BOARD OF STUDIES
NEW SOUTH WALES

2009
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 2–8

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

(**Section II**) Pages 9–12

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

(**Section III**) Pages 13–16

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

28 March 2009 Met with clients to discuss aims and objectives of new system	**BLOGGER BIZ**
3 April 2009 Asked client for more money to complete project	BLOGS OF NOTE
10 April 2009 Received more money for project	

This blog is being used as which project management tool?

(A) Gantt chart

(B) Journal of events

(C) Teleconferencing

(D) Communication management plan

2 What is the purpose of a requirements report?

(A) To plan a new system

(B) To produce a prototype

(C) To evaluate a project proposal

(D) To produce an operations manual

3 What does *information technology* refer to in an information system?

(A) Hardware related to the information system

(B) Users and software used in information processes

(C) Users and hardware related to the information system

(D) Software and hardware used in information processes

Use the following information to answer Questions 4–5.

LiveSMS is developing a website to allow people to create and send text messages online. The website has a database that stores personal information about its clients. This information will be available to other online companies such as telephone and digital media companies.

In order to test and evaluate the system before launching the site, the personal details of ten fictional customers were entered.

4   What type of test data was used by LiveSMS?

(A)   Live data

(B)   Operational data

(C)   Simulated data

(D)   Volume data

5   Which social and ethical issue should LiveSMS consider when developing the new system?

(A)   Data redundancy

(B)   Freedom of information

(C)   Globalisation

(D)   Privacy

6   What is the name given to a client PC when it has applications installed that are separate from its server?

(A)   Fat client

(B)   Mail client

(C)   Remote client

(D)   Web client

7   What is the role of the primary key in a relational database table?

(A)   To allow access to encrypted data

(B)   To uniquely identify records in the table

(C)   To operate as an alternative to a foreign key

(D)   To allow easier sorting of a field in the table

8   Which protocol does the circled icon represent?

    (A)   http

    (B)   smtp

    (C)   SSL

    (D)   TCP/IP

9   Which of the following would be included in a feasibility study?

    (A)   Participants' qualifications

    (B)   Computer equipment available

    (C)   A report from users who have trialled the new system

    (D)   A prototype to clarify participants' understanding of the problem

10   Relational databases for a system may have more than one user view of the data.

What is the reason for constructing these different views?

    (A)   To implement metadata structures

    (B)   To establish the validity of the data

    (C)   To determine data elements for different purposes

    (D)   To describe the relationship between hyperlinked design elements

11   Which design tool would best display the details of data and processes in a system?

    (A)   Data dictionary

    (B)   Database schema

    (C)   System flowchart

    (D)   Data flow diagram

12 Which of the following describes voice-over internet protocol (VoIP) transmissions?

    (A)   Analog audio data sent as digital signals

    (B)   Analog audio data sent as analog signals

    (C)   Digital audio data sent as analog signals

    (D)   Digital audio data sent as digital signals

13 Which technological development has supported the emergence of VoIP, 3G and podcasts?

    (A)   Broadband transmission

    (B)   Group Decision Support Systems

    (C)   Radio Frequency Identification Tags

    (D)   Twisted pair cables in local area networks

14 The diagram below represents a physical network topology.
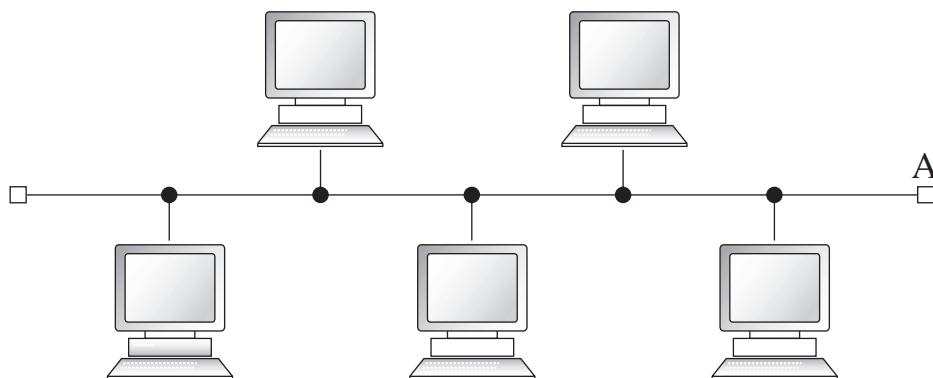
What is the function of the component labelled with the letter A?

    (A)   To prevent reflection of the data signal back down the cable

    (B)   To carry data packets up and down the network to all nodes

    (C)   To attach data to a token and then send it to the addressed node

    (D)   To listen for data present on the network to monitor the network activity

15 Which of the following do agile system development approaches involve?

    (A)   A step-by-step approach to find a flexible solution

    (B)   A swapping of the traditional roles of team members

    (C)   A flexible approach allowing the development team greater independence

    (D)   A complete understanding of the requirements before a project is commenced

16 What is an advantage of querying databases using Query By Example (QBE) compared to using Structured Query Language (SQL)?

(A) Tables are linked using a primary key.

(B) Data does not need to be previously sorted.

(C) It is a visual technique allowing non-experts to do searches.

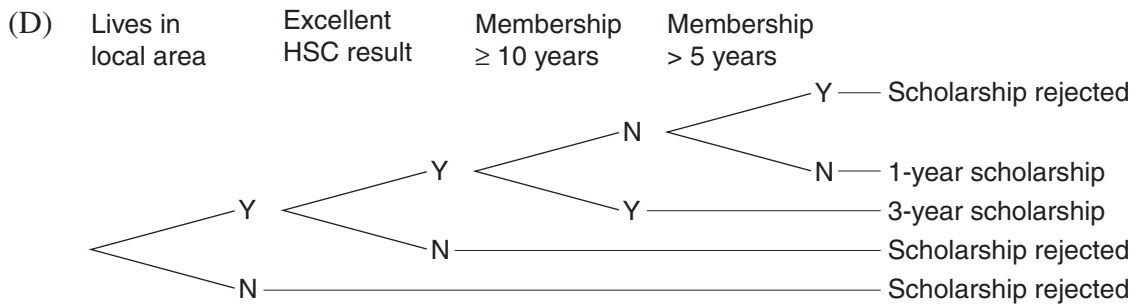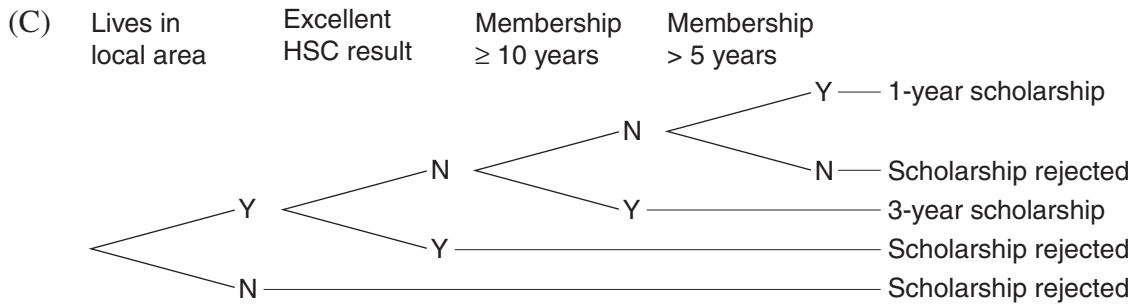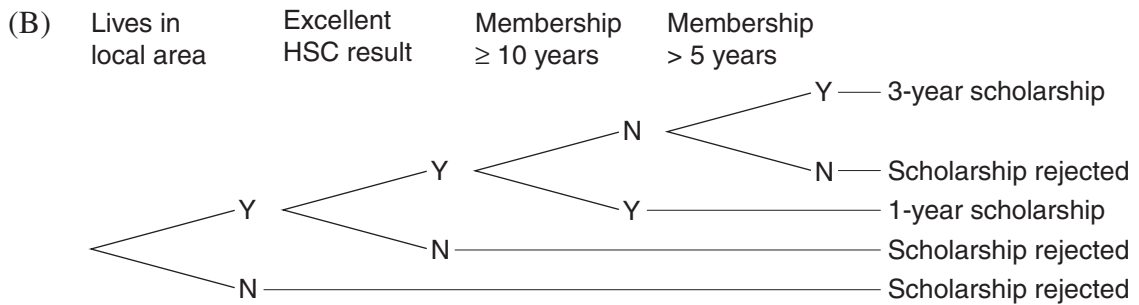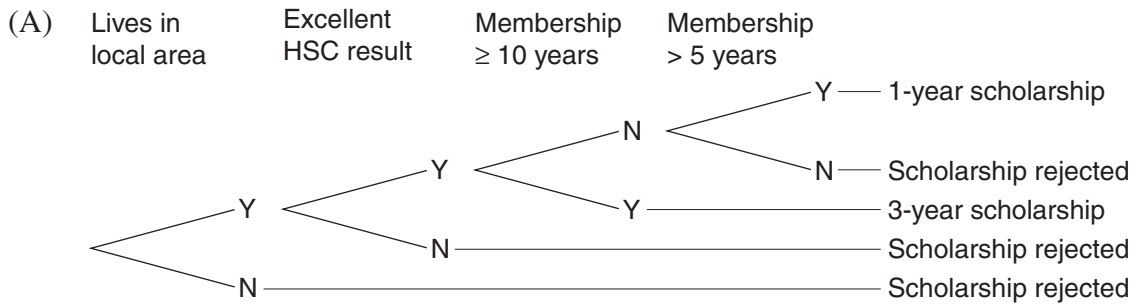(D) The computer is able to access the required information faster.

Use the following information to answer Questions 17–18.

A sporting association has designed a scholarship approval system. It uses the following decision table as the basis for deciding which student members will be granted a scholarship for their tertiary studies.

Conditions	Rules					
Lives in the local area	Y	Y	Y	Y	N	N
Excellent HSC results	Y	Y	Y	N	N	N
Membership for 10 years or more	Y	N	N	Y	N	N
Membership between 5 and 10 years	N	Y	N	N	Y	N
Actions						
Grant 3-year scholarship	Y	N	N	N	N	N
Grant 1-year scholarship	N	Y	N	N	N	N
Reject scholarship application	N	N	Y	Y	Y	Y

17 Which of the following statements is true?

(A) If the student lives in the local area and has been a student member for more than 10 years, he/she will be granted a 1-year scholarship.

(B) If a student has gained an excellent HSC result, lives in the local area and has been a student member for 6 years, he/she will be granted a 3-year scholarship.

(C) If a student has gained an excellent HSC result, lives in the local area and has been a student member for 4 years, he/she will be granted a 1-year scholarship.

(D) If a student has gained an excellent HSC result, lives in the local area and has been a student member for more than 10 years, he/she will be granted a 3-year scholarship.

18 Which decision tree represents the data in the decision table?

(A)

Lives in local area	Excellent HSC result	Membership ≥ 10 years	Membership > 5 years	

```
                                          Y ── 1-year scholarship
                              N <
                    Y <                   N ── Scholarship rejected
          Y <                 Y ─────────── 3-year scholarship
                    N ─────────────────────── Scholarship rejected
          N ─────────────────────────────────── Scholarship rejected
```

(B)

Lives in local area	Excellent HSC result	Membership ≥ 10 years	Membership > 5 years	

```
                                          Y ── 3-year scholarship
                              N <
                    Y <                   N ── Scholarship rejected
          Y <                 Y ─────────── 1-year scholarship
                    N ─────────────────────── Scholarship rejected
          N ─────────────────────────────────── Scholarship rejected
```

(C)

Lives in local area	Excellent HSC result	Membership ≥ 10 years	Membership > 5 years	

```
                                          Y ── 1-year scholarship
                              N <
                    N <                   N ── Scholarship rejected
          Y <                 Y ─────────── 3-year scholarship
                    Y ─────────────────────── Scholarship rejected
          N ─────────────────────────────────── Scholarship rejected
```

(D)

Lives in local area	Excellent HSC result	Membership ≥ 10 years	Membership > 5 years	

```
                                          Y ── Scholarship rejected
                              N <
                    Y <                   N ── 1-year scholarship
          Y <                 Y ─────────── 3-year scholarship
                    N ─────────────────────── Scholarship rejected
          N ─────────────────────────────────── Scholarship rejected
```

19 A Communication System Framework is shown.
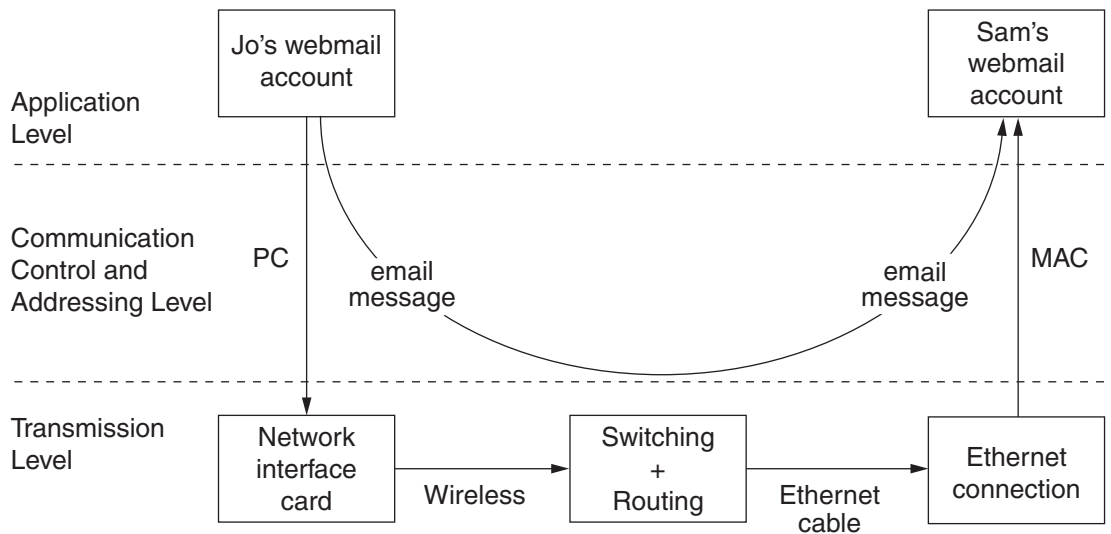
What are the appropriate components if Jo's webmail account is the source of the email message?

	Transmitter	*Receiver*	*Destination*
(A)	Ethernet connection	Sam's webmail account	MAC
(B)	Network interface card	Ethernet cable	Sam's webmail account
(C)	PC	MAC	Sam's webmail account
(D)	Wireless	Ethernet cable	Sam's webmail account

20 The following is an SQL query for a real estate database.

```
SELECT agent.name
FROM agent, residence
WHERE agent.agentno = residence.agentno
AND residence.residenceno = 342;
```

What fact can be deduced from this query?

(A) All sales have the same agent.

(B) The sale has an agent numbered 342.

(C) The residence number attribute occurs in both tables.

(D) The residence table is not required to identify an agent.

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 (9 marks) Use the Question 21 Writing Booklet.

A family consists of Mr and Mrs Morgan and their child, Taylor, who is in Year 11. Mrs Morgan works as a librarian and helps to manage the library's internet site. She uses a desktop computer at home to carry out emergency maintenance of the library site. This computer is presently connected to the internet by dial-up and to a laser printer which has network capabilities.

Mr Morgan and Taylor both have laptops, neither of which are connected to the internet. The family feels that it is time to upgrade so they can have more access to internet resources for work, study and entertainment.

(a) Outline THREE aspects that the family should consider when determining the feasibility of upgrading to a wireless network. **3**

(b) Draw a labelled diagram to represent the wireless solution, including hardware and software components. **3**

(c) Compare the selection of a wireless solution to a cabled solution for the Morgan family. **3**

Question 22 (9 marks) Use the Question 22 Writing Booklet.

An electronic banking service, Bank One, has been established.

(a) To access the Bank One website, customers need to use the following universal resource locator (URL). **3**

$$\text{http://www.bankone.com.au/xxxx=15210}$$
$$\underbrace{\qquad}_{\text{I}} \quad \underbrace{\qquad\qquad\qquad}_{\text{II}} \quad \underbrace{\qquad\qquad\qquad}_{\text{III}}$$

Explain the purpose of each of the three different parts of the URL labelled I, II and III.

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

In designing the Bank One electronic banking system, the following data flow diagram has been created.
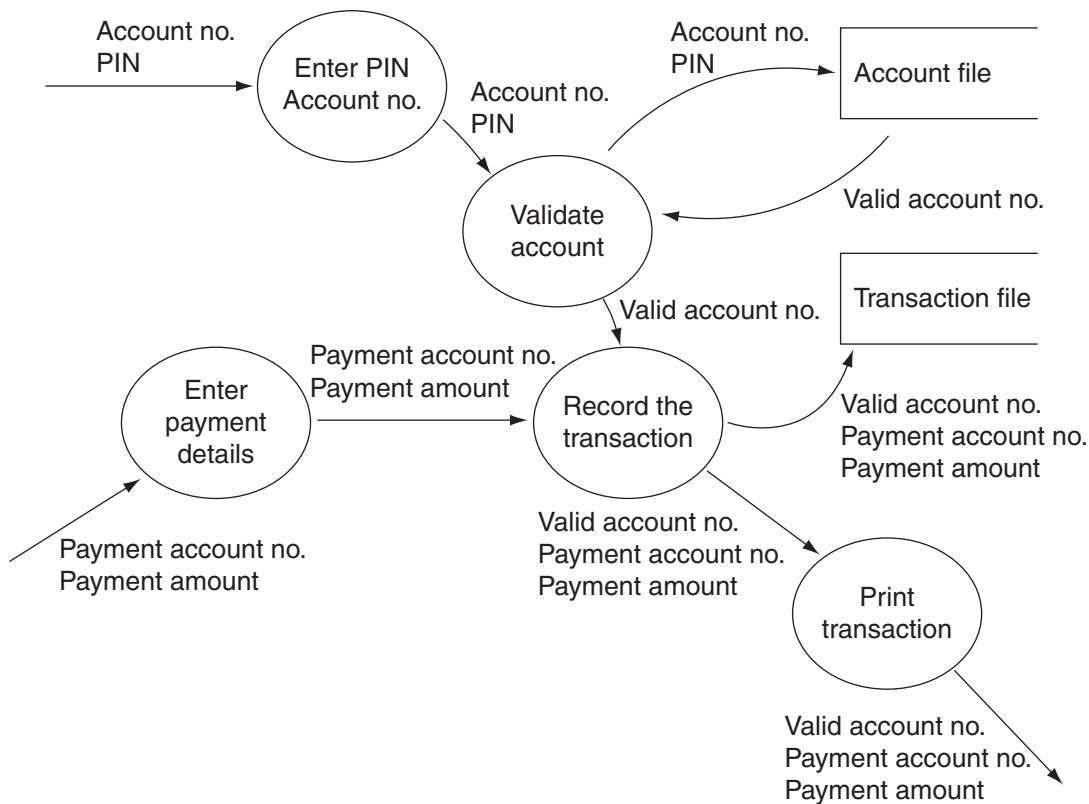

(b) Draw the context diagram for the data flow diagram shown. **2**

(c) Analyse what is required for the process Validate account, with reference to the tasks involved in the following information processes: **4**

- collecting
- processing
- storage and retrieval.

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Question 23 (11 marks) Use the Question 23 Writing Booklet.

Use the following information to answer Question 23.

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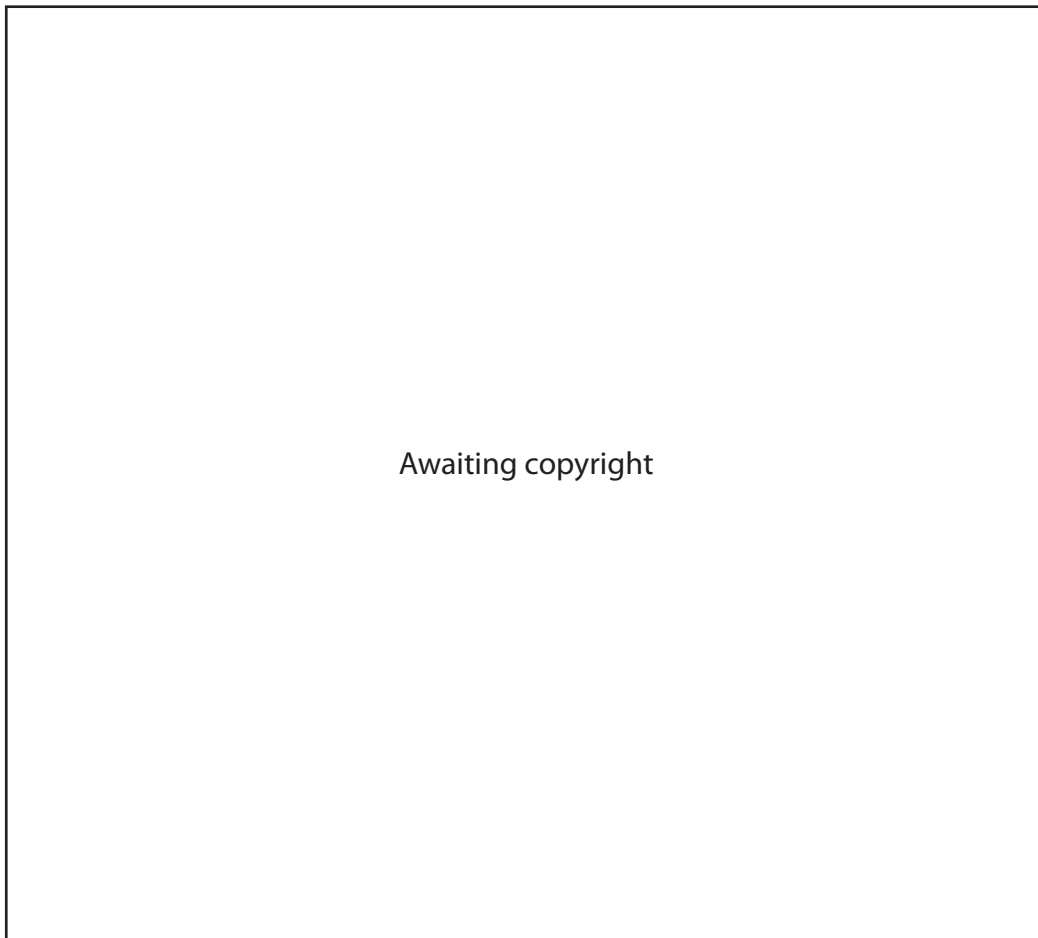
(a)   What is the underlying purpose of the ISA system?   **1**

(b)   Identify the information technology (hardware and software), involved in the   **2**
         ISA system.

(c)   Describe TWO social and/or ethical issues related to the proposed system.   **3**

(d)   Predict how this type of remote monitoring information technology could be   **5**
         applied in a different situation. Describe this application with particular
         reference to the tasks involved in the following information processes:

   • displaying
   • organising
   • processing.

Question 24 (11 marks) Use the Question 24 Writing Booklet.

XYZ is an internet-based music service that allows customers to purchase music from the store's online database, and then download immediately to their computers using a specified code.

When visiting the website, customers are asked to carry out the following steps:

Step 1: Select music genre

Step 2: View artists in a particular genre

Step 3: View currently available songs

Step 4: Select desired song(s)

Step 5: Pay for song(s) by selecting method of payment

Step 6: Complete payment details

Step 7: Receive a receipt with specified music code

Step 8: Download song

(a) Explain how the needs of customers have an impact on the design of the system. **3**

(b) Prepare a data dictionary for a table named 'Customer'. **3**

(c) Draw a schema that would demonstrate the logical organisation of data in the XYZ music store database. Show the nature of relationships and relevant key fields. **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.

Question 25 — Transaction Processing Systems (20 marks)
Use a SEPARATE Writing Booklet.

(a)	(i)	Define the term *transaction*.	**1**
	(ii)	Describe ONE example of a batch transaction processing system.	**2**
(b)		Identify TWO methods of data backup procedures to protect data. Give examples of when they would be most appropriate to use.	**3**

Use the following screenshots of an online airline booking system to answer part (c).

Flight Choice	**Customer**	**Confirmation**
Destination ▢	Name ▢	Print e-ticket
Flight date ▢	Credit card ▢	◉ Yes ◯ No
Departure Time ▢	Allocated seat number ▢	
Arrival Time ▢		Thank you for booking with us!
Fare for above flight is ▢	Confirm ◉ Yes ◯ No	
Confirm ◯ Yes ◯ No		

(c)	(i)	Design the e-ticket that would be displayed when a flight has been successfully booked. Describe the purpose of the data for the e-ticket transaction.	**4**
	(ii)	Analyse the data/information requirements for booking an airline ticket with reference to the above screenshots.	**6**

In your answer, include reference to the tasks from each of the information processes:

- collecting
- storage and retrieval
- analysing.

	(iii)	Analyse this online transaction processing system (OLTP) compared to booking an airline ticket in person.	**4**

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Question 26 — Decision Support Systems (20 marks)
Use a SEPARATE Writing Booklet.

(a) (i) Define the term *geographical information systems* (GIS). **1**

  (ii) Describe ONE example of how a GIS can be used in decision support. DO NOT use the 'ANNA' system described below as your example. **2**

(b) Name and briefly describe TWO roles in the development of an expert system. **3**

(c) (i) Compare and contrast the main features of a neural network with an expert system. **4**

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

The Artificial Neural Network for Australia (ANNA) provides forecasts of direction of waves, wave size and wave period (frequency). The forecasts use webcams installed on many Australian beaches.

Awaiting copyright

Existing global wave models allow forecasts of the size and frequency of waves to be made several days in advance.

However, these models do not take into account unique features of particular beaches and cannot accurately predict conditions at particular locations.

ANNA has been designed to translate these ocean wave forecasts into forecasts for individual beaches. The system can forecast wave heights, direction of waves and frequency of waves (as shown in the graph). It can also factor in such things as which direction a beach faces, headlands near the beach and any offshore reefs.

This system 'learns' over time to make more accurate forecasts by continually readjusting and reweighting factors such as wave height as each wave hits the coast. In this way ANNA continually factors in the local characteristics of individual beaches and is able to forecast conditions with high accuracy.

  (ii) Analyse the data/information requirements for the development of this system with reference to the tasks involved in each of the following: **6**

  • collecting

  • analysing

  • displaying.

  (iii) Analyse the use of neural networks such as ANNA for decision support. **4**

Question 27 — Automated Manufacturing Systems (20 marks)
Use a SEPARATE Writing Booklet.

(a)   (i)   Define the term *actuator*.   **1**

       (ii)   Describe the difference between CAD and CAM in an automated manufacturing system.   **2**

(b)   Identify TWO methods of processing in a manufacturing system and give an example of each.   **3**

Use the following information to answer part (c).

A car manufacturer has established an automobile recycling centre. Cars are dismantled into different reusable parts eg wheels, engines, batteries, bumpers etc.

Part of this process is described below.

| 1 An electric motor is used to move the car along the assembly line.	2 Light sensors are used to detect the varying location of the wheel nuts. An automated wrench then removes the wheel nuts from all four wheels.	3 The wheels are dropped onto a conveyor belt where they are transported to a warehouse for distribution.
4 This process continues until all reusable car parts have been removed.	5 After all of the reusable parts are removed from the car it is crushed flat so that it will be easier to dispose of.	

(c)   (i)   Draw a block diagram to illustrate the removal of the wheels in the scenario provided above. Include the sensors and actuators involved. Justify why block diagrams are used in the context of the scenario.   **4**

       (ii)   Analyse the data/information requirements for the removal of the wheels in this automated system with reference to the tasks involved in each of the following information processes: **6**

              • collecting

              • displaying

              • transmitting and receiving.

       (iii)   Analyse this automated system with reference to quality control and repetition of tasks.   **4**

Question 28 — Multimedia Systems (20 marks)
Use a SEPARATE Writing Booklet.

(a) (i) Define the term *pixel*. **1**

   (ii) Describe the relationship between pixels and screen resolution. **2**

(b) Briefly describe TWO fields of expertise required in the development of multimedia applications. **3**

Use the information below to answer part (c).

The screenshot shows the homepage of the LearnEnglish website. The website uses podcasts and animations to teach people how to speak English.
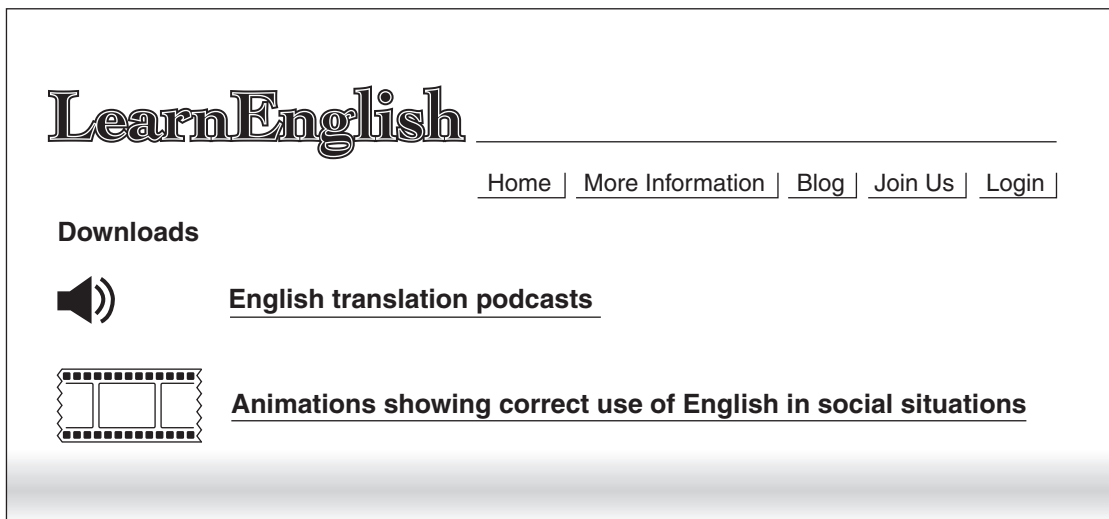
(c) (i) Describe appropriate file formats that could be used to store the data for the downloads from this website, and justify why they would be suitable. **4**

   (ii) Analyse the data/information requirements for the development of this website with reference to the tasks involved in each of the following information processes: **6**

   • collecting

   • organising

   • processing.

   (iii) The designers of the website are considering the development of a 'virtual world' link to allow participants to practise communicating in English with other people in interactive situations. **4**

   Analyse the issues relating to the use of this technology.

End of paper