2002

HIGHER SCHOOL CERTIFICATE
EXAMINATION

Information Processes and Technology

Total marks – 100

(**Section I**) Pages 2–11

20 marks

• Attempt Questions 1–20

• Allow about 40 minutes for this section

(**Section II**) Pages 12–16

40 marks

• Attempt Questions 21–24

• Allow about 1 hour and 10 minutes for this section

(**Section III**) Pages 17–25

40 marks

• Attempt TWO questions from Questions 25–28

• Allow about 1 hour and 10 minutes for this section

General Instructions

• Reading time – 5 minutes

• Working time – 3 hours

• Write using black or blue pen

• Draw diagrams using pencil

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.
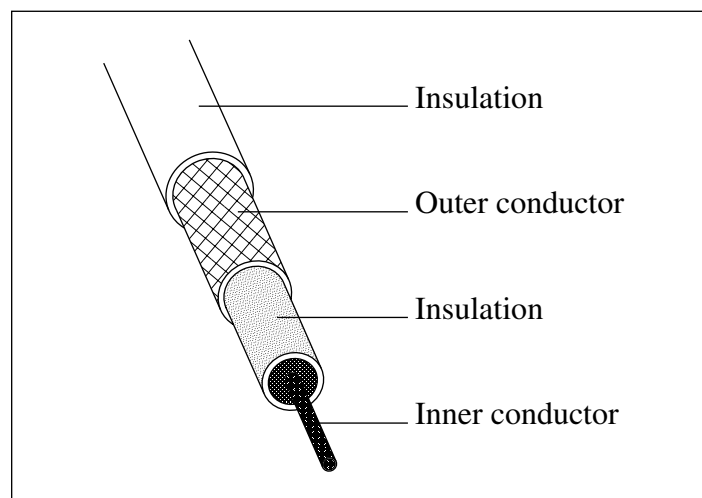
correct

A ✖   B ✖   C ◯   D ◯

1 When developing a new system, a project team needs to carry out a series of interviews with the system participants.

Which is the most important set of skills to ensure effective data gathering?

(A) Negotiation skills

(B) In-depth technical skills

(C) Conflict resolution skills

(D) Question preparation skills

2 What type of cable is shown in this diagram?

(A) Coaxial

(B) Fibre optic

(C) Shielded twisted pair

(D) Unshielded twisted pair

3 Hypermedia, by its very nature, CANNOT be transferred to

(A) an optical disk.

(B) another computer.

(C) a paper document.

(D) a computer network.

4   Which of the following storage media does NOT support direct access to data?

    (A)   Magnetic tape

    (B)   Magnetic disk

    (C)   Optical disk

    (D)   CD-ROM

5   Which of the following best describes a network operating system?

    (A)   Hardware needed for the operation of a network

    (B)   A configuration of devices to support network operation

    (C)   Software used to protect microcomputers on a network from virus infection

    (D)   Software that controls network communications and the sharing of resources

6   Which of the following would be a primary consideration when determining the economic feasibility of a proposed solution?

    (A)   The availability of suitable hardware and software

    (B)   The time taken to implement the proposed solution

    (C)   Whether users will be able to operate the proposed solution

    (D)   The purchase costs of new hardware required for the proposed solution

7   An organisation stores large amounts of data, collected by its transaction processing system, in a data warehouse.

How would the data warehouse be most effectively used?

    (A)   Storing data for everyday transaction processing

    (B)   Providing a storage facility for the organisation's products

    (C)   Mining the data to find trends that identify marketing opportunities

    (D)   Preparing summary reports to help managers make marketing decisions

**8**   Which of the following is the best description of the network shown?
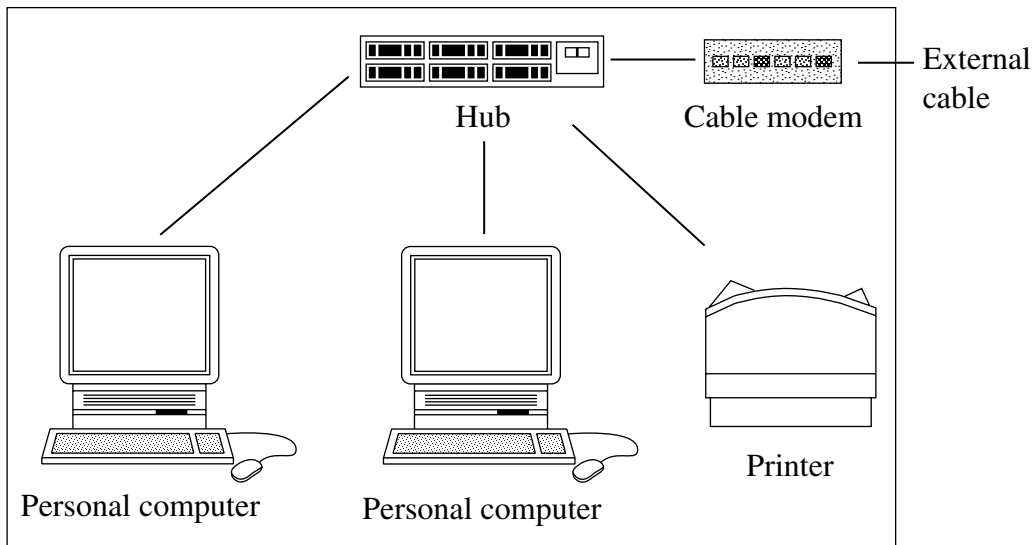
(A)   An intranet that has strong security and a cable modem to protect against access by off-site users

(B)   A small network that allows users to share files and a printer, and to access the internet using a cable modem

(C)   A wide area network for a small business that allows online ordering of products from suppliers via the internet, and sharing of a printer and file server

(D)   A local area network for a small business with a dedicated file server that allows sharing of database application software, online tape storage and a printer

9   A medical service has implemented an information system to collect and organise the personal information of patients.

Which of the following is NOT an ethical practice in the management of the information system?

(A)   Information about patients is kept secure.

(B)   Information about patients is made available to drug companies.

(C)   The medical service obtains the patients' consent to collect their information.

(D)   The medical service uses the information only for the reason it was collected.

10 Which information system development approach is best described by the diagram?
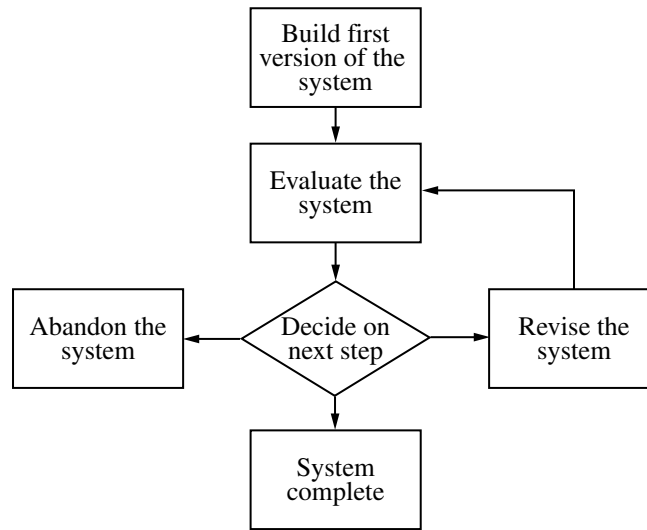
(A) Prototyping

(B) Phased approach

(C) Feasibility study

(D) End-user development

11 A cat owner wants to use an internet search engine to find sites about cat health. However, many internet sites on cat health also contain information about dogs.

Which of the following would best narrow the search so that the search engine lists sites that have information focusing on cat health?

(A) +cat +dog

(B) +cat −dog

(C) +cat +health −dog

(D) +cat +health +dog

12 The following reply was received by a student who sent an email to a friend.

```
Date: Thu, 24 Oct 2002 11:44:05 +1100 (EST)
From: Mail Delivery Subsystem <MAILER-DAEMON>
To: <hsc.student@school.edu.au>
MIME-Version: 1.0
Subject: Returned mail: see transcript for details
Auto-Submitted: auto-generated (failure)

  ----- The following addresses had permanent fatal errors -----
<pete.hindler@hotmail.com>

Final-Recipient: RFC822; pete.hindler@hotmail.com
Action: Failed
Status: 5.0.0
Diagnostics-Code: SMTP; 554 delivery error: dd This user doesn't
have a hotmail.com account (pete.hindler@hotmail.com)

  ----- message -----
Hi Peter

Chris is going to meet us at the cinemas on Friday at 6:30pm.
```

What should the student do to ensure that the email is sent successfully to the friend?

(A) Re-send the message to pete.hindler@hotmail.com

(B) Create a new message and send it to the same email address

(C) Save the message and re-send it later to hsc.student@school.edu.au

(D) Re-send the message after checking and correcting the email address

13 Which of the following activities would occur when developing a project plan?

(A) Detailing the time frame of the project

(B) Determining the nature of the problem

(C) Determining if project objectives have been met

(D) Documenting the economic and technical feasibility of the project

Use this table to answer Questions 14 and 15.

A real estate agency has the following rental properties in its database:

Properties

Address	Rent	Type	Branch
19 Blewett St, Hurstville	270	House	Hurstville
17 Bevan Pl, Padstow	260	Flat	Bankstown
16 Gilchrist Dr, Allawah	250	Flat	Hurstville
43 Hayden Pl, Revesby	210	Townhouse	Hurstville
99 Waugh St, Hurstville	200	House	Bankstown

14 What would be the output from the following SQL statement?

SELECT   Address, Branch   FROM Properties   WHERE Branch = "Hurstville";

(A)

Address	Rent	Type	Branch

(B)

Address	Rent	Type	Branch
19 Blewett St, Hurstville	270	House	Hurstville
16 Gilchrist Dr, Allawah	250	Flat	Hurstville
43 Hayden Pl, Revesby	210	Townhouse	Hurstville

(C)

Address	Branch
19 Blewett St, Hurstville	Hurstville
99 Waugh St, Hurstville	Bankstown

(D)

Address	Branch
19 Blewett St, Hurstville	Hurstville
16 Gilchrist Dr, Allawah	Hurstville
43 Hayden Pl, Revesby	Hurstville

15 A family wants to find a place to live where the rent is no more than $250. Both houses and flats would be suitable.

Which of these SQL statements will list suitable properties?

(A) SELECT   Address   FROM   Properties
          WHERE Type = "House" AND Type = "Flat" AND Rent <= 250;

(B) SELECT   Address   FROM   Properties
          WHERE Type = "House" OR Type = "Flat" OR Rent <= 250;

(C) SELECT   Address   FROM   Properties
          WHERE (Type = "House" AND Type = "Flat") OR Rent <= 250;

(D) SELECT   Address   FROM   Properties
          WHERE (Type = "House" OR Type = "Flat") AND Rent <= 250;

16 Protocols must be able to manage two computers on a network trying to send data at the same time.

How do the Token Ring protocol and the Ethernet protocol manage this?

(A) Token Ring detects collisions, Ethernet detects collisions.

(B) Token Ring avoids collisions, Ethernet detects collisions.

(C) Token Ring detects collisions, Ethernet avoids collisions.

(D) Token Ring avoids collisions, Ethernet avoids collisions.

17 A major enhancement has been planned for the information system of a department store. The diagram represents part of the existing database used by the store.

Employee code	Telephone number	Postcode	Available after hours
SMIT07	(02) 94431112	2037	N

Which data types would you expect to find in the data dictionary for these fields?

	Employee code	Telephone number	Postcode	Available after hours
(A)	Text	Number	Number	Boolean
(B)	Alphabetic	Text	Number	Text
(C)	Text	Text	Number	Boolean
(D)	Alphabetic	Number	Number	Text

Use this information to answer Questions 18 and 19.
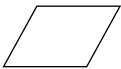
A direct marketing company proposes streamlining its inventory control system.

In the proposed system, once a telephone order is received, the operator will enter the order details into the computer system, and check and update stock availability in the company's central database. When the order is accepted, payment is automatically processed electronically using the customer's banking details, and a receipt is generated.

The diagram describes part of the ordering procedures in the proposed system.

```
        ┌──────────────┐
        │ Order details│
        └──────────────┘
               │
               ▼
        ┌──────────────┐        ┌ ─ ─ ─ ─ ─ ─ ┐
        │    Stock     │◄──────►      1
        │ availability │        └ ─ ─ ─ ─ ─ ─ ┘
        └──────────────┘
               │
               ▼
            ╱──────╲      No   ┌──────────────┐
           ╱  OK?   ╲─────────►│ Reject order │
            ╲──────╱           └──────────────┘
               │
              Yes
               │
               ▼
        ┌──────────────┐  ┌ ─ ─ ─ ─ ─ ┐
        │   Payment    │      2         Bank
        └──────────────┘  └ ─ ─ ─ ─ ─ ┘
               │
               ▼
        ┌ ─ ─ ─ ─ ─ ─ ┐
              3
        └ ─ ─ ─ ─ ─ ─ ┘
```
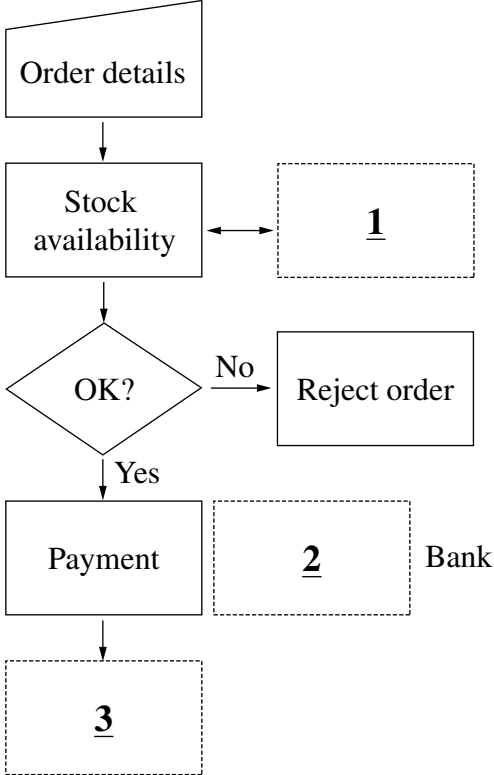
18 What symbols would be included in the areas 1, 2 and 3?

1　　　**2**　　　**3**

(A)

(B)

(C)

(D)

19 In the system flowchart on page 10, what does the symbol represent?

(A) Data inquiry

(B) Online input

(C) Direct access

(D) Manual operation

20 The following seven-bit ASCII character and parity bit were transmitted:

0011010　　　　　　0

Which of the following examples would cause the receiver to request that the message be re-sent?

	ASCII character	Parity bit
(A)	1011010	1
(B)	0011011	1
(C)	0011011	0
(D)	0011010	0

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 (10 marks) Use a SEPARATE writing booklet.

Mr Ferrano keeps a database of the computers on his small computer network.

Computer number	Computer RAM	Computer hard disk	Location	Phone extension	Room number
001	64	6	Reception	3227	9023
002	64	10	Reception	3227	9023
003	128	8	Manager's office	1859	9115
004	96	8	Manager's office	1859	9115
005	256	40	Store Room 3	2016	9153

(a)   Computer 005 is being used as a file server on this network. Describe the role of a file server on a network.   **3**

(b)   Identify data redundancy in Mr Ferrano's database and outline the problems it may cause as the database increases in size.   **3**

(c)   Normalise this database into two tables, showing all the data and clearly identifying the primary and foreign keys.   **4**

Question 22 (10 marks) Use a SEPARATE writing booklet.

Jill is a travelling sales representative who sells quality wines to licensed restaurants throughout the state. She often spends a week at a time away from the office, visiting customers. At least once a day Jill logs-on to the head office network to send and receive data. She uses her laptop computer that connects to her mobile phone.

The diagram shows the typical path the data takes through the public telephone network:

Laptop connected to mobile phone	Country telephone exchange	Country telephone exchange	Sydney telephone exchange	Head office building

Segment 1	*Segment 2*	*Segment 3*	*Segment 4*
3.5 km Across a country town	120 km Across mountains	260 km Across rural and suburban areas	15 km Across city area
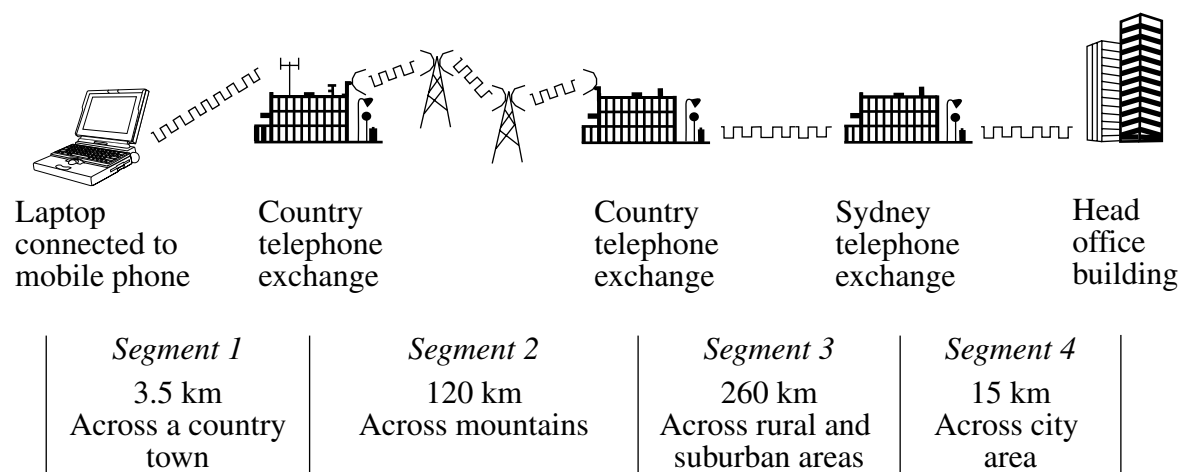
(a) For EACH segment, identify ONE appropriate transmission medium and outline why each one is appropriate. **4**

(b) Outline the advantages for Jill of using mobile technology to undertake her work. **3**

(c) The standard system interface cannot always provide the correct information for Jill to answer all customer enquiries. This means that Jill often needs to write SQL queries. **3**

Describe how a copy of the data dictionary would assist her to compose these queries.

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

Baksiano Pizza Delivery (BPD) is a company that makes and delivers pizzas. It has 40 outlets, a warehouse to supply ingredients to the outlets, and a head office. Until recently, BPD knew very little about its customers. The company did not keep information about:

- who was buying its pizzas;
- customer preferences;
- busy times for each outlet.

To address this issue and improve its business overall, BPD implemented a project to streamline inventory, improve customer service and reduce delivery costs. To do this:

- a computer was installed in each of the outlets, into which orders are entered when a customer phones;
- a caller-ID system linked to a database was added to the telephone system. This allows staff taking orders to view the name, address and preferences of existing customers as soon as they phone;
- a system that recommends the shortest delivery route for drivers was added;
- each outlet sends a copy of daily sales data to a large database stored on a mainframe computer at head office. The sales data includes customer names, addresses and phone numbers, along with what was ordered, when it was ordered, and the method of payment.

BPD is now collecting valuable data about customers and orders.

The diagram on page 15 summarises some aspects of the new information system used by Baksiano Pizza Delivery.

Question 23 (continued)

```
┌─────────────────────────────────────────────────────────────────────┐
│  ┌──────────────────────────────────────────────────────────────┐   │
│  │ Purpose                                                       │   │
│  │ • to ensure the delivery of fresh, hot pizzas to customers    │   │
│  │ • to identify customer purchasing trends                      │   │
│  │ • to maintain accurate records of pizza ingredients in-stock  │   │
│  └──────────────────────────────────────────────────────────────┘   │
│                              ↕                                        │
│  ┌──────────────────────────────────────────────────────────────┐   │
│  │                                  Baksiano Pizza Delivery       │   │
│  │                                  information system            │   │
│  │  ┌────────────────────────────────────────────────────────┐   │   │
│  │  │ Information processes                                   │   │   │
│  │  │ • collecting                                            │   │   │
│  │  │ • storage and retrieval                                 │   │   │
│  │  │ • organising                                            │   │   │
│  │  │ • analysing                                             │   │   │
│  │  │ • processing                                            │   │   │
│  │  │ • transmitting and receiving                            │   │   │
│  │  │ • displaying                                            │   │   │
│  │  └────────────────────────────────────────────────────────┘   │   │
│  │       ↕              ↕                    ↕                    │   │
│  │  ┌──────────┐  ┌──────────────────┐  ┌──────────────┐         │   │
│  │  │Participants│ │Data/information  │  │Information    │        │   │
│  │  │•outlet     │ │•customer details │  │technology     │        │   │
│  │  │ employees  │ │•sales data       │  │               │        │   │
│  │  │•head office│ │•location and route│ │               │        │   │
│  │  │ employees  │ │ database         │  │               │        │   │
│  │  │            │ │•details of       │  │               │        │   │
│  │  │            │ │ ingredients      │  │               │        │   │
│  │  │            │ │ in-stock         │  │               │        │   │
│  │  │            │ │•store location   │  │               │        │   │
│  │  │            │ │ details          │  │               │        │   │
│  │  └──────────┘  └──────────────────┘  └──────────────┘         │   │
│  └──────────────────────────────────────────────────────────────┘   │
└─────────────────────────────────────────────────────────────────────┘
```

(a) Identify the information technology (hardware, software and communication technologies) used by Baksiano Pizza Delivery's new information system. **4**

(b) Propose and outline TWO different types of information systems that could be used to analyse Baksiano Pizza Delivery's purchasing trends. Recommend which of the systems is the most appropriate for Baksiano Pizza Delivery and justify your recommendation. **5**

End of Question 23

Question 24 (11 marks) Use a SEPARATE writing booklet.

A supermarket is planning to expand its operations by creating an online store using internet technology. The online store will allow customers to browse the product information, place orders, make payments using credit cards and arrange for delivery.

Deliveries from the online store may attract a charge, depending on:

• whether the delivery contains perishable items;

• the delivery distance;

• the order value.

This decision tree is used to determine if the delivery charge applies:

Contains perishable items	Delivery distance	Order value	Delivery charge
Yes			Yes
No	> 10 km	> $100	No
		≤ $100	Yes
	≤ 10 km		No
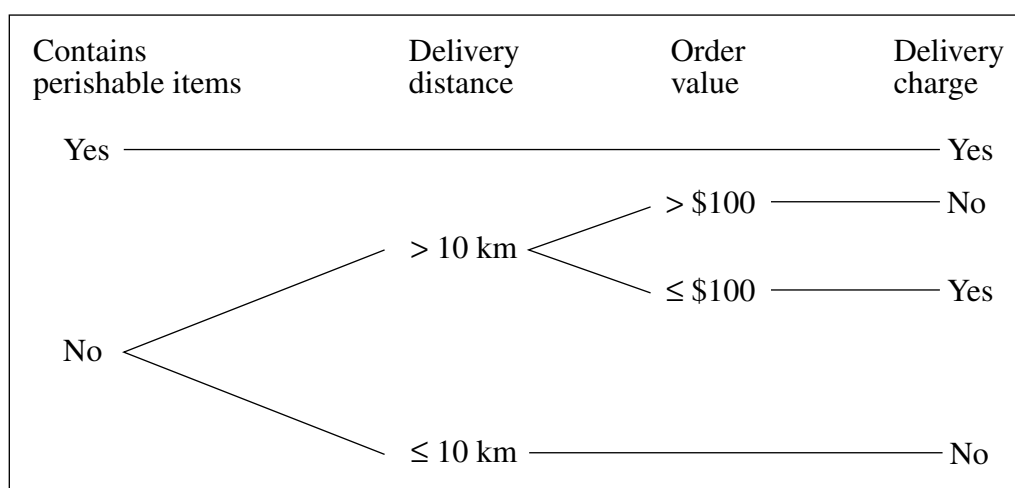
(a)   Translate this decision tree into a decision table.   **3**

(b)   Discuss the importance of user documentation for this online store.   **3**

(c)   When designing the new online store, developers should consider the social and ethical impacts that the new system will have.   **5**

Identify TWO social or ethical issues associated with the design of the system and propose how they could be addressed in the design of the online store.

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)

Please turn over

Question 25 — Transaction Processing Systems (20 marks)

Use a SEPARATE writing booklet.

(a)   (i)   Define batch processing, and briefly describe a situation where batch processing is appropriate.   **3**

       (ii)   Distinguish between data accuracy and data integrity, using an example that illustrates the difference.   **3**

(b)   A video store is considering installing a 'self-checkout' system where customers can borrow videos by scanning their membership cards and videos and pay by EFTPOS.

A 'self-checkout' transaction has three steps:

- membership validation;
- borrowing limit check;
- payment processing.

For membership validation the barcode on the membership card is used to access the member database to find a match. The customer proceeds to the scanning of videos if the membership is valid, otherwise a message is displayed.

Using the video barcode data and details from the member database, the system checks that no more than six videos are borrowed. A message is displayed if the limit is exceeded.

Payment processing involves the calculation of borrowing charges, the scanning of the customer's EFTPOS card, the entry of a personal identification number and the electronic communication of these details to the financial institution. Video charges are obtained from the video database via the video barcodes. Transaction details are written to the transaction file for each video borrowed.

       (i)   Draw a dataflow diagram with the three processes that represents this proposed 'self-checkout' system, ensuring that you show external entities and data stores.   **5**

       (ii)   Discuss appropriate backup procedures for the proposed system.   **3**

Question 25 (continued)

(c)   Web-Ticket allows customers to purchase tickets for major theatre and sporting **6**
events over the internet.

When customers visit the company's website they can choose an event, view the
seating arrangements, see what seats are available, choose their seats and
purchase tickets.

For the business to run successfully it is essential that the seating details supplied
to any customers at any time in any location, are correct and up-to-date. There
is no margin for error or system failure.

Describe and analyse the ticketing system in terms of the information processes
of:

- collecting;
- storage and retrieval;
- processing;

with particular emphasis on the process of storage and retrieval.

End of Question 25

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

(a)   (i)   Define the term *structured problem* and provide an example of such a problem.   **3**

      (ii)   Define the term *certainty factor* in regard to decision-making situations and provide an example of a situation where one would be used.   **3**

(b)   Gertrude's mobile phone contract is about to expire and she needs to choose a new plan. She has identified three plans for people who already own their own phone.

The first plan is from Toady Phones. The monthly connection fee is $0, and each call costs 1 cent per second. This plan has no free calls per month.

The second plan is from Monopoly Mobile. The monthly connection fee is $14.50, and each call is charged at 0.75 cents per second. This plan includes $10 of free calls per month.

The third plan is from Shakey Service. The monthly connection fee is $28.50, each call costs 0.5 cents per second, and $15 of free calls per month are included.

Monthly charges are calculated by adding the monthly connection fee to the monthly call cost. The monthly call costs are calculated by subtracting the free call amount from the actual call costs (time × cents per second). However, if the actual call cost is less than the free call amount the monthly call cost is $0.00.

None of the plans have a flag fall (cost to establish each call) or allow unused monthly free calls to be carried over.

    (i)   Gertrude's use of her mobile phone varies greatly from month to month. Design a spreadsheet that would assist Gertrude to explore a range of usage alternatives and select the cheapest plan. Show all relevant data and formulae.   **5**

    (ii)   Outline how different types of graphs could assist Gertrude's decision making.   **3**

Question 26 (continued)

(c)   Deciding which university degree to apply for can be a long and frustrating process.   **6**

Kim and Hendra have developed a Decision Support System (DSS) that will assist their fellow Year 11 and Year 12 students identify university degrees that suit their needs and abilities.

Kim and Hendra have used the following decision criteria:

• The student's area of interest
• The Universities Admission Index (UAI) the student expects to obtain
• Whether the student wants to study at a local university
• Whether a small or large university is preferred.

The information for the system was collected from university websites and includes degree name, degree detail, the UAI required for each degree in the previous year, and the university location, size and distance from Kim and Hendra's high school.

Describe and analyse the decision support system in terms of the information processes of:

• organising;
• analysing;
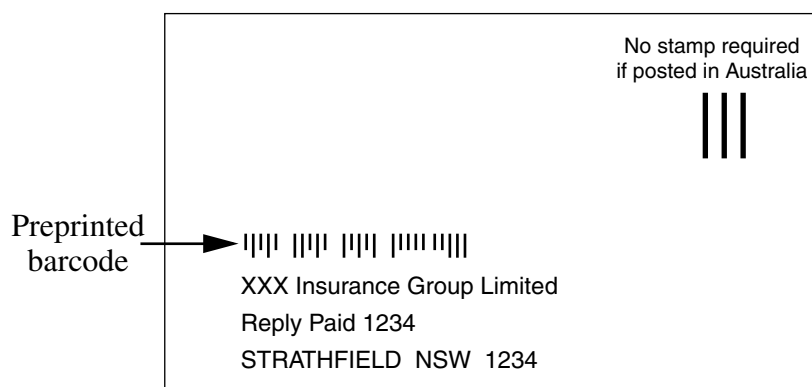• processing.

End of Question 26

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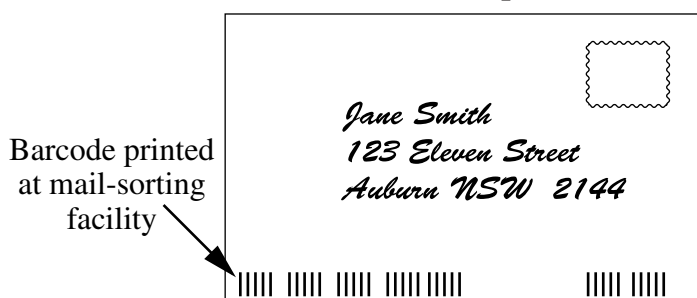Use a SEPARATE writing booklet.

(a)   (i)   Describe Computer Aided Design, using an example.   **3**

        (ii)   Identify TWO actuators and describe a situation in which each would be used.   **3**

(b)   In an automated mail-sorting facility, letters are sorted by a scanning machine into two broad categories:

- letters with preprinted barcodes;
- letters without barcodes.

The barcoded letters can then be directly sorted into postcode areas. The other letters are scanned by an OCR device. The system finds the matching barcode for the address and then prints a barcode on the bottom of the letter. These letters are then sorted into their postcode areas. Examples are given below:

A barcoded business letter

Preprinted barcode →

No stamp required
if posted in Australia

XXX Insurance Group Limited
Reply Paid 1234
STRATHFIELD NSW 1234

A scanned letter with printed barcode

Barcode printed
at mail-sorting
facility

Jane Smith
123 Eleven Street
Auburn NSW 2144

(i)   Draw a block diagram of the automated letter-sorting system.   **4**

(ii)   Explain advantages and disadvantages of using barcodes in commercial applications, such as mail sorting.   **4**

Question 27 (continued)

(c)   Get-it-Quick is the automated warehouse system used by a large clothing   **6**
      wholesaler that supplies fashion items to retail stores. Orders from the retailers
      go direct to the warehouse. Get-it-Quick then picks, packs and dispatches the
      orders. Get-it-Quick also tracks goods from storage in the warehouse until
      delivery.

      Using the automated warehouse system, the manager can find out at any time:

      • The number of fashion items in stock;

      • The movement of items from storage to dispatch;

      • The movement of items from dispatch to delivery to the customer.

      Describe and analyse the Get-it-Quick system in terms of the information
      processes of:

      • collecting;

      • processing;

      • displaying;

      with particular emphasis on the process of collecting.

End of Question 27

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

(a)   (i)   Distinguish between LCD screens and CRT monitors.   **3**

       (ii)   Distinguish between path-based and cell-based animation.   **3**

(b)   Sunny Ishida is creating a website with highlights of Australia's success at the 2002 Winter Olympics in Salt Lake City.

       He has identified three events that he wants to feature:

       • Steven Bradbury's gold medal in the 1000-metre short-track speed skating;

       • Alisa Camplin's gold medal in the aerial skiing event;

       • Jacqui Cooper's recovery from a fall during training.

       He has obtained permission from each of his heroes to use video footage, an audio interview, several photos and a brief biography.

       (i)   Draw a storyboard for this website using good design principles.   **5**
              Clearly label the major elements for each page.

       (ii)   One of Sunny's photos is of Jacqui Cooper at the World Championships.   **3**
              The photo has 16 colours and is 600 pixels by 400 pixels.

              Demonstrate how he could calculate the file size in kilobytes for this photo. Explain what each number in the calculation represents.

Question 28 (continued)

(c)   The website for a newspaper www.regionalclassified.com.au displays **6**
advertisements for individuals and companies. It targets country areas of New
South Wales.

Advertisements can be submitted by fax, email or post. They may contain
contact details for the seller, item descriptions, photos and other graphics. The
advertisements are charged by the number of words, with photos and graphics
attracting an additional fee.

Interested buyers need to contact the seller direct because the newspaper does
not process sales. Advertisements are displayed for 28 days. They are
automatically removed at the end of that time, or at the request of the advertiser.

Advertisements are arranged into categories to make finding an item easy.
Search facilities are available to search all the advertisements on the website.

Many users of the website access the internet using a dial-up connection and
long-distance phone calls to their Internet Service Provider.

Describe and analyse the system in terms of the information processes of:

• collecting;
• organising;
• displaying;

with particular emphasis on the process of displaying.

End of paper

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