

Transmission Level	Transmitter	Medium	Switching and Routing	Medium	Receiver

19 As a packet moves from Source to Destination in the Communication System Framework, protocol-specific information is

    A.   added.

    B.   stripped.

    C.   stripped, then added.

    D.   added, then stripped.

20 Which of the following correctly associates a protocol with the framework level in which it is used?

	Protocol	*Framework level*
A.	Token ring	Application
B.	SSL	Communication Control and Addressing
C.	Ethernet	Transmission
D.	TCP	Application

Section II

40 marks
Attempt Questions 21–24
Allow about 1 hour and 10 minutes for this section

Answer each question in the appropriate writing booklet. Extra writing booklets are available.

If you include diagrams in your answer, ensure that they are clearly labelled.

Question 21 (10 marks) Use the Question 21 writing booklet.

A large software development team is working on a new system to create personalised travel itineraries. These itineraries include a variety of destinations based on a customer's travel preferences and where they have previously travelled.

(a) There have been disagreements within the team about the technical and design elements of the system.

    Outline ONE action that the project manager could take to minimise issues within the team. **2**

(b) Explain how the use of a Gantt chart can assist throughout the development of this system. **3**

(c) Outline ONE ethical issue relevant to this system that could affect customers. **2**

(d) The system has been developed for use over a range of internet browsers. **3**

    Justify an appropriate conversion method for this new system.

Question 22 (10 marks) Use the Question 22 writing booklet.

Organisers of a film screening event want to set up a secure web page to allow attendees to vote for their favourite of the four films being shown. A prototype has been developed.

(a) Outline the benefits of developing a prototype prior to setting up the web page. **3**

(b) Design an improved screen layout to minimise errors in data entry. Clearly label all features. **3**

(c) All responses will be stored in a database once the system is fully developed. **4**

Recommend security measures for safeguarding the submitted votes against unauthorised tampering.

Question 23 (11 marks) Use the Question 23 writing booklet.

A local council is implementing a pet tracking system using a specially-designed pet collar. There are many ways of implementing wireless transmission, including short-range and long-range technologies using radio waves. If a lost pet is found, an enabled short-range reader can be used by a vet to identify its registered owner. Owners can also use a tracker app to remotely check where their pet is.

(a) Social and ethical issues may arise with this pet tracking technology. Describe ONE example of each. **3**

(b) Construct a schema of the database that could be used by the local council for identifying pets with their owners. **5**

(c) Construct a labelled network diagram to represent this pet tracking system. **3**

Please turn over

Question 24 (9 marks) Use the Question 24 writing booklet.

A company is expanding its operations globally, with teams distributed across different geographical locations. They need seamless communication to maximise productivity among team members and their business partners.

(a)   Outline TWO tasks undertaken by a network administrator in this company.   **2**

(b)   Describe TWO application-level protocols that the company needs to utilise for effective global communications.   **3**

(c)   Explain how the speed and reliability of the network infrastructure can affect communication between users. Refer to communications hardware in your response.   **4**

Section III

40 marks
Attempt TWO questions from Questions 25–28
Allow about 1 hour and 10 minutes for this section

Answer each question in a SEPARATE writing booklet. Extra writing booklets are available.

If you include diagrams in your answer, ensure that they are clearly labelled.

Question 25 — Transaction Processing Systems (20 marks)
Use a SEPARATE writing booklet.

(a)   Define data integrity. Include a relevant example in your answer.   **3**

(b)   Explain why rollback is important in backup and recovery systems.   **3**

(c)   A local club captures details from a person's membership card on entry to and exit from the club. The date and time of entry and exit are recorded with the member's details. The club contains several sections such as a restaurant and a pool. A member needs to swipe their membership card each time they enter and leave a section.

   (i)   Create a data flow diagram (DFD) for this system.   **4**

  (ii)   A report that lists the number of members attending each section for each hour of the day is required by management.   **4**

      Design the report. Clearly label each report section.

(d)   In banking, data mining can be used successfully to detect fraud. Software can be used to analyse previous transactions such as deposits, withdrawals, purchases and transfers by linking a number of databases.   **6**

     Explain how data mining makes it possible to detect potential fraud through the retrieval and analysis processes.

Question 26 — Decision Support Systems (20 marks)
Use a SEPARATE writing booklet.

(a) Discuss the use of a group decision support system (GDSS) in a large company to manage meetings and allow the attendees to arrive at solutions to unstructured problems.   **3**

(b) Consider the following spreadsheet showing vegetable sales by sellers over a series of months.

	A	B	C	D	E
1	**Product**	**Seller**	**Month**	**Sales**	
2	Cucumbers	José	Oct	$250	
3	Capsicums	Matt	Nov	$200	
4	Tomatoes	Pam	Oct	$180	
5	Carrots	Matt	Nov	$400	
6	Capsicums	Sam	Oct	$250	
7	Tomatoes	Matt	Oct	$120	
8	Cucumbers	Sam	Sep	$330	
9	Tomatoes	Pam	Oct	$110	
10	Cucumbers	Matt	Sep	$250	

(i) Construct a formula for cell E2 to appropriately display an asterisk (∗) if the sale is greater than $200.   **2**

(ii)   A pivot table can be used to present a variety of views.   **5**

In the following example:

- Pivot table 1 presents the data by product and seller for each month
- Pivot table 2 shows the monthly sales by seller.

In each pivot table the data is the same. The software produces the output from the data stored in the spreadsheet as specified by the user.

Pivot table 1

Sales				
	Sep	Oct	Nov	Total
⊟ Capsicums		250	200	450
Matt			200	200
Sam		250		250
⊟ Carrots			400	400
Matt			400	400
⊟ Cucumbers	580	250		830
José		250		250
Matt	250			250
Sam	330			330
⊟ Tomatoes		410		410
Matt		120		120
Pam		290		290
Total	580	910	600	2090

Pivot table 2

Product	(All) ▾			
Sales	Month ▾			
Seller ▾	Sep	Oct	Nov	Total
José		$250		$250
Matt	$250	$120	$600	$970
Pam		$290		$290
Sam	$330	$250		$580
Total	**$580**	**$910**	**$600**	**$2090**

Explain how the use of Pivot table 1 and Pivot table 2 can aid in decision-making. In your answer, refer to the relevant information process.

Question 26 (continued)

(c)   Expert systems can be effectively used to aid in decision-making. They have the same basic components as shown in the diagram.   **4**
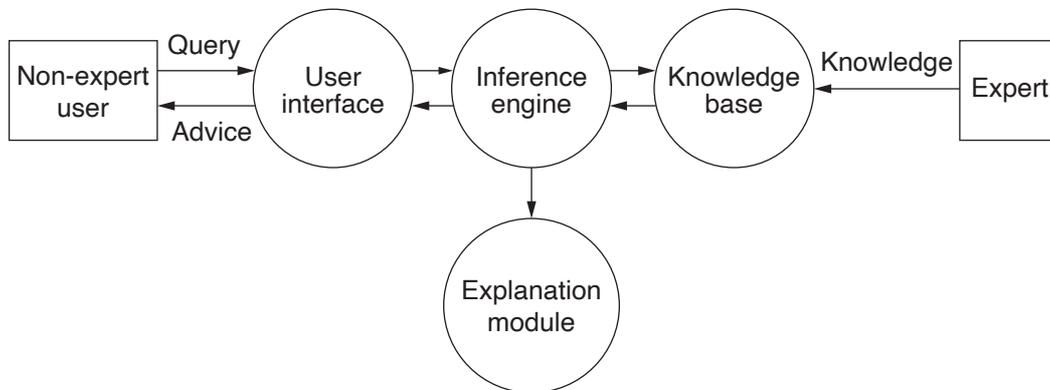
Explain the role of the knowledge engineer in the design of an expert system. In your answer, make reference to this diagram.

(d)   An art collector wishes to purchase paintings by a famous artist, and needs to be sure that they are not just reproductions.   **6**

To help them to verify the authenticity of the paintings, the art collector is going to use specially developed software. This software inputs a high-resolution image of a painting and determines if it is by a famous artist. If the software cannot 'recognise' the correct artist from the image of the work, it will produce a message indicating that the work may not be original.

The software is created using a neural network and has already been trained to recognise artistic styles by being shown a series of images known to have been painted by famous artists.

Explain issues that could arise from using the neural network-based software to determine the authenticity of paintings.

End of Question 26

Question 27 — Automated Manufacturing Systems (20 marks)
Use a SEPARATE writing booklet.

(a)   Distinguish between continuous and batch processing, providing an example of   **3**
each.

(b)   A boom gate at a local shopping centre carpark is slamming and affecting the   **3**
safety of people nearby.

Describe how adjusting the damping could overcome this issue.

(c)   A doughnut shop has an automated system for making fresh doughnuts. The
system consists of sensors, a control unit and actuators that perform the tasks of
detecting the heat of the oil, cooking and flipping the doughnuts.

(i)   Explain how this system could work. Use a block diagram of the   **5**
automated doughnut machine to support your answer.

(ii)   Explain how the system ensures quality control for the doughnuts   **3**
produced.

(d)   Technology can be used to enhance crop production on a farm. Irrigation   **6**
(appropriate watering) is an important factor in ensuring crops receive enough
water to grow. With careful management and access to weather data this can
keep the cost of production low.

Explain how an automated irrigation system can be used by farmers to maximise
production and minimise cost. In your answer, consider the appropriate use of
sensors and actuators.

Question 28 — Multimedia Systems (20 marks)

Use a SEPARATE writing booklet.

(a) Describe an audio compression technique, naming a relevant file type. **3**

(b) Outline the features that contribute to the large file sizes of animation multimedia files. **3**

(c) Describe the hardware requirements needed for efficient editing of uncompressed video with large file sizes. **4**

(d) A system has been developed for educating children about plants. It contains a printed set of cards containing QR codes and a companion app. An enabled touch-screen device with the installed application scans a QR code which triggers a pop-up image of a plant. Alternatively, children can use voice activation to trigger an audio prompt, enabling them to navigate the system. Children can tap the image or voice activate the system to playback an audio narrative. Plant and information on the ideal climate for growth and country of origin will be displayed. The image below shows how the system will be used.
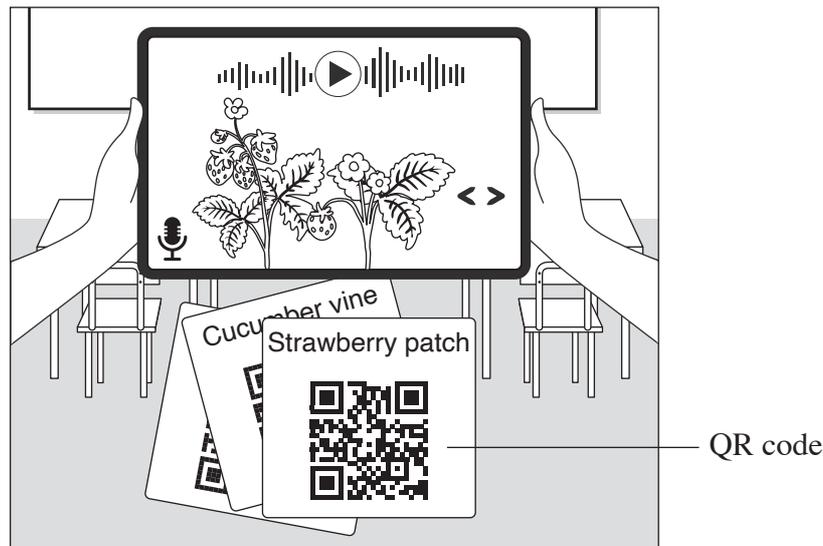
   (i) Explain the specialist roles that would have been required by the team to develop the system. **4**

   (ii) This system is designed to be used by children, including those with visual and hearing impairments and low literacy levels. **6**

   Explain how the design of this system could meet their needs, in terms of displaying and collecting.

End of paper