BOARD OF STUDIES
NEW SOUTH WALES

2001

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 2–12

20 marks

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

(**Section II**) Pages 13–19

40 marks

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

(**Section III**) Pages 20–24

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

A ◯   B ⬤   C ◯   D ◯

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

A ⬤   B ✖   C ◯   D ◯

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.

correct

A ✖   B ✖   C ◯   D ◯

1 An organisation needs to store staff manuals, forms and policy information to allow online access for employees.

What would be the most appropriate form of storage to use?

(A) Hypermedia

(B) Filing cabinet

(C) Flat-file database

(D) Relational database

2 A student locates information on the World Wide Web, at the following address:

http://edweb.optics.crc.org.au/fibres/fabrication.htm

The student saves the web page for later viewing, accepting the default name suggested by the browser.

Which of the following is most likely to identify the saved file when the student attempts to locate it at a later time?

(A) document1.htm

(B) fabrication.doc

(C) fabrication.htm

(D) fibres/fabrication.htm

3 Which of the following design tools shows the movement of information in an information system?

(A) Decision table

(B) Context diagram

(C) System flowchart

(D) Data flow diagram

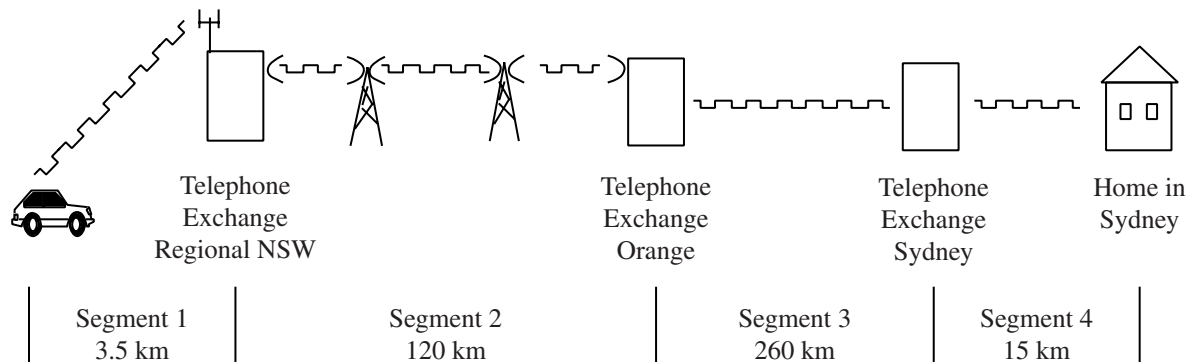**4** What does a database schema consist of?

(A) Records, entities and attributes

(B) Relationships, entities and attributes

(C) Relationships, attributes and fields

(D) Relationships, entities and files

5 In developing an information system last year, the Australian Taxation Office used data collected by the Electoral Commissioner. This data included name, address, gender and birth date. The Solicitor-General intervened during the development of the project to prevent this information being used.

What issue would the Solicitor-General be concerned about in this situation?

(A) Acknowledgement of data sources

(B) Freedom of Information Act

(C) Privacy principles

(D) Reliability of data sources

6 A passenger in a car travelling in country New South Wales phones a friend in Sydney. The diagram shows how the call could be transmitted through the telephone system.

| Segment 1 | Segment 2 | Segment 3 | Segment 4 |
| 3.5 km | 120 km | 260 km | 15 km |

What transmission media, in order from Segment 1 to Segment 4, would be most appropriate?

(A) Microwave, microwave, optic fibre, twisted-pair cable

(B) Radio, microwave, optic fibre, twisted-pair cable

(C) Radio, radio, twisted-pair cable, coaxial cable

(D) Radio, microwave, twisted-pair cable, coaxial cable

7   What is the meaning of the term *baud rate*?

(A)   The number of bits that can be transmitted along a communications channel every second.

(B)   The full range of frequencies that a communications channel is capable of transmitting.

(C)   The full range of frequencies that can be transmitted along a communications channel every second.

(D)   The number of electronic signals or data symbols that can be transmitted along a communications channel every second.

8   A systems professional works with participants to identify the requirements of a system. Based on these requirements, the following screen is developed:
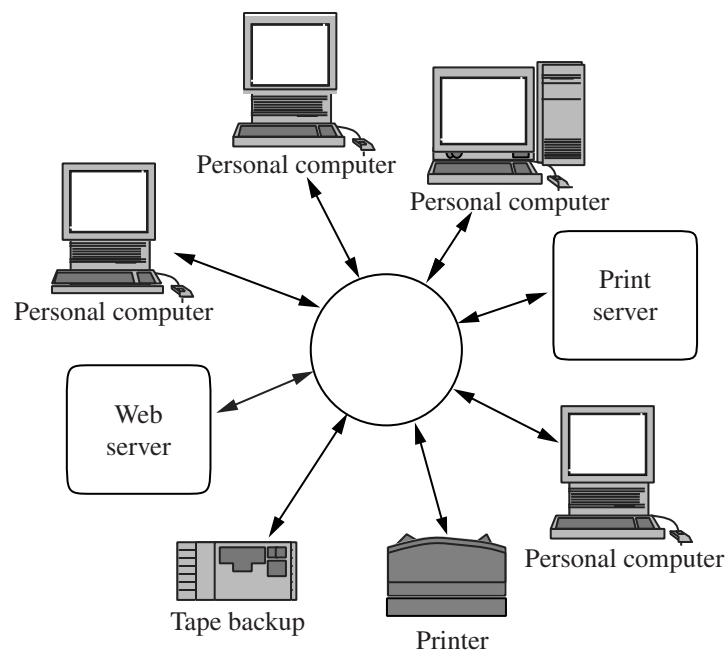
```
+----------------------------------+
|          UTILITY COSTS           |
|                                  |
|   Usage rate:                    |
|        Cost:                     |
|                                  |
+----------------------------------+
```

Following participant feedback, the screen is modified to the following:

```
+----------------------------------+
|      UTILITY USAGE PROFILE       |
|                                  |
|  Department:                     |
|        Date:                     |
|                                  |
|    Usage rate:                   |
|         Cost:                    |
|  Cost to date:                   |
+----------------------------------+
```

What is the most accurate description of this activity?

(A)   Developing a project plan

(B)   Information strategy planning

(C)   Participant development

(D)   Prototype modification

9   What type of network is shown in the diagram?

- (A)   Bus
- (B)   Star
- (C)   Local area
- (D)   Wide area

10   Which of the following is NOT an example of metadata?

- (A)   Data dictionary
- (B)   Data flow diagram
- (C)   HTML tags
- (D)   Schema

11 A teacher whose students are located in remote areas of Australia uses reliable electronic mail and facsimile to communicate with them.

What disadvantage would this have for the communication between teacher and students?

(A) Errors may occur in the messages because the teacher will not be able to check the messages after sending them.

(B) Messages from the teacher may arrive too late for the time scheduled for the students and teacher to communicate.

(C) The information in the message could not be explained if students are unclear about the tasks that they are required to complete.

(D) Messages might be misinterpreted because the teacher's facial expressions and body language cannot be seen by the students.

12 A local community group decides to produce a monthly newsletter.

This is the Gantt chart the group uses.

TASK NO	TASK NAME	DAYS									
		MON	TUE	WED	THUR	FRI	MON	TUE	WED	THUR	FRI
0	Start										
1	Establish brief	■									
2	Write stories		■	■	■						
3	Design graphics		■								
4	Gather photos		■	■							
5	Desktop publish					■	■				
6	Proof							■			
7	Edit and finalise								■		
8	Print									■	

How many days will elapse in the completion of tasks 2, 3 and 4?

(A) 3 days

(B) 4 days

(C) 6 days

(D) 7 days

13   Students are simulating the way that a network deals with multiple users accessing the network. They are sitting in a circle, with their eyes closed, obeying the following two rules:
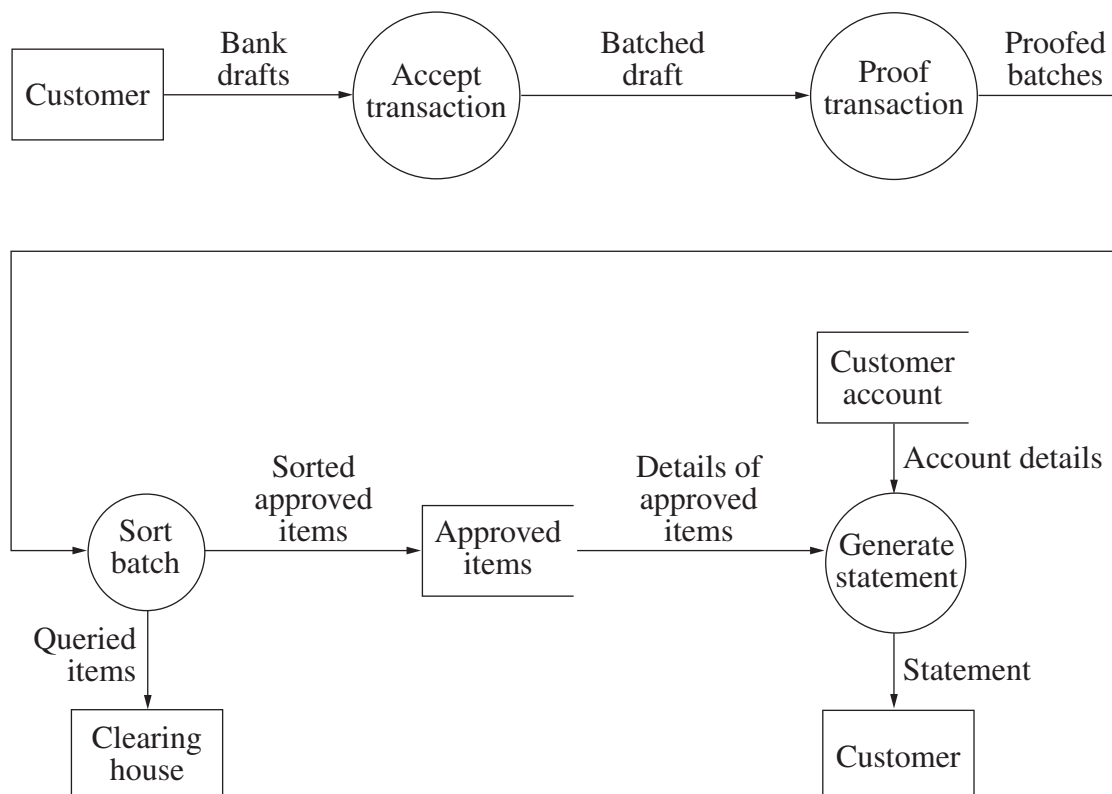
- No-one can talk when someone else is talking.

- If someone starts talking at the same time as someone else, both must stop talking and wait between two and five seconds before they may try talking again.
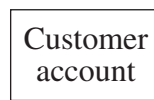
Which topology would use the protocol they are simulating?

(A)   Bus

(B)   Star

(C)   Hybrid

(D)   Token Ring

Use the diagram to answer Questions 14 and 15.
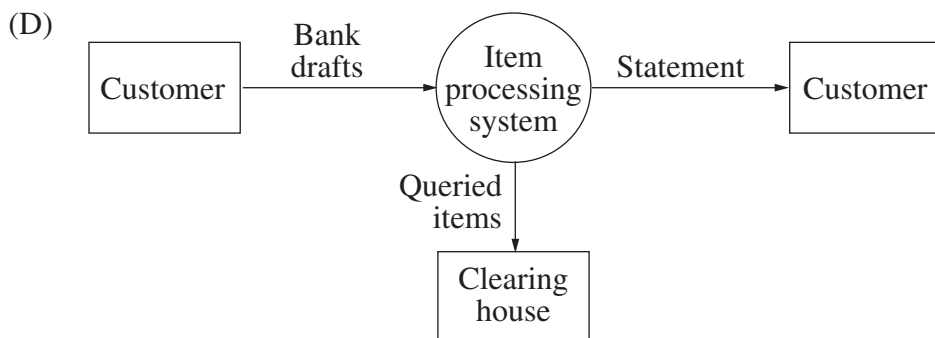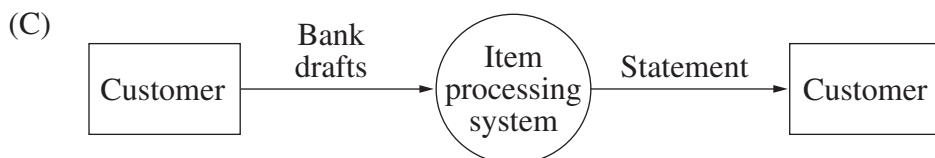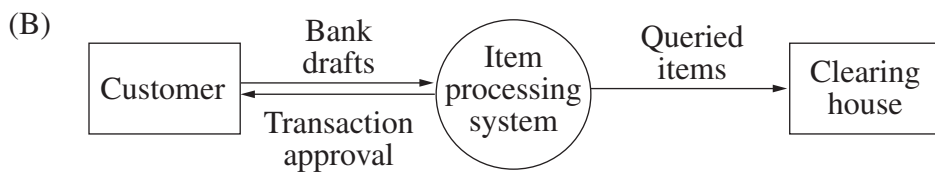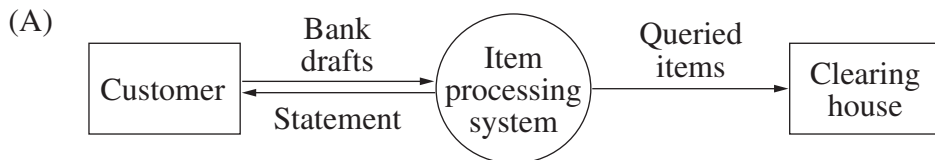
This diagram is used in designing an information system.

14 The following symbol appears in the diagram on page 8.

```
┌──────────┐
│ Customer │
│ account  │
└──────────┘
```

What does this symbol represent?

(A) A process

(B) A data flow

(C) A data store

(D) An external entity

15 Which of the following is the correct context diagram for the system?

(A)

(B)

(C)

(D)

Use the following information to answer Questions 16 and 17.

A university keeps staff data in this database table:

FACULTY

FACID	FAC_NAME	DEPARTMENT	GENDER	SALARY
J01	RAYMOND J JAAFAR	I.T.	MALE	60 000
S01	LYNETTE SIMON	I.T.	FEMALE	65 000
D01	ANDREA D'CRUZ	I.T.	FEMALE	54 500
S02	DIB SURANYI	HISTORY	MALE	48 000
K01	LE HAN KWOK	ACCOUNTING	FEMALE	55 000

16 The following SQL statement is used to select data:

SELECT FACID, FAC_NAME

FROM FACULTY

WHERE SALARY > 55 000 AND SALARY < 50 000

Which of the following sets of data will be retrieved?

(A)

FACID	FAC_NAME

(B)

FACID	FAC_NAME
J01	RAYMOND J JAAFAR
S01	LYNETTE SIMON
S02	DIB SURANYI

(C)

FACID	FAC_NAME	SALARY
J01	RAYMOND J JAAFAR	60 000
S01	LYNETTE SIMON	65 000
S02	DIB SURANYI	48 000

(D)

FACID	FAC_NAME	DEPARTMENT	GENDER	SALARY
J01	RAYMOND J JAAFAR	I.T.	MALE	60 000
S01	LYNETTE SIMON	I.T.	FEMALE	65 000
S02	DIB SURANYI	HISTORY	MALE	48 000

17 Details about each of the courses taught by each staff member need to be added to the database.

Which of the following changes will allow this to happen while minimising data redundancy?

(A) Add a field

(B) Add independent metadata

(C) Add a table with a foreign key

(D) Add a table with a primary key

18 An analysis of the criteria for the award of certificates resulted in this decision table.
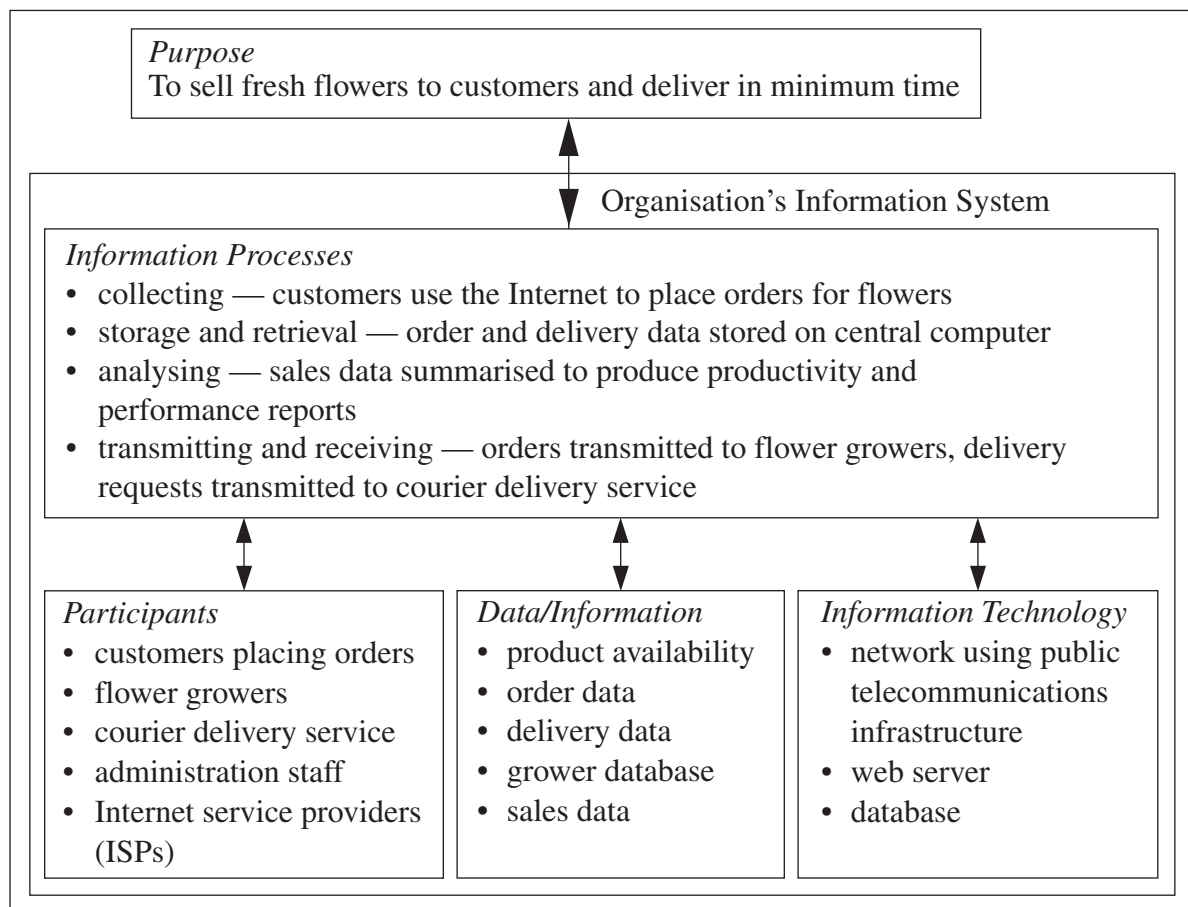
Conditions	Rules										
Junior subjects completed ≥ 6	✓	✓	✓	✓	✓	✓	×	×	×	×	×
Senior subjects completed = 5	×	×	✓	✓	×	×	×	×	✓	×	×
Senior subjects completed > 5	✓	✓	×	×	×	×	✓	✓	×	×	×
Special subjects completed > 1	✓	×	×	✓	×	✓	✓	×	×	×	✓
Actions											
Issue junior certificate	✓	✓	✓	✓	✓	✓	×	×	×	×	×
Issue senior certificate	✓	✓	✓	×	×	×	×	×	×	×	×
Issue certificate of attainment	×	×	×	✓	✓	✓	×	×	×	×	×

Which of the following conditions will result in a certificate of attainment being issued?

(A) Completion of less than six junior subjects and more than five senior subjects

(B) Completion of at least six junior subjects and less than five senior subjects

(C) Completion of at least six junior subjects and exactly five senior subjects and one special subject

(D) Completion of less then six junior subjects and exactly five senior subjects and one special subject

Use this information to answer Questions 19 and 20.

The diagram represents the information system of an organisation.

Purpose
To sell fresh flowers to customers and deliver in minimum time

Organisation's Information System

Information Processes
- collecting — customers use the Internet to place orders for flowers
- storage and retrieval — order and delivery data stored on central computer
- analysing — sales data summarised to produce productivity and performance reports
- transmitting and receiving — orders transmitted to flower growers, delivery requests transmitted to courier delivery service

Participants
- customers placing orders
- flower growers
- courier delivery service
- administration staff
- Internet service providers (ISPs)

Data/Information
- product availability
- order data
- delivery data
- grower database
- sales data

Information Technology
- network using public telecommunications infrastructure
- web server
- database

19 The diagram was created during analysis of the information system. What do the arrows on the diagram represent?

(A) Hyperlinks between storyboards

(B) The flow of data between the related components

(C) Two-way interactions between the related components

(D) Full duplex telecommunication between the related components

20 Which of the following does this diagram most accurately represent?

(A) The information system of an online library

(B) The information system of a virtual organisation

(C) The information system of a telecommuting organisation

(D) The information system of a communications service provider

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.

Question 21 (10 marks)

Please turn over

Question 21 (10 marks) Use a SEPARATE writing booklet.

Country Wide Couriers (CWC) delivers packages to locations around Australia. Its customers are Australian businesses who want packages delivered quickly. CWC had a problem answering customers' enquiries about progress of package delivery because once a package left CWC's depot it was not possible to determine where a package was or when it would be delivered.

To address the problem, CWC introduced a package-tracking system to track the progress of a package at every stage of delivery.

To do this:

- Information from a unique bar-code label attached to each package is collected using a hand-held scanner each time the package is handled, such as when the package is collected by a driver, when a package reaches a distribution centre, when a package is placed on a plane, and when a package is delivered.

- Data from the hand-held scanners is transmitted to the head office and updated in a database when the scanner is placed in a docking station in a delivery truck or distribution centre.
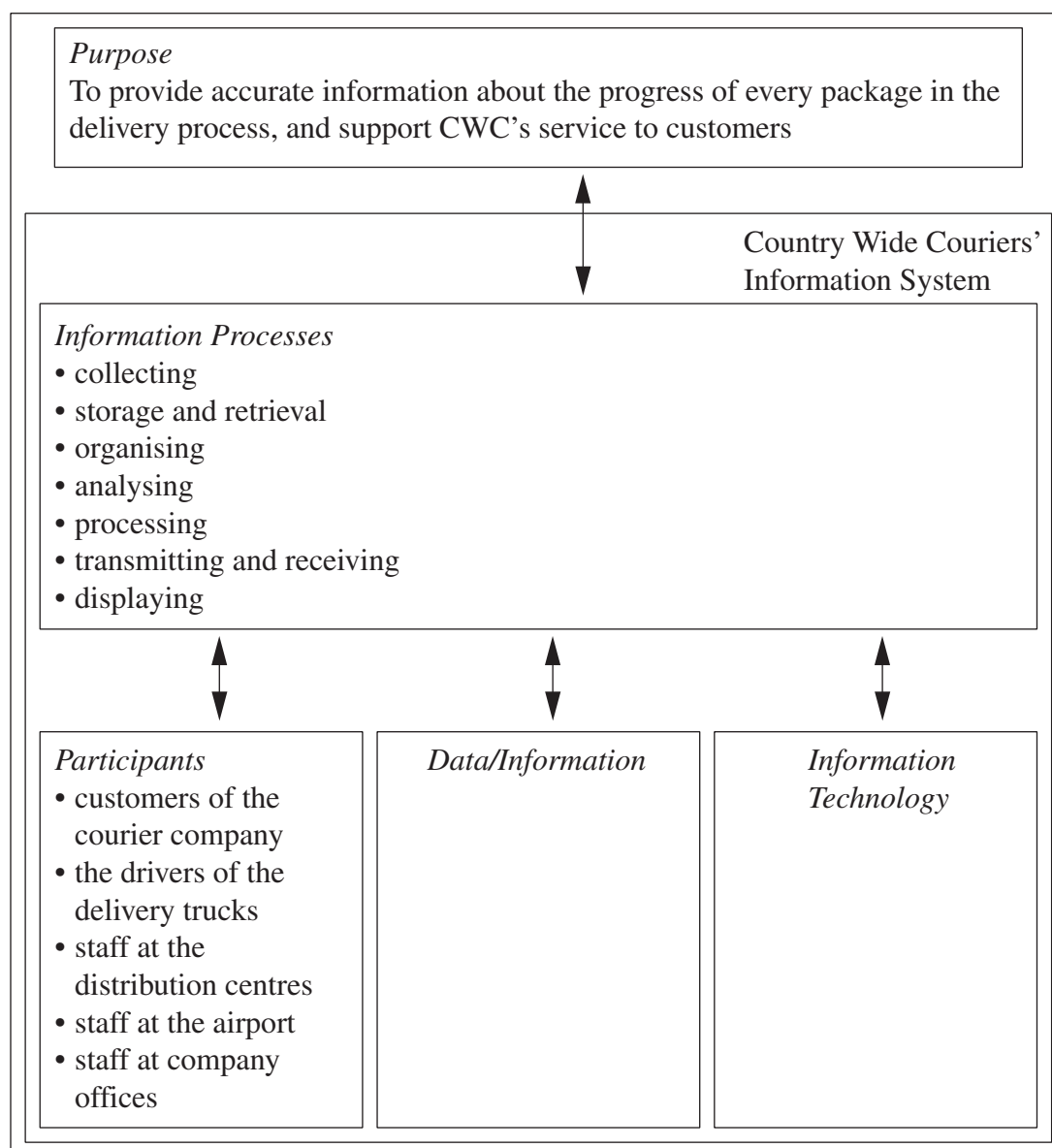
Customers can connect to the website of CWC and check the progress of their package. Delivery times and costs for different destinations are also available on CWC's website, along with the facility to request that a package be collected for delivery.

Customers who do not have Internet access can phone CWC offices to make enquiries, or to request that a package be collected.

The diagram on page 15 summarises some aspects of the information system used by CWC.

Question 21 (continued)

Purpose
To provide accurate information about the progress of every package in the delivery process, and support CWC's service to customers

Country Wide Couriers'
Information System

Information Processes
• collecting
• storage and retrieval
• organising
• analysing
• processing
• transmitting and receiving
• displaying

Participants	*Data/Information*	*Information Technology*
• customers of the courier company • the drivers of the delivery trucks • staff at the distribution centres • staff at the airport • staff at company offices		

(a)   In the package-tracking data collection process, identify the participants, how data is collected, and where it is stored.   **3**

(b)   Explain TWO ways in which the package-tracking system improves service to customers.   **3**

(c)   Analyse the main components in the package-tracking system that are involved in transmitting and receiving data. Your answer must include the main components, appropriate transmission media and the direction of transmissions. A diagram may be used in your answer.   **4**

End of Question 21

Question 22 (9 marks) Use a SEPARATE writing booklet.

Urbanville Medical Centre (UMC) is a small medical practice that prides itself on maintaining patient records that are accurate, up-to-date and detailed. The doctors at UMC believe that quality information will allow them to make informed diagnoses and provide quality patient care. UMC currently has a local area network that allows the receptionist to schedule consultations, and doctors to access and edit patient records in their consultation rooms.

Although the doctors currently have access to detailed text records, they also want online access to images used in diagnosis, such as X-rays, ultrasounds, and other high quality, colour-enhanced images.

(a)   Explain ONE advantage and ONE disadvantage of the computerised information system used at UMC when compared to medical practices that use paper-based records.   **2**

(b)   Discuss the technology issues relating to the storage and retrieval, and display of images in the information system.   **4**

Question 22 (continued)

(c)   The screen-shots show the screens accessed and used by the receptionist and by   **3**
the doctors. Explain why the receptionist and doctors would have different
views of the data.

Receptionist's screen

Doctors' screen

End of Question 22

Question 23 (9 marks) Use a SEPARATE writing booklet.

A group of high school students plan to supplement their income by running an Internet-based business to assist other students with their schoolwork and assignments.

The business aims to provide after-school online tutorial support, e-mail support, a news group, access to a large collection of electronic books, teacher notes, student assignments and computer software. Ideally, the business should commence operation at the beginning of the next school year.

Fees will be charged on the basis of access time and frequency of use. These fees will be collected online.

(a) The group is conducting a feasibility study for the development of an information system to support its planned new business. Identify and describe the criteria it should consider. **4**

(b) Analyse the business initiative from social and ethical perspectives. **5**

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

Madison is a large department store chain with its own credit card. Madison makes extensive use of networks to transmit data. As a part of its business, Madison has over 100 000 credit card holders. In administering these credit card accounts, Madison accumulates vast quantities of data in its accounting system. This data includes items such as:

- customer name, age, address and income bracket

- description and price of item purchased
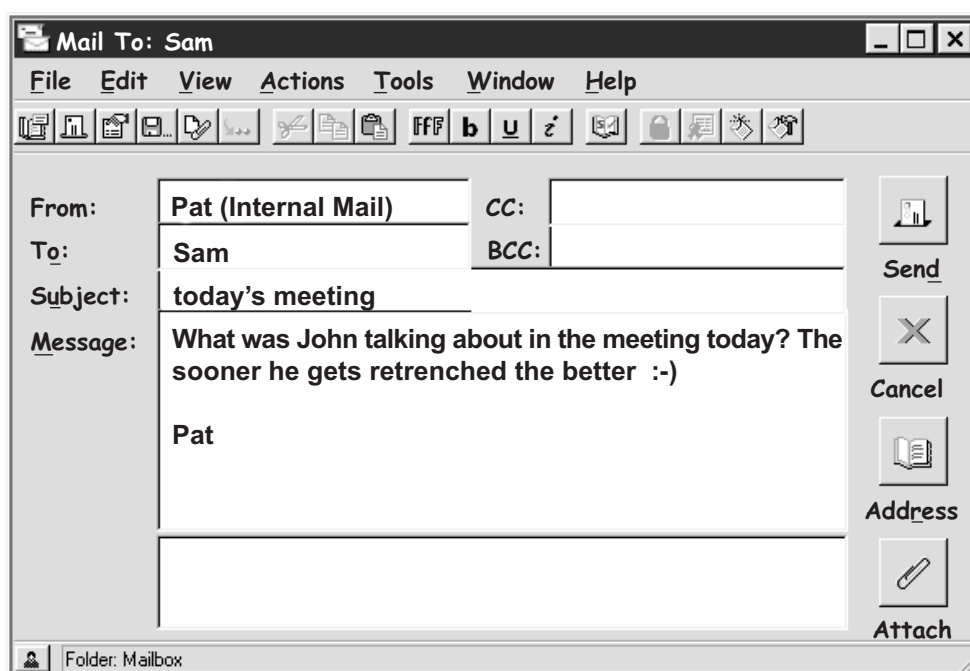
- location of store from which the item was purchased.

(a) Identify and describe the operation of TWO methods of error detection that could be used to help check for errors in Madison's communications links.   **3**

(b) Madison has not yet developed an effective way of using its data to advance its business.   **4**

Identify and outline TWO new trends in processing, organising, storing and retrieving data that could provide a solution for the company. Demonstrate the way that each of these TWO new trends might be applied to Madison.

(c) Pat, John and Sam are all employees of Madison. Pat and Sam both have their own internal company e-mail accounts; John does not. Pat sent Sam the e-mail message below.   **5**

Analyse the messaging issues that are relevant to this situation.

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)   Discuss the advantages of a 'grandfather, father, son' backup procedure. **2**

       (ii) Many organisations establish alternative procedures to deal with transactions when the computer is not available. Explain why these alternative procedures should be tested periodically. **2**

Question 25 (continued)

(b)   Country Bakers produces a wide variety of delicious pies made with fresh fruit. Each variety of pie is 'seasonal' as it is only made when the fruit is in season.

Some time ago Country Bakers established a website to advertise its pies and provide information about placing orders via the telephone, facsimile and e-mail. Since the establishment of the website, the number of orders received has increased markedly.

All orders received are entered into the Sales System. The Sales System processes all transactions relating to sales and stock, and maintains customer and stock databases.

A number of problems have arisen with the increase in orders:

- Staff are having trouble finding enough time to enter all the additional orders.

- Many of the orders received by e-mail and facsimile require changes as they include pies that are out of season. In these cases the customer has to be contacted, significantly slowing the fulfilment of orders.

- Many customers pay for the orders by credit card. Each of these payments is currently processed manually, which is time consuming and error prone.

The manager of Country Bakers is very happy with the increase in business, but wonders if the website could be used to solve the problems that have arisen from the increased number of orders.

(i)   Propose and justify ways in which the website could be modified or extended to address the current problems.   **3**

(ii)   Discuss the issues that may arise from your proposed modifications or extensions to the website.   **5**

(c)   Online banking allows customers to access account details, transfer funds between their accounts and make payments over the Internet. A number of banks have introduced a new facility that allows customers to transfer funds to accounts at other banks.   **8**

Critically analyse the data accuracy, security and integrity issues that arise from the introduction of this new facility.

End of Question 25

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

(a)   (i)   Explain the use of absolute and relative references in spreadsheets.   **3**

(ii)   Discuss the advantages and disadvantages of the use of macros in spreadsheet processing.   **3**

(b)   An expert system that gives advice on possible careers for school leavers has replaced a database of career information. The expert system collects information about students and then uses that information to offer advice on their career choices. For example, a student with good results in Information Processes and Technology and an interest in design might be advised by the system to follow a career in web design.

(i)   For the student described in the example, demonstrate what would form part of the *knowledge base*, and what would form part of the *database of facts*.   **2**

(ii)   Compare the use of an expert system for this application for careers advice to the use of a database for the same purpose.   **4**

(c)   The departmental managers of Big Corp meet once a month to review the previous month's performance, and discuss plans and activities for the coming month.   **8**

In the past these meetings have been ineffective for different reasons, including:

• conflict between various departments of Big Corp

• lack of agreement about Big Corp business priorities

• lack of interest and involvement of some managers

• bullying of junior managers by senior managers

• general lack of coordination and leadership of the meeting

• poor distribution of material needed prior to the meeting

• poor access to information during the meeting.

Critically analyse the ways in which Group Decision Support Systems (GDSS) would assist Big Corp's planning and decision making, and improve the meeting process.

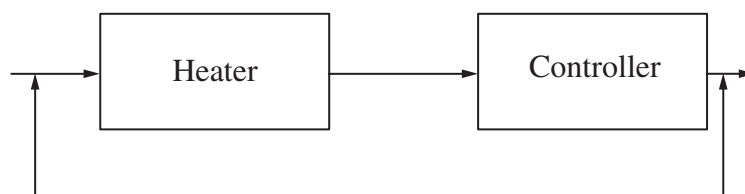**Question 27 — Automated Manufacturing Systems** (20 marks)
        Use a SEPARATE writing booklet.

(a)   (i)   Using examples, distinguish between discrete, continuous and batch   **3**
             automated manufacturing systems.

    (ii)   Define CAD and CAM, and explain the relationship between them in an   **3**
             automated manufacturing system you have studied.

(b)   The basic steps in ice cream manufacture are generally:

- blending ingredients
- pasteurisation
- homogenisation
- chilling
- packaging.

After blending the ingredients, the ice cream mixture is pasteurised. This is done by heating the mixture to 69°C for 30 minutes so that harmful bacteria are destroyed. While the mixture is still at 69°C, it is homogenised by high pressure. The mixture then has to flow across a heat exchanger so that it can be chilled to 4°C.

    (i)   Identify and describe how ONE sensor and ONE actuator may be used   **3**
             in an automated manufacturing system for the production of ice cream.

    (ii)   This block diagram was developed to represent the subsystem of   **3**
             pasteurisation, but it contains errors.

             Redraw the diagram in your writing booklet so that it is correct.

(c)   Mass customisation is a term used to describe a delivery process through which   **8**
mass-produced goods and services are individualised to satisfy a very specific customer need. It is made possible through the combination of digital information and mass production.

Name a product suitable for mass customisation, and critically analyse the information processes and technologies involved in its production and delivery.

Please turn over

– 23 –

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

(a)   Describe

    (i)   audio compression;   **2**

    (ii)   video compression.   **2**

(b)   The Complete Knowledge Company has, for some years, published a printed encyclopedia. More recently the company also started publishing a CD-ROM version of the encyclopedia.

    (i)   Outline FOUR key roles of people involved in the design of the CD-ROM version of the encyclopedia.   **4**

    (ii)   There is an article in the CD-ROM version that contains an animation of a falling object. Either path-based or cel-based animation could be used for the animation. Evaluate the appropriateness of applying EACH of these technologies to this animation.   **4**

(c)   The World Wide Web makes widespread use of multimedia. A number of existing information technologies support this use. There are also several emerging information technologies that will allow increased use of multimedia on the World Wide Web.   **8**

Critically analyse BOTH existing and emerging information technologies relevant to the use of multimedia on the World Wide Web.

End of paper