



B O A R D O F S T U D I E S
NEW SOUTH WALES

2011

**HIGHER SCHOOL CERTIFICATE
EXAMINATION**

Information Processes and Technology

General Instructions

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

Total marks – 100

Section I Pages 2–9

20 marks

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

Section II Pages 10–14

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

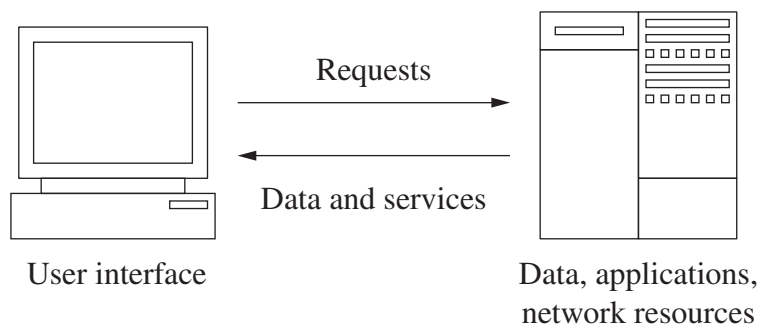
Allow about 40 minutes for this section

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

- 1** The access to data in a database management system (DBMS) is primarily related to which of these information processes?
- (A) Storing and retrieving
 - (B) Receiving and analysing
 - (C) Collecting and displaying
 - (D) Transmitting and organising
- 2** What is the primary purpose of HTML?
- (A) To provide secure access to a web page via the world wide web
 - (B) To specify how text, graphics and sound are displayed on a web page
 - (C) To control access to files when downloading data via a web page
 - (D) To transfer a web page from a remote server and display it on a screen
- 3** A local council stores information relating to property ownership in a database.
- Under the terms of the Freedom of Information Act (now Government Information (Public Access) Act) who owns the data?
- (A) The local council
 - (B) The person to whom the data refer
 - (C) The participants who collected the data
 - (D) The personnel who manage the database
- 4** Under what conditions would it be appropriate to outsource the development of a new solution?
- (A) When the design team does not have the skills to deliver a part of the system
 - (B) When the materials required for the system cannot be delivered to schedule
 - (C) When the new system does not meet the basic requirements of the client
 - (D) When the cost of the new system is not economically feasible

- 5 What type of connection does Bluetooth wireless technology use between two devices enabled to receive data?
- (A) Long-range high-bandwidth
 - (B) Short-range high-bandwidth
 - (C) Long-range low-bandwidth
 - (D) Short-range low-bandwidth

- 6 What term is used to describe the type of computing shown in the diagram?



- (A) Virtual
 - (B) Client-Server
 - (C) Peer to Peer
 - (D) Multiprocessor
- 7 A local entertainment venue is implementing a website to promote its business.

Currently the website has information about upcoming events. Shortly customers will be able to purchase memberships through the website. Within six months the venue hopes to be selling merchandise online.

Which of the following methods of conversion is being used?

- (A) Pilot
- (B) Direct
- (C) Parallel
- (D) Phased

- 8 What is the advantage of creating a system using an iterative system development approach?
- (A) Users are not needed at any stage of the project, so time and cost are reduced.
 - (B) Users are only involved at the end of the project, so problems are identified, solved and reduced.
 - (C) Users are involved at each step of the project, so problems are identified, solved and reduced at each stage of development.
 - (D) Users are only involved at the beginning of the project, so time, cost and unnecessary use of additional staff are reduced.

9

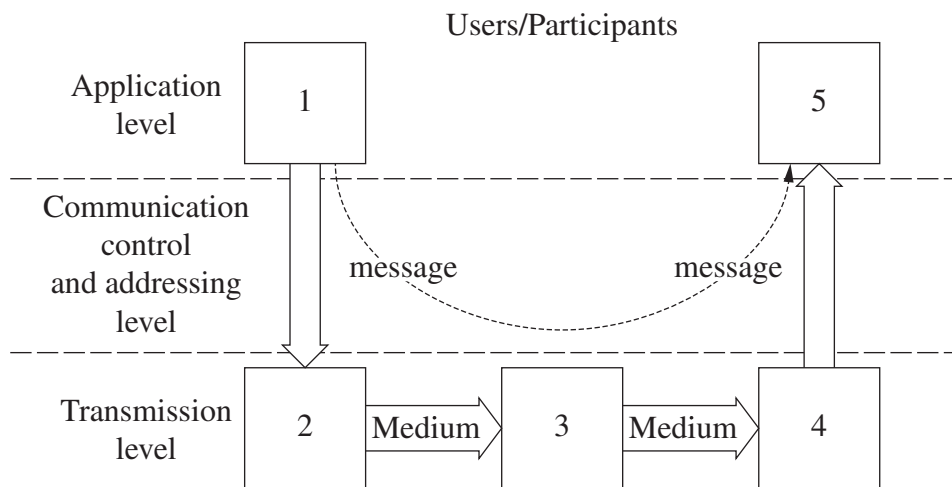
line 1	SELECT	STUDENTID, STUDENTNAME, MARKS
line 2	FROM	STUDENT, RESULTS
line 3	WHERE	STUDENT.Student ID = RESULTS.Student ID and RESULTS.MARKS > 49

In the above SQL, what does line 2 do?

- (A) It specifies the criteria used for data retrieval.
 - (B) It identifies the fields displayed in the results.
 - (C) It identifies the tables to be used for data retrieval.
 - (D) It determines the sequence for the displayed results.
- 10 Which of the following is an element of the logical organisation of hypermedia?
- (A) Field name
 - (B) Hard disk
 - (C) Node
 - (D) Text
- 11 Which network administration task is common to many networks?
- (A) Designing the cabling layout for a network
 - (B) Giving users file access rights
 - (C) Writing the code for an application
 - (D) Personalising users' desktops

Use the following diagram to answer Questions 12 and 13.

Communication System Framework



- 12** Which of the following correctly identifies components 2, 3 and 5 in the communication system framework?

	2	3	5
(A)	Source	Transmitter	Destination
(B)	Transmitter	Switching & routing	Receiver
(C)	Source	Transmitter	Receiver
(D)	Transmitter	Switching & routing	Destination

- 13** Which of the following is part of the communication control and addressing level?













- (A) Physically transferring each message
- (B) Ensuring the correct transmission of each packet of data
- (C) Controlling the size of data packets and speed of transfer
- (D) Reorganising the data into a form suitable for transmission

- 14** A system development team has tested a new information system to sell books online. When the system went live customers had difficulty using the system successfully.

What strategy could have been used to ensure a more successful implementation?

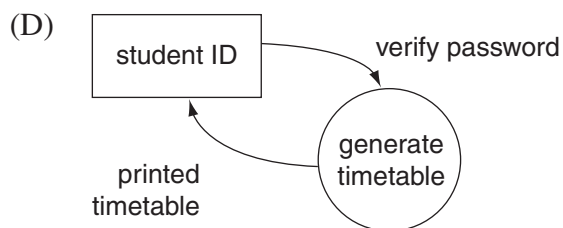
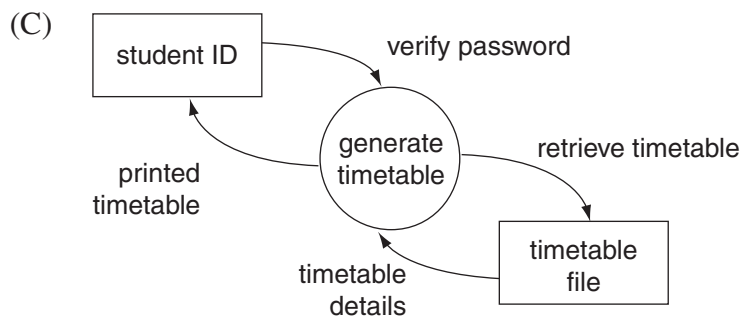
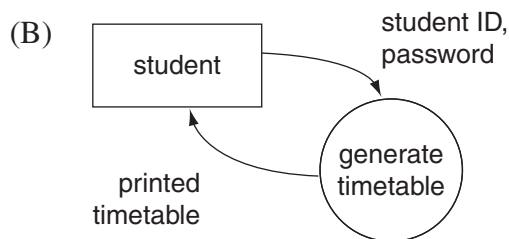
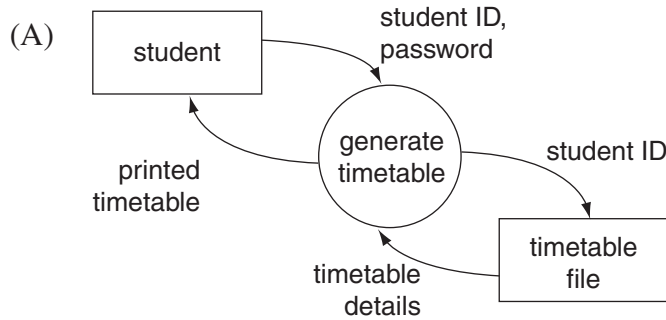
- (A) Use a traditional development method to control the project schedule and scope
- (B) Use participant development to allow customers to develop a system that best meets their needs
- (C) Undertake a phased implementation so that the system would not be available to all customers at the one time
- (D) Test the system with a group of customers and provide online documentation to support customers shopping at home

- 15** Which row in the table shows data flow symbols that represent a process, an external entity and data flow?

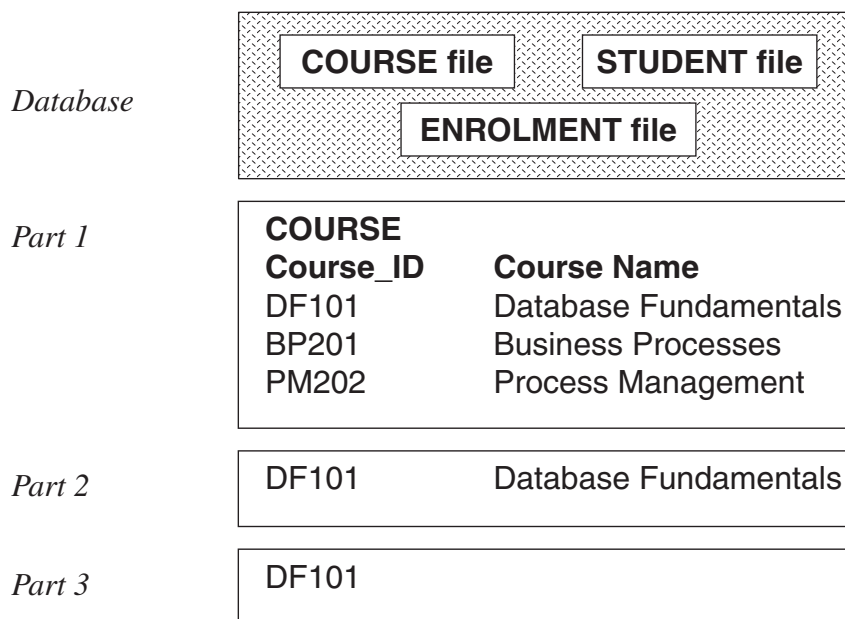
	Process	External entity	Data flow
(A)			
(B)			
(C)			
(D)			

- 16 A school timetable system allows students to print their own timetable. When they enter their student ID and password the student has access to the timetable file and can retrieve the timetable details. A printed copy is then produced for the student.

Which context diagram best represents this process?

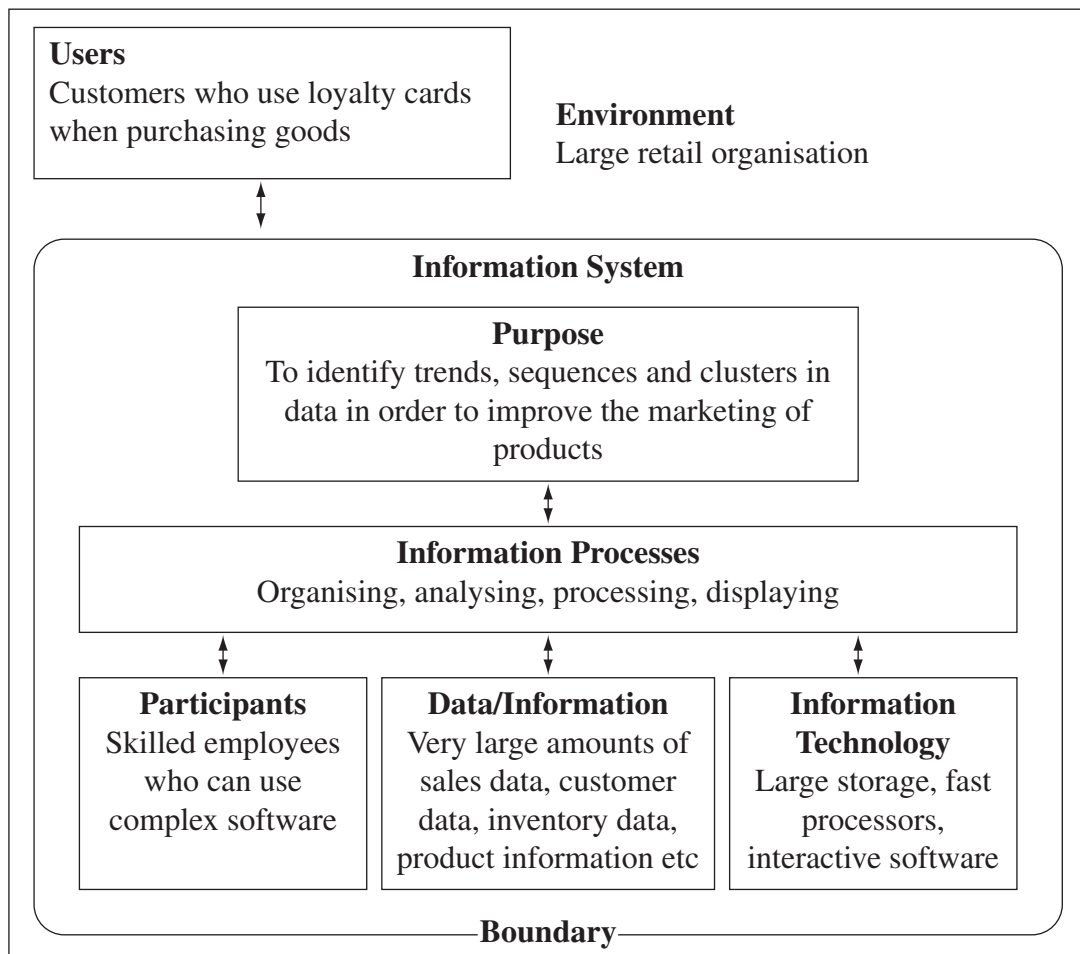


- 17 Which of the following is an example of the independence of data from the database management system (DBMS)?
- (A) An organisation uses data as part of a DBMS.
 (B) The DBMS accesses data using sequential access.
 (C) An organisation can only access data using a DBMS.
 (D) The DBMS retrieves data without knowing where the data is stored.
- 18 What are the names given to the three parts of the database hierarchy shown in the diagram?



- | | <i>Part 1</i> | <i>Part 2</i> | <i>Part 3</i> |
|-----|---------------|---------------|---------------|
| (A) | Record | Field | Table |
| (B) | Table | Record | Field |
| (C) | Field | Record | Table |
| (D) | Table | Field | Record |

Use this information to answer Questions 19–20.



- 19** What would be the most powerful tool to help participants best achieve the purpose of this system?
- (A) Online analytical processing to explore patterns in data
 - (B) Decision tables to represent the purchasing patterns of customers
 - (C) Structured query language commands to interrogate a sales database
 - (D) What-if analysis to explore trends/sequences in large amounts of data
- 20** What would be the most appropriate structure to store the data for this system?
- (A) Spreadsheet
 - (B) Flat-file database
 - (C) Data mine
 - (D) Data warehouse

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.

Mel's Mobile Apps has been approached by the owners of various restaurants to develop an application (app) that customers can use on mobile hand-held devices. The app would contain data to help customers select a suitable restaurant located nearby.

The proposed application should allow customers to search for, select and view details of individual restaurants including:

- location
- cuisine
- menu items
- prices
- reservations
- take-away meals
- favourite meals.

Question 21 continues on page 11

Question 21 (continued)

- (a) In your answer booklet, provide the metadata for data type and field size as indicated by A, B, C, D, E and F in the data dictionary below. 2

<i>Field name</i>	<i>Data Type</i>	<i>Data Format</i>	<i>Field Size</i>	<i>Description</i>	<i>Example</i>
CUSTOMER ID				Unique five digit ID for each customer	12345
RESTAURANT ID	A	XXX9999	D	First three letters identifying restaurant and 4 digits	FRA1234
MENU ITEM				Name of menu item	Sweet and Sour Fish
ITEM PRICE		\$99.99		Price of menu item less than \$100	\$12.50
QUANTITY	B		E	Number of menu items ordered	2
ORDER DATE	C	DD/MM/YYYY	F	Date order placed	31/10/2011

- (b) Describe how employees of Mel's Mobile Apps would use active listening techniques to determine the needs of the restaurant owners. 2
- (c) Why should live data be used to test the developed app? 2
- (d) Draw a storyboard that displays the screens a customer would use to make a booking or to order take-away food from a local restaurant. 4

End of Question 21

Question 22 (9 marks) Use the Question 22 writing booklet.

Sacha's Fitness wishes to develop a new system that will automate processes of member access and security within their gyms across Australia. After an initial investigation, management has decided that the new system will provide:

- self-service access, 24 hours per day using swipe cards. Members will swipe their card at the door, which will open automatically if the membership payment is up to date
- membership inquiries and payment via online access only
- a skeleton staff who assist members with fitness-related advice
- the installation of sophisticated security and surveillance equipment
- transformation of all gyms within 12 months.

(a) List the important headings on the contents page of the requirements report for this new system. **2**

(b) New membership fees for the gym are as follows: **3**

Full Adult	\$50 a month
Concession Adult (pensioner)	\$40 a month
Concession Adult (tertiary student)	\$30 a month
High School Student (during term)	\$20 a month
High School Student (school holidays)	free

Draw a decision tree that shows the different fees members will be charged to visit the gym each month.

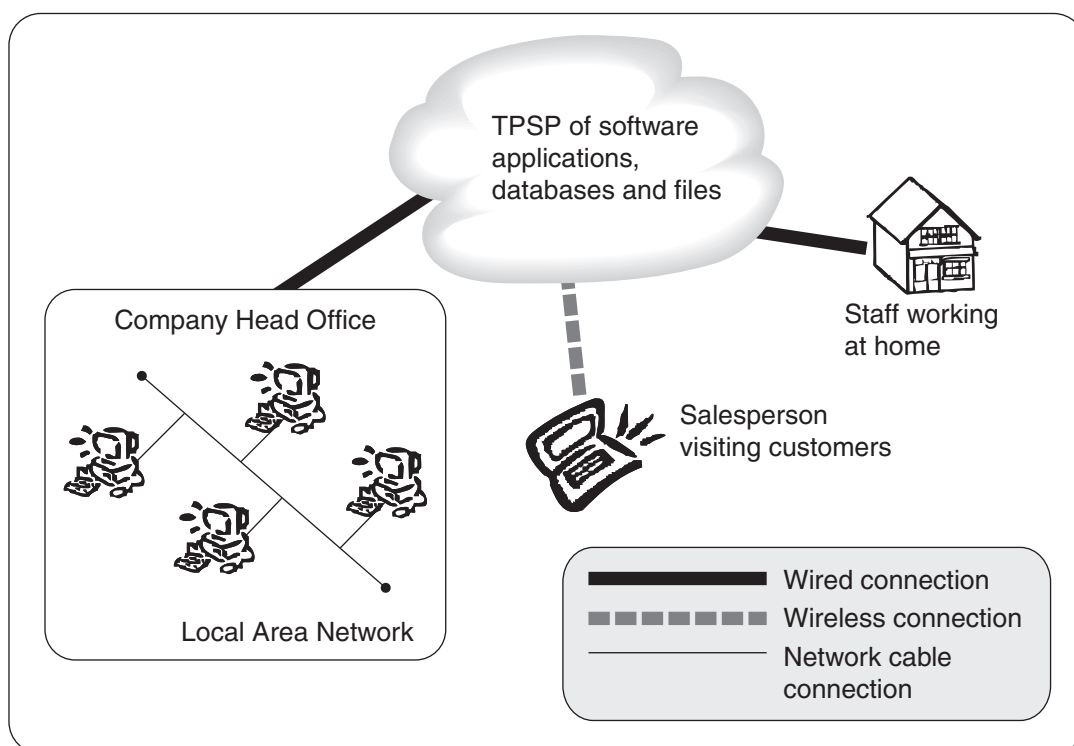
(c) Assess the impact of the changes on both employees and members. **4**

Question 23 (10 marks) Use the Question 23 writing booklet.

Cloud computing is an emerging trend that gives companies a different way of managing hardware, software applications and data resources. Rather than owning hardware and software, a third party service provider (TPSP) hosts a company's applications and data stores.

Companies use the internet to access and use applications, databases and files. They pay a fee based on their usage. For example, ABC Solar Installations has its databases hosted by the TPSP, and pays for access and use by staff at head office, staff working at home and salespersons with laptops visiting customers.

This diagram illustrates a possible configuration of cloud computing.



- (a) Identify a transmission medium for the network cable connection and describe features that make it appropriate in this situation. 2
- (b) Design separate database views of a company database to show the different data used by: 3
- sales staff who use laptops to answer inquiries about products when visiting customers
 - staff at head office who pack and dispatch products purchased by customers.
- (c) Analyse issues that the company should consider before storing corporate data using a TPSP. 5

Question 24 (11 marks) Use the Question 24 writing booklet.

A state police department is fitting its highway patrol cars with state-of-the-art crime-fighting technology. This includes Automatic Number Plate Recognition System (ANPRS) and a computer installed in the boot of the car.

ANPRS uses a number of cameras that are mounted on the police car. The cameras are constantly scanning number plates on parked and moving vehicles. These are checked immediately against the police database in a real-time process. Stolen, unregistered or wanted vehicles set off a warning beep. The offending registration plate appears on a monitor in the police car.

Essential components of the on-board computer are housed in tamper-proof and fire-proof containers. An officer is able to type reports into the computer using a keyboard that is stowed on a sliding tray in the car. The mobile computers are connected to a central police computer system via a wireless 3G mobile communication link so that all data (including ANPRS) is up to date and regularly backed up.

- (a) Why is the on-board computer a fat client? **1**

- (b) Describe a technology issue regarding data accuracy when number plates of vehicles are scanned. **2**

- (c) Discuss the use of 3G mobile communications in this network compared to other possible forms of wireless transmission. **3**

- (d) The processing power of the on-board computer and its wireless connection allow data collected by the ANPRS system to be compared to a range of data from other government databases and collection devices. **5**

Data from fixed speed cameras, toll collection gates and the Roads and Traffic Authority (RTA) driver licence and car registration databases are analysed using a process of data-matching, enabling cross-linking of the data for the purpose of profiling offenders.

Analyse the social and ethical issues arising from data-matching. Use examples from the scenario to illustrate the issues.

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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) | (i) | Define <i>batch transaction processing</i> . | 1 |
| | (ii) | Why is online real-time transaction processing important in a theatre booking system? | 2 |
| | (iii) | How is the output from a transaction system used as input to other information systems? | 3 |

Question 25 continues on page 17

Question 25 (continued)

- (b) A Human Resource Management System (HRMS) has been installed for InterONE, a large multinational organisation. InterONE is able to manage the information relating to the many individuals who work in the organisation through modules in the HRMS for personnel information management, leave, hours worked, benefits and recruitment. Employees can access their information and update appropriate data.

Information on employees, including different types of personal information, is maintained in the personal information module (PIM). Information captured in this module is used by all other modules of the HRMS to perform their tasks.

The PIM adds, edits or deletes, stores and retrieves specific data including:

- coloured graphic of the employee
- contact details (address, phone numbers, email)
- current job information
- dependants
- educational qualifications
- emergency contact(s)
- employee supervisor
- payment details (pay grade and salary)
- personal information (name, date of birth)
- work history.

- (i) Describe the importance of data integrity in this HRMS. **2**
- (ii) Identify the participants, and describe the different data/information that each would edit in an existing employee's data. **3**
- (iii) Analyse the collection process for adding a new employee to the HRMS. **4**
- (iv) Compare the HRMS with a system used for paper-based transactions. In your answer, explain how the electronic system offers improvements to paper-based transactions. **5**

End of Question 25

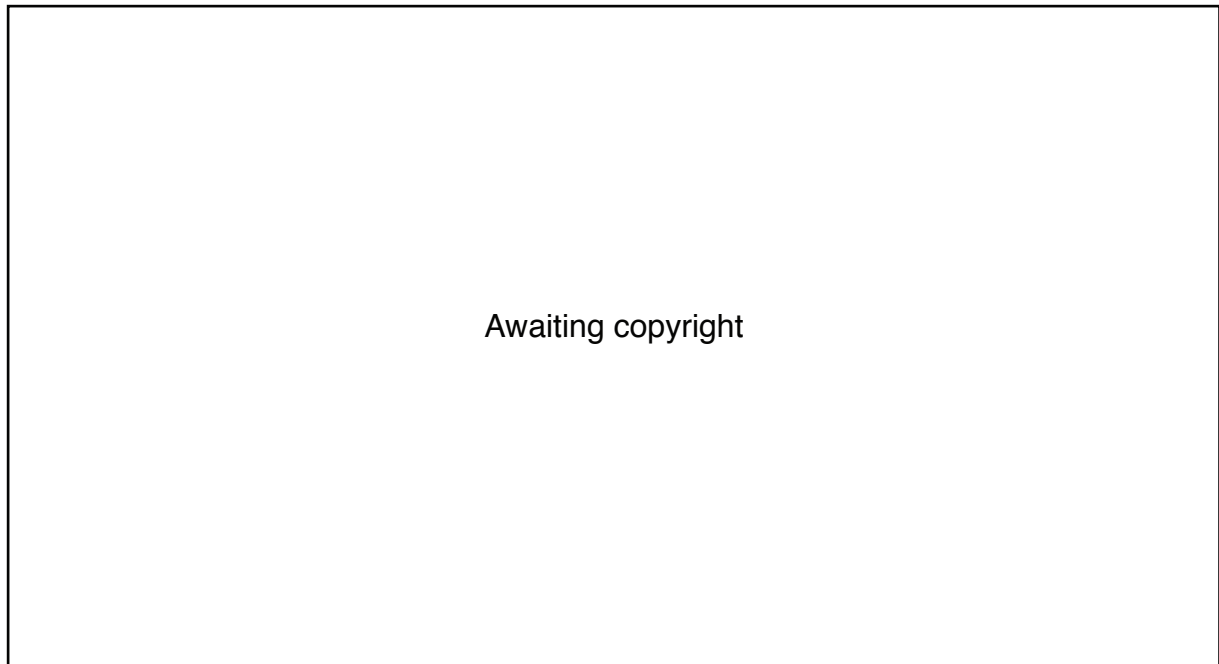
Question 26 — Decision Support Systems (20 marks)

Use a SEPARATE writing booklet.

- (a) (i) Give an example of a decision that a what-if analysis would assist. **1**
- (ii) Describe the process of backward chaining used by inference engines in expert systems. **2**
- (iii) Describe the role of a knowledge engineer in the creation of an expert system. **3**
- (b) A Swiss website ‘<http://map.search.ch>’ provides an interactive system to help people make decisions about their daily lives. The site opens with a map of Switzerland, and people can click on a location to zoom into their town. Continued clicking will zoom to street level. At street level by selecting an icon on the map, it is possible to get up-to-date information, including cinema schedules, train and bus timetables, locations of restaurants, public buildings and car parks.

Figures 1 and 2 are examples of screens from the website.

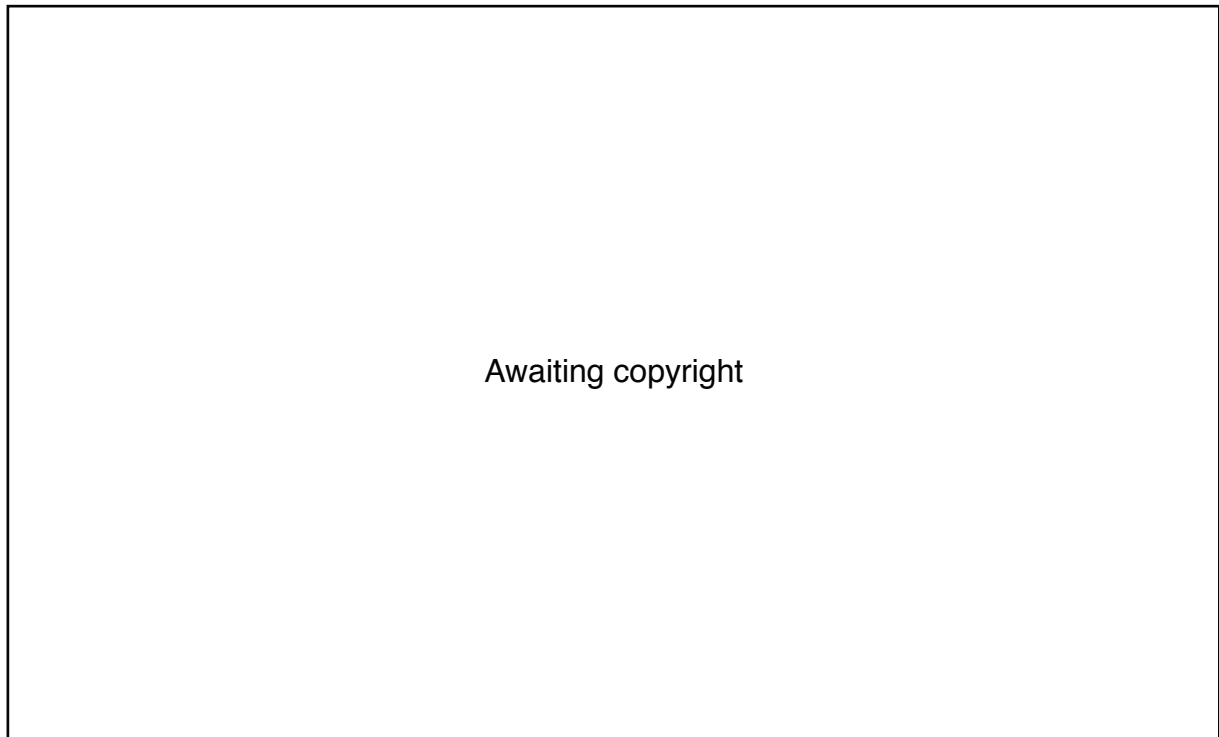
Figure 1: Map of Interlaken area, after zooming in from the map of Switzerland



Question 26 continues on page 19

Question 26 (continued)

Figure 2: Cinema information on the street level map of Interlaken after zooming in from Interlaken area



- (i) Identify features of this system that make it a Geographical Information System (GIS). **2**
- (ii) Describe the structure of decision making that this system would support. Use an example to illustrate your answer. **3**
- (iii) Analyse the technologies, different sources of data, and different formats of data required for this system. **4**
- (iv) Compare the use of this GIS to access information with alternative methods of finding the same information. In your answer, explain how the GIS system offers improvements over alternatives. **5**

End of Question 26

Question 27 — Automated Manufacturing Systems (20 marks)

Use a SEPARATE writing booklet.

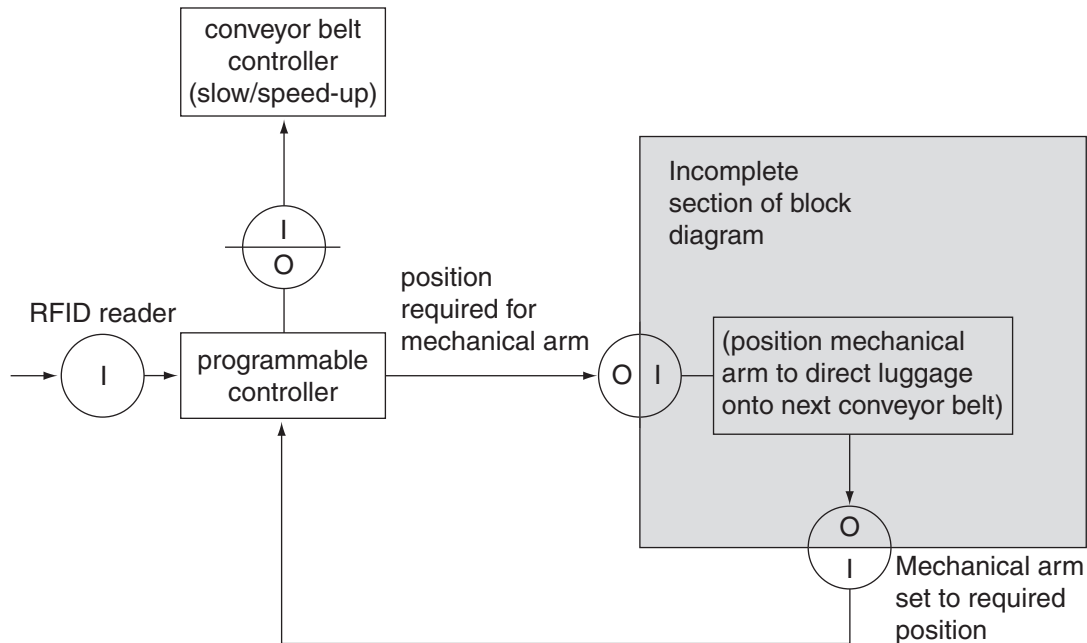
- (a) (i) Define *damping*. **1**
- (ii) Describe the use of a CAD/CAM system to manufacture a wooden jigsaw puzzle. **2**
- (iii) Explain why manufacturing systems are automated. **3**
- (b) Many airports around the world have introduced an RFID (Radio Frequency IDentification) system to automate luggage handling and track passengers' luggage. When a passenger checks in luggage, a self-adhesive luggage tag is printed for each item with passenger name, destination airport and flight number in both text and barcode formats. This allows processing in other airports that do not have the RFID technology. In addition, an RFID chip encoded with an ID-number is embedded in the luggage tag which is folded around each item's handle. The ID in the tag is linked to passenger data in the booking system.

A series of long conveyor belts take luggage from the check-in desks to each aircraft. The luggage passes through a series of fixed RFID readers installed at various points along the conveyor belts. RFID tags can be read at a distance without direct contact. RFID technology is more reliable than barcode technology used in the manual systems where workers scan and handle each item. At strategic locations in the RFID system, mechanical arms direct luggage onto different conveyor belts. Luggage is spaced on the conveyor belts so that it can be directed to the next conveyor belt one piece at a time. Conveyor belts are temporarily slowed while arms that direct the luggage are positioned.

Question 27 continues on page 21

Question 27 (continued)

The block diagram shows one part of the RFID luggage handling system, where luggage is directed by a mechanical arm from one conveyor belt to the next in order to reach the passenger's plane.



- (i) Identify an actuator and how it would be used in this system. 2
- (ii) The shaded section of the block diagram is incomplete. 3

Refine the block diagram to complete it. Show and label the inputs and outputs.

- (iii) Analyse the processes described in the block diagram in order to outline the sequence of steps that occurs. 4
- (iv) Compare an RFID luggage handling system with a manual/barcode luggage handling system. In your answer, explain how the RFID system offers improvements on a manual/barcode system. 5

End of Question 27

Question 28 — Multimedia Systems (20 marks)

Use a SEPARATE writing booklet.

- (a) (i) Define *hyperlinks*. **1**
- (ii) Outline the technical skills required to support the use of information technology in multimedia development. **2**
- (iii) Describe the process of digital conversion of analog data for use in multimedia products. **3**

- (b) iPT Home Realty is a company that manages rental properties and sells properties.

The company's website allows customers to search for properties according to various criteria. Based on this search customers can:

- view details about the property
- receive alerts when properties that match their criteria become available
- take an interactive virtual tour where they can control the movement and the direction of internal and external views giving a continuous image of the property.


Question 28 continues on page 23

Question 28 (continued)

iPT Home Realty

Property Details

◀ Search results ▶ New search ▶ Printable brochure



IP TOWN NSW 1/12 OBOS Street 3 2

This second floor flat is in a magnificent setting. It has an elegance that combines high ceilings with contemporary fittings.

- Beautifully presented
- High ceilings
- Central Air Conditioning
- Large bedrooms, one with ensuite
- Newly refurbished kitchen and bathroom

Slideshow
Video
Floor plan
Map
Virtual tour


Property details

Price on request
View by appointment
Total area 190sqm
Council rates \$1,220 per annum
Water rates \$662 per annum

Other tools

- Download to MP3
- Recent sales
- Print brochure
- Compare with other properties
- Stamp duty calculator

Sales agent



Sam Fisher
(02) 1234 5678
0123 456 789
sfisher@ipthomerealty.com

Property Search

Buy Rent

Location Please select ▼ Price \$min ▶

Building House ▼ \$max ▶

Bedrooms 1 minimum ▼

- (i) Identify the hardware required to display all the interactive features of this website. 2
- (ii) Describe the animation process used to create the interactive virtual tour. 3
- (iii) Analyse the storing process for the website. In your answer, examine different file formats used to store different types of data. 4
- (iv) Compare the use of a website to access information about properties for sale to alternative methods of finding the same information. In your answer, explain how the website offers improvements to the alternatives. 5

End of paper

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