BOARD OF STUDIES
NEW SOUTH WALES

2006

HIGHER SCHOOL CERTIFICATE EXAMINATION

Information Processes and Technology

General Instructions

- Reading time – 5 minutes
- Working time – 3 hours
- Write using black or blue pen
- Draw diagrams using pencil

Total marks – 100

Section I Pages 2–11

20 marks

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

Section II Pages 12–15

40 marks

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

Section III Pages 16–23

40 marks

- 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

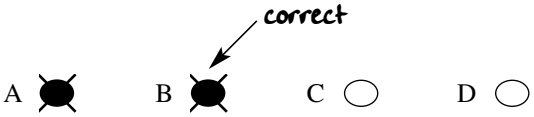
Use the multiple-choice answer sheet.

Select the alternative A, B, C or D that best answers the question. Fill in the response oval completely.

Sample: 2 + 4 = (A) 2 (B) 6 (C) 8 (D) 9

If you think you have made a mistake, put a cross through the incorrect answer and fill in the new answer.

If you change your mind and have crossed out what you consider to be the correct answer, then indicate the correct answer by writing the word **correct** and drawing an arrow as follows.



1 What is represented in the diagram?

(A) Encryption and decryption

(B) Modulation and demodulation

(C) Error detection and correction

(D) Log-on and log-off procedures

2 Which of the following best describes a backup procedure?

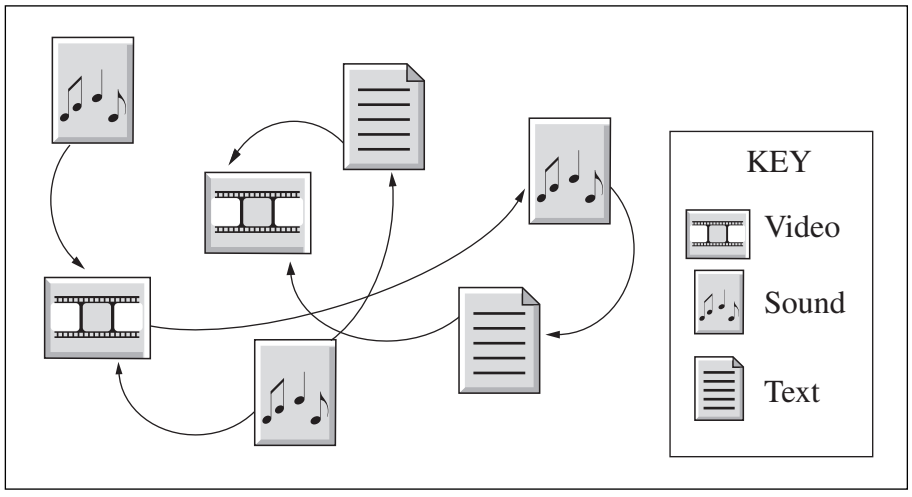
(A) Copying a database for use by multiple users

(B) Updating a database to identify and eliminate errors

(C) Copying a database and storing it off-site in case of an emergency

(D) Distributing a database across a network for quick access at different locations

3 The diagram shows the organisation of a database.



What organisation method is being used for this database?

(A) Flat-file

(B) Relational

(C) Hypertext

(D) Hypermedia

4 Which URL is most likely to locate a website?

(A) http//www.shop.co.uk

(B) http:/www.university.edu.nz/

(C) http://www.company.au.com/

(D) http://www.organisation.com

5 A department store has abandoned its proposed internet shopping website because the website would discourage customers from using the physical department store.

Which of the following best describes the reason why this decision was made?

(A) The website was not technically feasible.

(B) The website was not economically feasible.

(C) There was not enough time to implement the website.

(D) The website did not fit the objectives of the department store.

6 Ken receives many unwanted phone calls from a telemarketing company. Ken seeks details from the company about the information they hold about him.

To what issue does this relate?

(A) Freedom of information

(B) Equity of access to services

(C) Copyright and data security

(D) Protection of intellectual property

7 Which of the following primarily uses the information process of *transmitting and receiving*?

(A) Sorting data in a database

(B) Typing text into a mobile phone

(C) Downloading music to an MP3 player

(D) Entering your PIN at an EFTPOS terminal

8 When the individual components of an information system were tested, no errors were found. However, when all components were tested together the system failed to operate.

Which of the following most likely identified the failure?

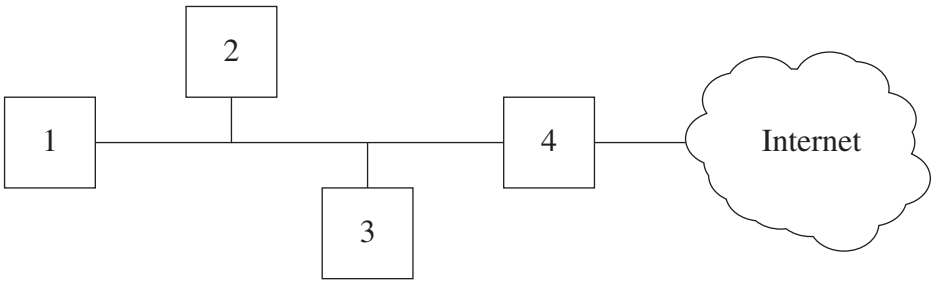
(A) Testing with live data

(B) Testing backup procedures

(C) Testing user documentation

(D) Testing individual components

9 In the following diagram, the boxes represent devices on a network.



Which device on this network represents a router?

(A) 1

(B) 2

(C) 3

(D) 4

10 A school is planning to change its reporting system from paper-based reports to reports accessed online. The implementation plan currently details participant training and system testing.

Which of the following needs to be added to the implementation plan?

(A) Specification of a prototype

(B) Details of conversion method

(C) Details of the technical feasibility study

(D) Schedule for the development of the new system

11 A free-text search is undertaken on the following hypertext document.

> Definition of BANDWIDTH
>
> In general, bandwidth refers to telecommunication in which a wide band of frequencies is able to transmit information.
>
> Related terms are wideband (a synonym), baseband (a one-channel band), and narrowband (sometimes meaning just wide enough to carry voice, or simply 'not broadband').

In the free-text search, a * can be used to replace from 0 to 7 characters in a word, not including white space.

Which of the following searches would locate all the words containing 'band'?

(A) *band

(B) band*

(C) *band*

(D) * band *

12 Which of the following are ALL tools that help overcome physical boundaries to enable virtual organisations?

(A) Email, decision tree, video-conferencing

(B) An intranet, the internet, teleconferencing

(C) Gantt chart, file sharing, web-conferencing

(D) Chat rooms, discussion groups, system flowchart

13 A communication link uses *cyclic redundancy check* (CRC) for error detection. The transmitting device divides the data by a constant and transmits the remainder with the data.

Which of the following best describes the process carried out by the receiving device?

(A) The data is divided by the transmitted remainder to find the constant.

(B) The data is divided by the same constant and the remainders are compared to check that they are the same.

(C) The total number of '1's in the data is calculated and compared with the transmitted remainder.

(D) The data is divided by the same constant and the remainder is sent back to the transmitting device to check that the remainders are the same.

14 Two nodes on a local area network attempt to communicate at the same time. A collision occurs.

Which of the following correctly outlines what will take place after the collision so that eventually both nodes communicate successfully?

(A) Each node waits for a free token before attempting to communicate.

(B) Each node waits a random amount of time before checking if a token is free.

(C) Each node waits a random amount of time before attempting to communicate.

(D) Each node waits until it has permission to communicate from the network controller.

15 A courier company changed from a manual system to a computer system. Under the manual system, the state of NSW was divided into many regions. The computer system was designed to handle all deliveries across the state. The company adopted a two-stage implementation approach:

Stage 1	*Stage 2*
• A system was built with partial functionality. • Successful trial in one region	• A system was built with full functionality. • Switched from the manual system to the computer system at the same time in all regions

What were the conversion methods used in Stage 1 and Stage 2?

	Stage 1	*Stage 2*
(A)	Pilot	Direct
(B)	Pilot	Parallel
(C)	Phased	Direct
(D)	Parallel	Phased

Use the following information to answer Questions 16 and 17.

A video store tracks movie loans using a relational database which includes the tables Movie, Borrower and Loan. Parts of the tables are shown below.

Movie

Movie_ID	*Movie_Name*	*Type*
MX5	King Kong	Adventure
MP6	Keeping Mum	Comedy
MF1	Mrs Henderson Presents	Drama

Borrower

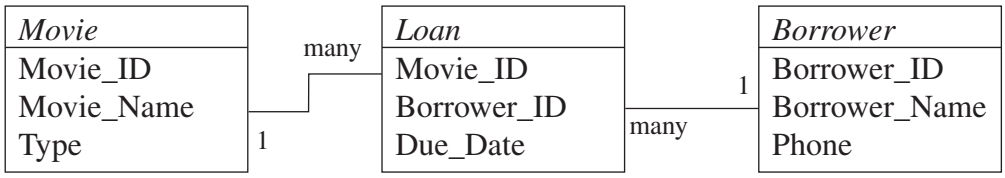
Borrower_ID	*Borrower_Name*	*Phone*
BA3	E Bunnie	9213 1234
BP2	S Clause	9625 5678
BL9	T Ferry	9718 9101

Loan

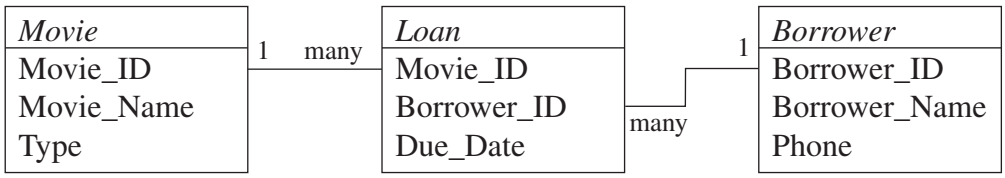
Movie_ID	*Borrower_ID*	*Due_Date*
MX5	BL9	16 Oct 06
MF1	BL9	16 Oct 06
MP6	BP2	16 Oct 06

16 Which schema represents the relationships between the three tables?

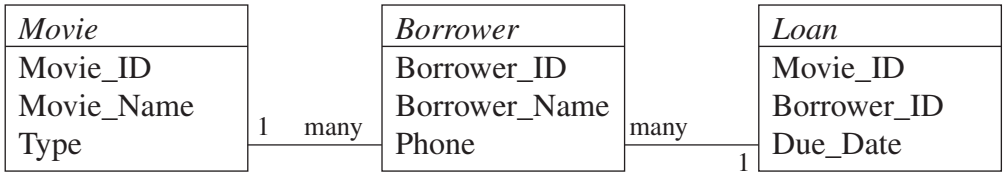
(A)



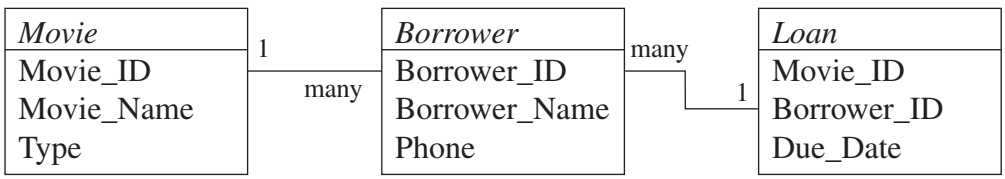
(B)



(C)



(D)



17 The following SQL is run on the tables shown on page 8.

```
SELECT    Borrower.Borrower_Name, Loan.Movie_ID
FROM      Borrower, Loan
WHERE     Borrower.Borrower_ID = Loan.Borrower_ID
AND       Loan.Movie_ID = "MP6";
```

Which of the following is the correct result?

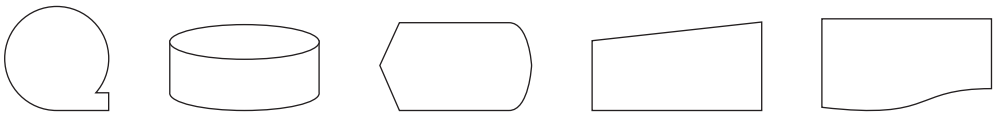
(A) S Clause MP6

(B) S Clause Keeping Mum

(C) T Ferry MP6

(D) T Ferry Keeping Mum

18 Diagrams 1–5 are system flowchart symbols.



1 2 3 4 5

Which symbols could be used to represent input and output in a system?

	Input	*Output*
(A)	1, 2	4, 5
(B)	3, 4, 5	1, 2
(C)	1, 3, 4	2, 3, 4, 5
(D)	1, 2, 4	1, 2, 3, 5

19 The ASCII code for the character ‘A’ is 1000001. The character ‘A’ is transmitted using even parity as:

1000001 parity bit 0

The following bits are received:

1000010 parity bit 0

The receiving device accepts the transmission as the letter ‘B’ which has the ASCII code 1000010.

What went wrong?

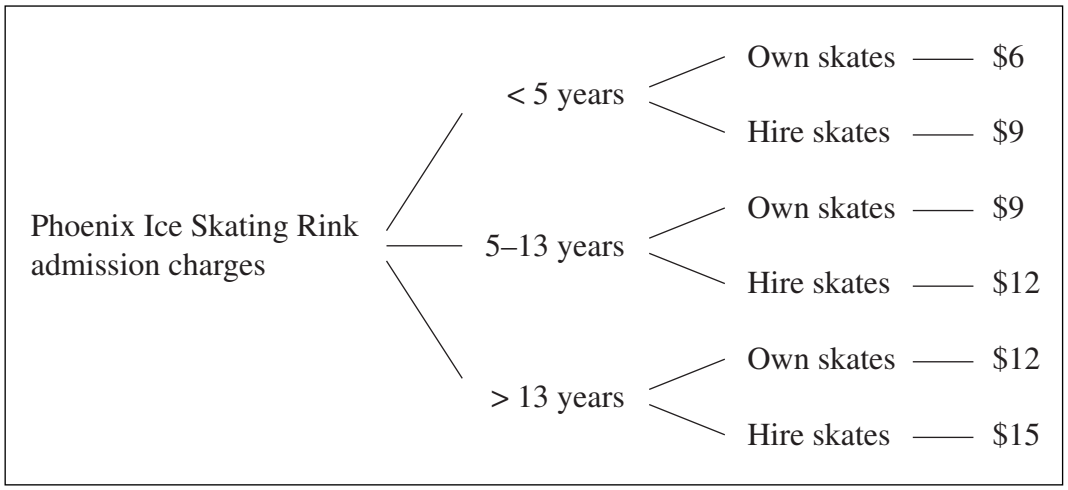
(A) Transmission was corrupt and parity check was incorrect.

(B) Transmission was corrupt and parity check was correct.

(C) Transmission was correct and parity check was correct.

(D) Transmission was correct and parity check was incorrect.

20 The following decision tree illustrates the calculation of admission charges for a public session at Phoenix Ice Skating Rink.



Based on the decision tree above, which of the following decision tables is correct for an admission charge of $12?

(A)

Conditions	*Rules*	
< 5 years	✗	✗
5–13 years	✓	✗
> 13 years	✗	✓
Hire skates	✓	✗
Actions		
Admission charge $12	✓	✓

(B)

Conditions	*Rules*	
< 5 years	✗	✗
5–13 years	✗	✓
> 13 years	✓	✗
Hire skates	✓	✓
Actions		
Admission charge $12	✓	✓

(C)

Conditions	*Rules*	
< 5 years	✗	✗
5–13 years	✓	✗
> 13 years	✗	✓
Hire skates	✗	✗
Actions		
Admission charge $12	✓	✓

(D)

Conditions	*Rules*	
< 5 years	✓	✗
5–13 years	✗	✗
> 13 years	✗	✓
Hire skates	✓	✓
Actions		
Admission charge $12	✓	✓

Section II

40 marks
Attempt Questions 21–24
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.

Marks

Question 21 (9 marks) Use a SEPARATE writing booklet.

The data dictionary shown was developed to show users the fields to be included in a database system that stores information about countries in a single table called 'Countries'.

Field name	*Type*	*Length*	*Description*
CountryName	Text	25	Name of the country
Continent	Text	15	Continent in which the country is situated
BirthRate	Text	6	Percentage value of the birth rate in the country
DeathRate	Text	6	Percentage value of the death rate in the country
LifeExpectancy	Text	6	Expected life span of the male population
Language	Text	10	Language spoken by most of the population

(a) Using the data dictionary, construct an SQL command that would display the names of countries in the continent of South America where most of the population speak Spanish. **3**

(b) Show a calculation to estimate the file size (in kilobytes) if a database with 200 records was constructed using the data dictionary. Explain what each number in the calculation represents. Do NOT calculate the answer. **3**

(c) After seeing the data dictionary, a user would like to be able to: **3**

- calculate the rate of population increase using the fields BirthRate and DeathRate;
- store information about the expected life span of the female population.

Explain the changes that would have to be made to the data dictionary to best meet the user's needs.

Marks

Question 22 (11 marks) Use a SEPARATE writing booklet.

Use the article to answer parts (a)–(c).

Awaiting Copyright Clearance

Source: *The Sydney Morning Herald*, 30 September 2003

(a) Identify the participants in the system and describe the purpose of the system. **3**

(b) Draw a diagram to show the hardware components in the pet-monitoring system, label them, and show how they are connected. **3**

(c) Explain the impact of the new system on the veterinarian's work. **5**

Marks

Question 23 (8 marks) Use a SEPARATE writing booklet.

You receive the following email and suspect that it is electronic junk mail. You have an account with the Bank of Australia that you use regularly.

From: Bankofaustralia<Billing@bankofaustralia.com>
Subject: **You Must Update Your Account**
Date: 9 November 2006 12:29:20 PM
To: s.tweak@textmail.com.au

Online Banking Alert

Security Update Information

Dear Valued Customer:

It has come to our attension that your account information needs to be updated due to inactive members, frauds and spoof reports. If you could please take 5–10 minutes out of your online experience and renew your records you will not run into any future problems with the online service. However, failure to update your records will result in account suspension. This notifikation expires on December 9, 2006.

Once you have updated your account records your Bank of Australia account service will not be interrupted and will continue as normal.

Please follow this link and update your account information:

http://www.netbank.com/custcare/details.asp

Sincerely, Bank of Australia customer trust department

Because your reply will not be transmitted via secure email, the email address that generated this alert will not accept replies. If you would like to contact Bank of Australia with questions or comments, please *sign in to Online Banking* and visit the customer service section.

(a) Identify TWO things that are suspicious about this email, and explain why each is suspicious. **4**

(b) Explain the risks associated with following the link to the website, and suggest an alternative appropriate course of action to deal with this email. **4**

Marks

Question 24 (12 marks) Use a SEPARATE writing booklet.

Build Safe, a government agency, is responsible for safety on building sites. Before builders can work on a building site, they must be certified by Build Safe. Certification lasts for five years. A new system for certifying builders is to be developed by Build Safe.

Current System	*Proposed New System*
(1) Renewal reminder letter sent by post to builder	(1) Renewal reminder sent by email to builder
(2) Builder applies in writing to Build Safe for certification	(2) Builder registers with Build Safe via its website
(3) Builder is sent written material in the post	(3) Builder application is verified by Build Safe
(4) Builder attends an examination centre to undergo a pen-and-paper test	(4) Builder is emailed a password to access secure section of Build Safe website to do test online
(5) If builder is successful in the test, a certificate is issued. Otherwise, the builder is notified of failure by post	(5) If builder is successful in the test, a certificate is issued. Otherwise, the builder is notified of failure by email

You have been employed as the project manager to oversee the development of the new system in the time frame of 6 months.

(a) The success of the new system will depend upon the support of builders and the employees of Build Safe. **3**

Describe TWO strategies you would use as project manager to negotiate with participants.

(b) In moving from the current system to the proposed new system, renewal reminders will be sent by email instead of by post. Identify and briefly describe the tasks that would need to be undertaken to develop step (1) in the proposed new system. **4**

(c) Draw a data flow diagram for the proposed new system. Show the external entity, processes, data stores and data flows. **5**

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.

Marks

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

(a) (i) Define the term *transaction*, and give TWO examples of transactions that occur in a library. **3**

(ii) Identify and describe TWO features of *online forms* to enable data collection. **3**

Question 25 continues on page 17

Question 25 (continued)

Use the following information to answer parts (b) and (c).

In 2001 the Australian Capital Territory successfully used the EVACS electronic voting system in a parliamentary election. At the polling place, a vote is processed in the following steps:

1	After a voter has his/her name marked off the electoral roll, the voter is given a voting card that has a unique barcode. The card identifies the electorate and the polling place but not the voter. It also has a digital signature to prevent forgery.
↓	
2	The voter moves to a voting booth that has a computer screen, a barcode reader and a keypad. A welcome screen displays a menu to allow the voter to choose a language for the display. The voter is then prompted to swipe the barcode to start voting. After validation, a ballot paper is displayed on the screen and the voter enters his/her choices for candidates.
↓	
3	After entering his/her choices the voter presses the 'Finish' key on the keypad. The completed ballot paper is displayed and the voter is asked to confirm his/her choices.
↓	
4	To confirm his/her final choice the voter must swipe his/her barcode again. If the barcode matches the one used to commence the vote, a confirmation screen will be displayed instructing the voter to put the voting card in a secure box as he/she leaves the polling place. If the barcode does not match the one used to commence, the voter is prompted to seek help from an attendant.
↓	
5	When the barcode is swiped the second time and a valid vote has been entered, the vote is transmitted to a virtual ballot box on a server, where it is stored.
↓	
6	After polling has finished, the data from all the virtual ballot box servers at all the different polling places are transferred to a central computer for the counting of votes.

(b) (i) Outline real-time processing and batch processing in the EVACS system, and clarify the sequence in which real-time and batch processing occur. **4**

(ii) Identify and describe security measures that could be used in the EVACS system to protect data during *storage and retrieval*. **4**

(c) Predict and explain the issues that might arise if SMS (short messaging system) votes from mobile phones were used for future parliamentary elections. In your response, you may consider aspects such as: **6**

- security
- technology
- interface design
- social issues.

End of Question 25

Marks

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

(a) (i) Define the term *data mining* and provide an example. **3**

(ii) Describe *what-if analysis*, using an example. **3**

Use the following information to answer parts (b) and (c).

> An Australian company is developing a safety product to detect when a driver of a car is likely to fall asleep. The product, called SleepCam, is to be mounted on the dashboard of the car.
>
> To estimate the positioning of the driver's eyes, SleepCam continually monitors the more easily determined position of the driver's head, detecting the ears, nose and chin. It calculates where the driver is looking by measuring the shape of the eyes. It also monitors how frequently the driver blinks, matching this data to predetermined blinking patterns that indicate a person is sleepy. From this information, the system determines the probability that the driver is falling asleep, and sounds an alarm if sleepiness is detected.

(b) (i) Determine if the SleepCam Decision Support System is being used in a structured, semi-structured or unstructured situation, and justify your answer. **3**

(ii) Identify the type of Decision Support System used to implement SleepCam, and explain how this system would *analyse* the data. **5**

(c) A large transport company is considering the use of SleepCam technology to monitor fatigue in long-distance truck drivers. **6**

Discuss implications that may arise for the company and the truck drivers. In your response you may consider aspects such as:

- potential misuses of SleepCam
- responsibility for decision making
- technology.

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Marks

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

(a) (i) Define the term *actuator* and provide an example. **3**

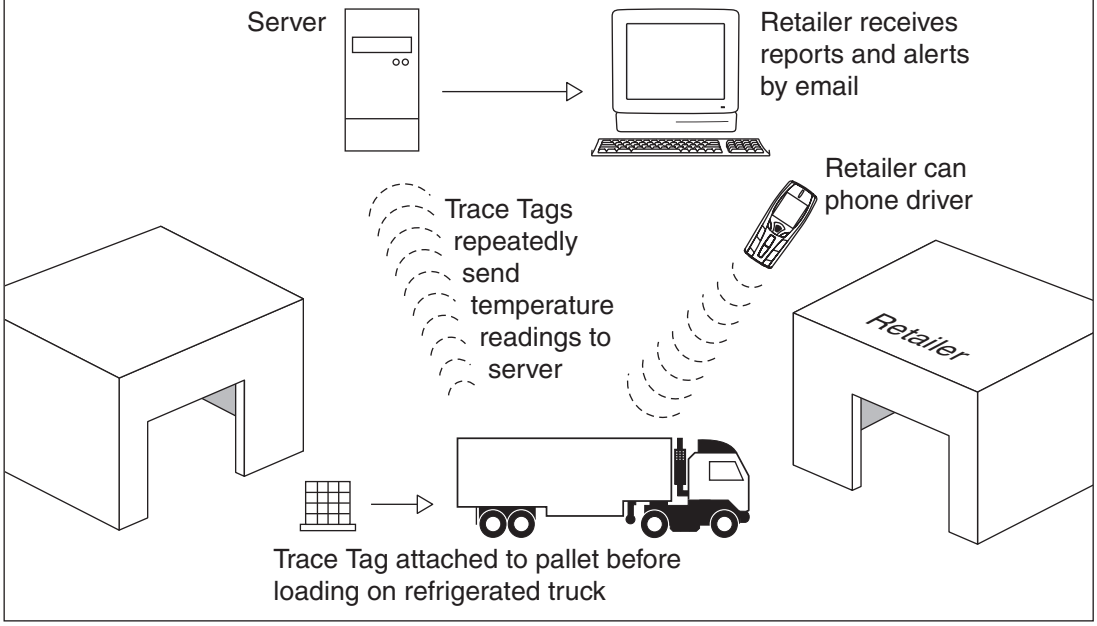
(ii) Use examples to distinguish between *batch* and *continuous processing* in automated manufacturing systems. **3**

Use the following information to answer parts (b) and (c).

Trace Tag is a system that monitors perishable goods in transit using a tag the size of a credit card. Tags are attached to pallets of goods. The tags have onboard sensors for light, temperature and other measures, enabling real-time capture of data. The low cost, disposable tags use radio frequencies to transmit data to a server.

Using the tags, manufacturers and retailers can monitor the temperature of goods in transit.

This diagram shows the use of Trace Tag by a group of organisations trading cold produce, such as meat and dairy products.



(b) (i) Identify the technologies required, and describe how they operate to get temperature information from the pallets to the server. **4**

(ii) The system shown in the diagram requires the driver to stop and make adjustments to the refrigeration unit if there are any problems. Discuss the problems that arise from this system, and propose possible technological improvements to the design. **4**

Question 27 continues on page 21

Marks

Question 27 (continued)

(c) Compare and contrast Trace Tag and barcode technologies for the purposes of automating inventory tracking and control. In your response you may consider aspects such as: **6**

- quality control
- monitoring of acceptable tolerance ranges
- costs and productivity gains
- data management.

End of Question 27

Please turn over

Marks

Question 28 — Multimedia Systems (20 marks)
Use a SEPARATE writing booklet.

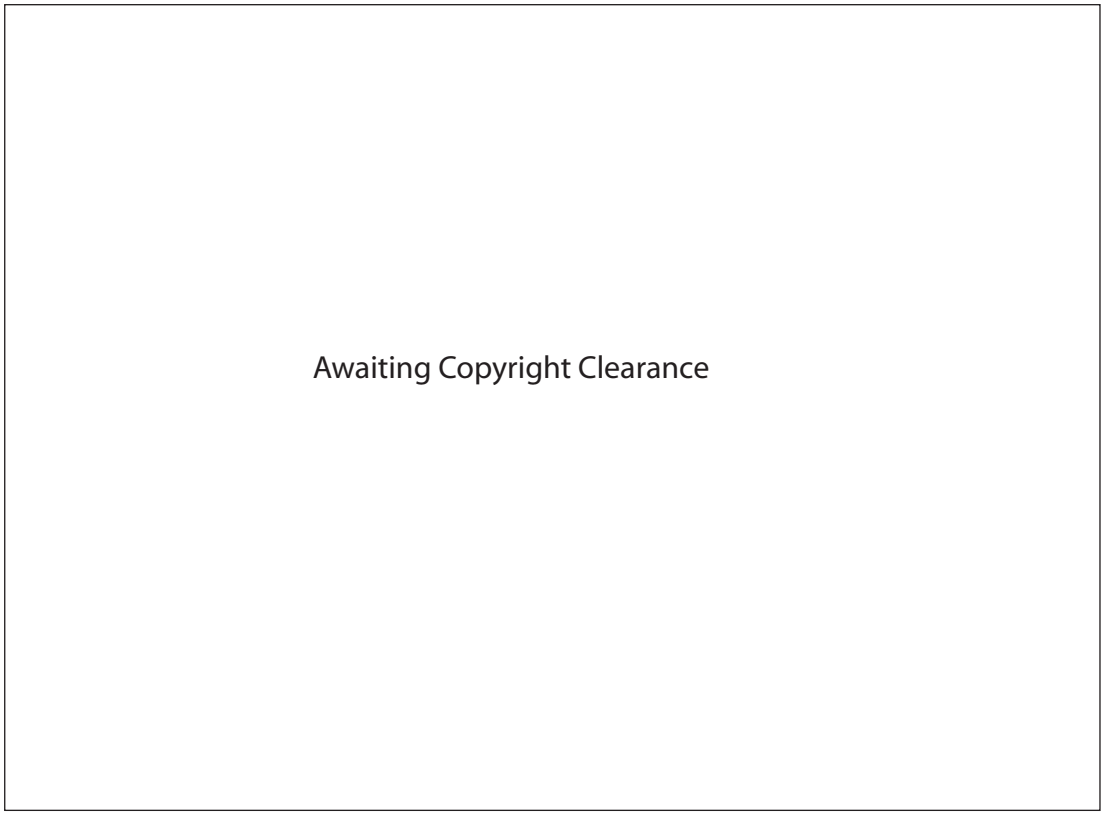
(a) (i) Define the term *virtual reality* and give an example of its use. **3**

(ii) Use an example to describe how *simulations* are used in education and training. **3**

Use the following information to answer parts (b) and (c).

A major area of multimedia use is in the provision of information. A personal GPS (global positioning system) device provides interactive multimedia navigation. GPS is a satellite navigation system for determining one's precise location almost anywhere on Earth.

Navmap incorporates a variety of features to display different types of information, and the receiver allows you to interact with the GPS satellite system.



(b) (i) Identify information technologies used for *displaying* information in Navmap, and justify the inclusion of each. **4**

(ii) Describe how image and audio data are compressed, and explain the importance of compression in Navmap. **4**

Question 28 continues on page 23

Marks

Question 28 (continued)

(c) Compare and contrast navigation with printed maps to navigation with Navmap. **6**
In your response you may consider aspects such as:

- technologies
- quality of information
- impacts on users.

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