



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

2005

**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 13–16

40 marks

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

Section III Pages 17–20

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.

A B C D
correct →

1 The members of a team working on a project are located in different cities.

Which of the following would be the most appropriate technology for the team to use to exchange text and graphical information for editing?

- (A) Letter
- (B) Email
- (C) Facsimile
- (D) Voice mail

2 The printing of a receipt from an EFTPOS terminal is an example of which information process?

- (A) Analysing
- (B) Collecting
- (C) Displaying
- (D) Organising

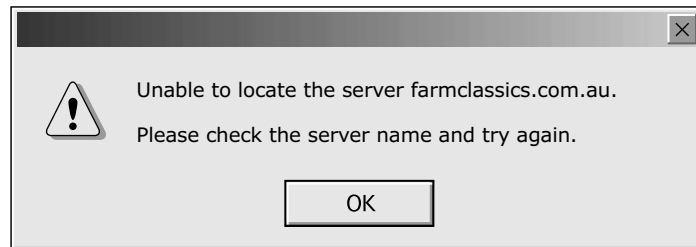
3 Which graphical tool best shows how a project and its subprojects could be completed in a specified timeframe?

- (A) Gantt chart
- (B) Decision tree
- (C) Data flow chart
- (D) System flow chart

4 Which of the following personnel would allocate file-access rights to users?

- (A) Programmer
- (B) System analyst
- (C) Software trainer
- (D) Network administrator

- 5 In seeking a site on the internet, a user types the URL `http://farmclassics.com.au/` into a browser. The message below is displayed.



Which of the following actions should the user perform to find the desired site?

- (A) Use a different browser that is more reliable.
 - (B) Check the URL for typing errors and try again.
 - (C) Email farmclassics' webmaster and request further information.
 - (D) Type in the name of the print server for the desired site, and try again.
- 6 A political party collected data from a large number of 18-year-old people. The data will be analysed to identify patterns that relate to issues affecting young people.

Which of the following would be the most effective analysis technique?

- (A) Data mining
 - (B) Data sorting
 - (C) Data validation
 - (D) Data warehousing
- 7 Several networked computers share a database that is stored on one computer.

Which type of network architecture is this?

- (A) Parallel
- (B) Relational
- (C) Distributed
- (D) Client-server

- 8 Which of the following is an example of metadata?
- (A) Search engine
 - (B) System prototype
 - (C) Site map for a website
 - (D) Result of an SQL query
- 9 What would ensure that the restricted area of a website is accessed only by registered users?
- (A) Internet nanny
 - (B) Username and password
 - (C) Encryption and decryption
 - (D) Uniform Resource Locator
- 10 A chain of fifty DVD rental outlets proposes a trial of a new information system prior to full implementation. At the beginning of the trial, ten outlets will change over to the new system.

What is the name for the conversion method the chain will use?

- (A) Direct
 - (B) Parallel
 - (C) Phased
 - (D) Pilot
- 11 The table shows four pairs of statements about the order of arrival and paths of packets through a packet-switching network.

In which case are both statements TRUE?

	<i>Arrival order</i>	<i>Path through network</i>
(A)	Arrive in random order	All packets take same path
(B)	Arrive in random order	Packets can take different paths
(C)	Same order as transmitted	All packets take same path
(D)	Same order as transmitted	Packets can take different paths

- 12 A cost-benefit analysis is conducted on two proposed solutions for a new information system.

A table from the analysis report is shown.

	<i>Solution One</i>	<i>Solution Two</i>
Set-up cost	\$2000	\$3000
Running cost per year	\$500	\$500
Estimated total benefit after two years	\$1100	\$1600
Estimated total benefit after four years	\$1100	\$2200
Expansion capability	No	Yes

Based on the information in the table, which of the following statements is TRUE?

- (A) *Solution Two* can be expanded and has lower costs.
- (B) *Solution One* would cost less to set up and return higher benefits after four years.
- (C) *Solution Two* will return higher benefits after two years even though it is more expensive to set up.
- (D) *Solution One* has the same running costs as *Solution Two* and will return higher benefits after four years.

Use the following information to answer Questions 13 and 14.

Below is part of the data dictionary of a travel agent's database. Only the metadata for the 'Travel' table is shown.

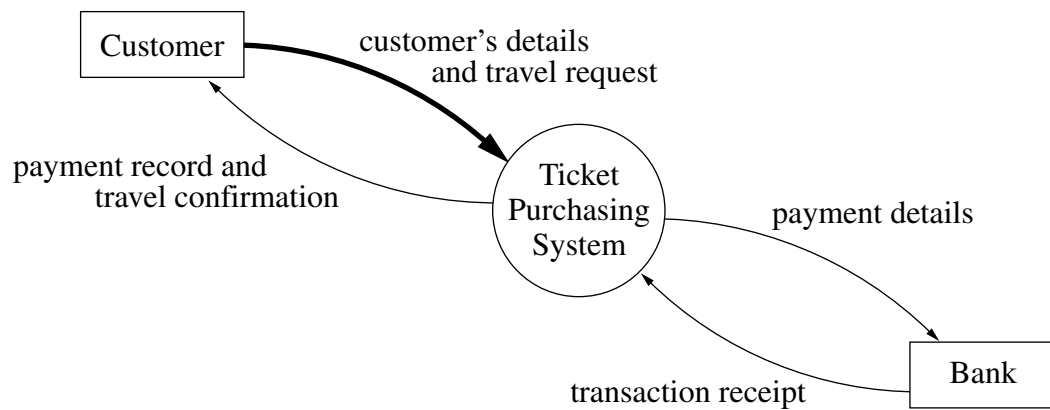
Field name	Date type	Field width	Description
Customer_Code	Text	4	Unique customer identification
Tour_Destination	Text	30	Main country of tour
Tour_Duration_Days	Number	2	Length of tour
Departure_Date	Date	8	Departure date of tour
Cost	Number	8	Charges for travel
Booking_Date	Date	8	Date of booking

- 13** The travel agent does not allow bookings to be made close to the date of departure of a tour.

Which of the following would be the most appropriate range check to prevent the entry of bookings within 14 days of the departure date?

- (A) `Tour_Duration_Days < 14`
 - (B) `Departure_Date > 14`
 - (C) `Booking_Date + 14 > = Departure_Date`
 - (D) `Booking_Date + 14 < = Departure_Date`
- 14** Which of the following SQL commands would display the codes of the customers travelling to China on tours of more than 10 days duration?
- (A) `SELECT Customer_Code FROM Travel WHERE Tour_Destination = "China" AND Tour_Duration_Days > 10;`
 - (B) `SELECT Customer_Code FROM Travel WHERE Tour_Destination = China AND Tour_Duration_Days > = "10";`
 - (C) `SELECT Customer_Code FROM Travel WHERE Tour_Destination = "China" OR Tour_Duration_Days > = 10;`
 - (D) `SELECT Customer_Code FROM Travel WHERE Tour_Destination = China OR Tour_Duration_Days > 10;`

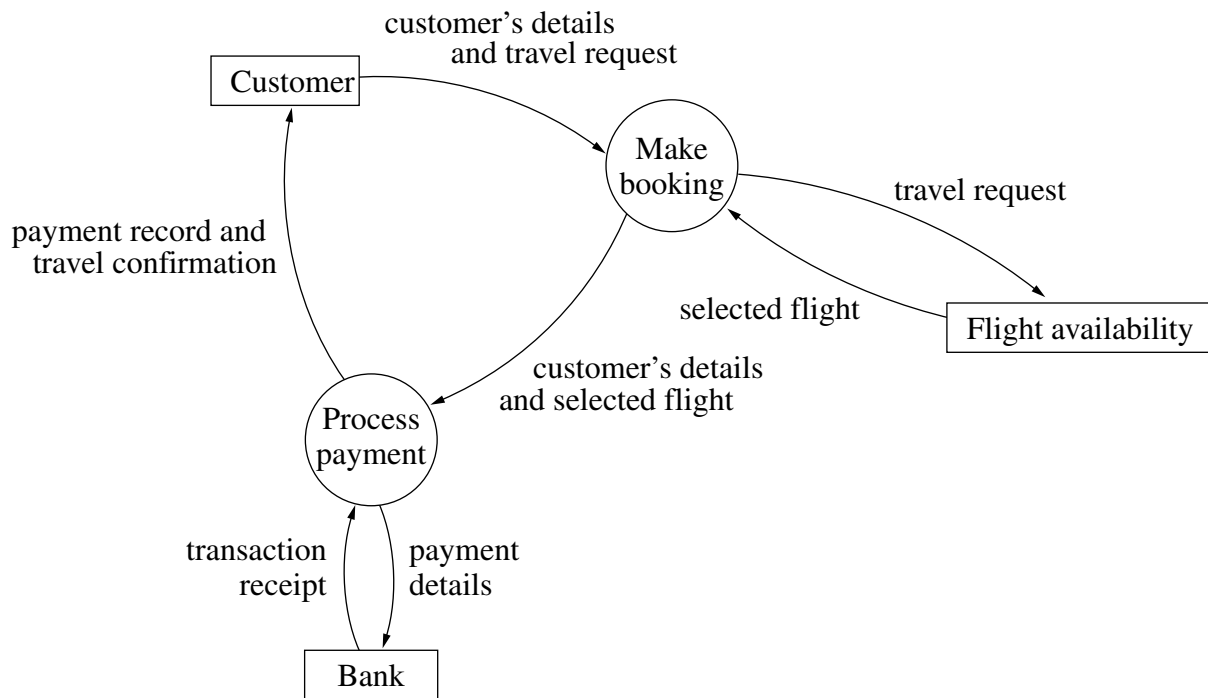
- 15 The context diagram represents the purchase of airline tickets through a travel agent.



Which information process is necessary for the flow of data from a customer to the Ticket Purchasing System?

- (A) Analysing
- (B) Collecting
- (C) Displaying
- (D) Processing

16 The following data flow diagram is a refinement of the context diagram in Question 15.

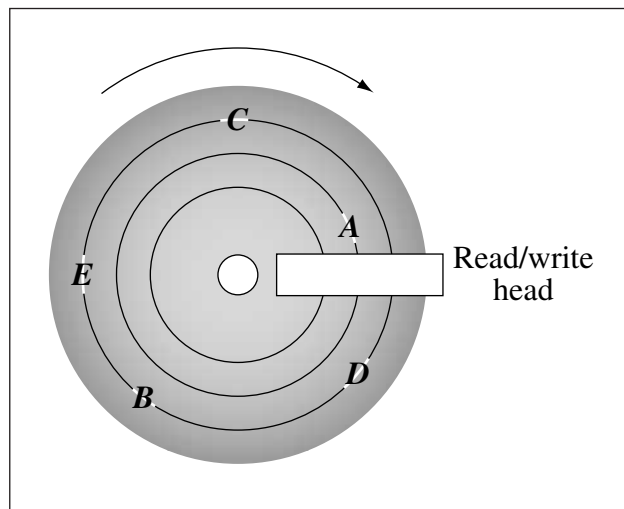


Which of the following is a correct interpretation of how the purchase of an airline ticket is represented in the data flow diagram?

- (A) Stored data is accessed to make a booking.
- (B) Payment details are accessed to make a booking.
- (C) The customer provides payment details to the bank.
- (D) The customer receives a transaction receipt from the bank.

17 The diagram represents some components of a random access storage device.

A, B, C, D and *E* represent different blocks on the medium.



The table below contains information about the medium this device uses and the sequence in which the device would access data.

In which row is all the information correct?

	<i>Medium</i>	<i>Sequence of data access</i>
(A)	Flash memory	Could be accessed in any sequence
(B)	Magnetic tape	Must be accessed in the sequence <i>A, B, C, D, E</i>
(C)	Magnetic disk	Could be accessed in the sequence <i>E, D, C, B, A</i>
(D)	Optical disk	Must be accessed in the sequence <i>A, D, B, E, C</i>

18 Data flow diagrams and system flow charts are graphical tools used in documenting and designing information systems.

What is the major difference between these two tools?

- (A) Data flow diagrams can be converted to decision trees or decision tables, unlike system flow charts.
- (B) System flow charts are for a proposed information system, while data flow diagrams are for an existing information system.
- (C) Data flow diagrams have more symbols available than system flow charts, enabling the designer to convey more ideas.
- (D) Data flow diagrams represent the movement of data through a system, while system flow charts focus on the physical aspects of information flow.

- 19 The table describes the characteristics of optic fibre cable, copper cable and wireless transmission media, but not necessarily in sequence.

	<i>Medium 1</i>	<i>Medium 2</i>	<i>Medium 3</i>
<i>Installation characteristics</i>	Does not require cable installation	Relatively inexpensive	Can be difficult to join
<i>Transmission frequencies</i>	Middle range	Low range	High range
<i>Risks</i>	High potential for interception	Can be affected by electromagnetic interference	Brittle, easily damaged

Which one of the following alternatives shows the most appropriate uses for Medium 1, Medium 2 and Medium 3?

	<i>Medium 1</i>	<i>Medium 2</i>	<i>Medium 3</i>
(A)	Satellite television	A company intranet	Connecting a printer to a home computer
(B)	Remote telephone services	A cordless telephone	Cabling the links between computers connected to the internet
(C)	Mobile phone	A local area network	A dedicated link between an organisation and a branch office
(D)	WAN cabling	Connecting a modem to a home computer	A link between telephone exchanges

- 20 The analysis of criteria to choose suitable computer hardware for an organisation resulted in this decision table.

<i>Conditions</i>	<i>Rules</i>							
Processor speed ≥ 2 GHz	✓	✗	✓	✓	✗	✓	✓	✓
Hard disk storage > 100 GB	✓	✓	✓	✗	✓	✗	✓	✓
Flat screen	✗	✓	✓	✗	✗	✓	✓	✓
Includes a sound card and speakers	✗	✗	✗	✗	✗	✗	✓	✓
Price $> \$1500$ and $< \$4000$	✓	✓	✗	✓	✓	✓	✗	✓
<i>Actions</i>								
Suitable for an office system	✓	✓	✗	✓	✓	✓	✗	✓
Suitable for a multimedia system	✗	✗	✗	✗	✗	✗	✓	✓
Suitable for an EFTPOS terminal	✗	✗	✓	✓	✗	✓	✓	✓

Which of the following would be the minimal conditions (requirements) for a system suitable for both an office system AND an EFTPOS terminal?

- (A) A processor speed of 2 GHz and a flat screen
- (B) A flat screen and a price between \$1500 and \$4000
- (C) A processor speed of 2 GHz and a price between \$1500 and \$4000
- (D) A processor speed of 2 GHz, a flat screen and a price between \$1500 and \$4000

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.	
(a) Define <i>communication protocol</i> and give an example of a communication protocol.	3
(b) The Board of Studies NSW has made the syllabus for Information Processes and Technology available at the following URL: http://www.boardofstudies.nsw.edu.au/syllabus_hsc/pdf_doc/infoprotech_syl.pdf If a student did not know the above URL, he or she could find the document using a search engine. However, inputting just 'IPT' into a search engine will generate many unwanted matches, including pages about 'Insurance Protection Tax' and a Brazilian website for 'Instituto de Pesquisa Technologias' http://www.ipt.br Outline THREE distinct strategies which you could use to refine the search to eliminate many unwanted matches. Include an example for each refinement.	3
(c) A university has developed an improved search engine for its website. Propose and justify ONE appropriate method of testing and ONE method of implementing the improved search engine.	4

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

Susan is responsible for administering the loan of items to various faculties in a school. She has allocated a unique number to each piece of equipment. To keep track of records, Susan has set up an electronic flat-file database. A portion of this database is shown.

<i>Item</i>	<i>Item number</i>	<i>Borrower's first name</i>	<i>Borrower's surname</i>	<i>Faculty</i>	<i>Date borrowed</i>	<i>Date returned</i>
Laser printer #1	001	John	Jones	Science	31-Jan-05	2-Feb-05
Video camera	008	John	Jones	Science	7-Feb-05	12-Feb-05
Video camera	008	Mary	Green	Mathematics	14-Feb-05	
Multimedia projector	005	John	Jones	Science	21-Feb-05	06-Jun-05
Digital camera	003	Jack	Smith	English	04-Apr-05	08-Apr-05
Laser printer #2	002	Mary	Green	Mathematics	05-Apr-05	09-Apr-05
.
.
.
.
Multimedia projector	005	Mary	Green	Mathematics	15-Sep-05	22-Sep-05

- (a) With reference to the above database, identify an example of data redundancy, and describe TWO problems that could arise with this database structure. **3**
- (b) Normalise this flat-file structure into three tables. Indicate all necessary relationships, and label all primary and foreign keys. **3**
- (c) Susan wants to present a report at the end of the year, showing the usage of the multimedia projector by the different faculties. **3**

The report should show:

- who has used the projector;
- how long they borrowed the projector for each time; and
- summary information.

Sketch and label the features of an appropriate report layout.

Question 23 (12 marks) Use a SEPARATE writing booklet.

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



WWW.australianIT.com.au August 2004

Rural towns seek skilled city slickers as jobs rise

Diana Thorp
Employment

REGIONAL IT jobs are increasing, Icon Recruitment noting a 70 per cent growth in the number of jobs in regional Victoria compared with three years ago.

The rise is prompting recruiters to encourage city-based IT professionals to take up these jobs.

“We’ve definitely seen a huge growth in Victoria and there has been some growth in NSW in areas such as Wollongong,” Icon Recruitment recruitment consultant Jill Noble said.

“In Victoria, Geelong and Bendigo seem to be really buzzing.

“Everything was pretty quiet three years ago,” Ms Noble said.

Skills in demand include network support, data managers, operational staff, helpdesk staff, software developers and analyst programmers.

Ms Noble said the IT market generally had picked up.

“It’s stabilising and becoming more mature. Salaries are evening out so regional companies can attract people, and so on,” she said.

“The other thing is that a lot of those regional companies are small to medium enterprises – home-grown companies.” . . .

City workers who relocate are paid equivalent salaries to the city, but have lower living costs. . . .

Ms Noble said professionals were often willing to move to regional areas, especially if they had a family “because instantly you reduce your cost of living”.

© Diana Thorp

One company that has taken advantage of relocating workers to regional areas allows staff to work from home. Staff use technology to communicate with co-workers in their homes and in head office.

- (a) Identify the technologies (hardware, software and communications) that would be needed for regionally-based employees to communicate with co-workers. **3**
- (b) Identify the advantages and disadvantages for employers of having staff located in regional areas. **4**
- (c) Describe project management strategies that would assist members of a software development project team based in multiple locations (including regional and city) to work together effectively. **5**

Question 24 (9 marks) Use a SEPARATE writing booklet.

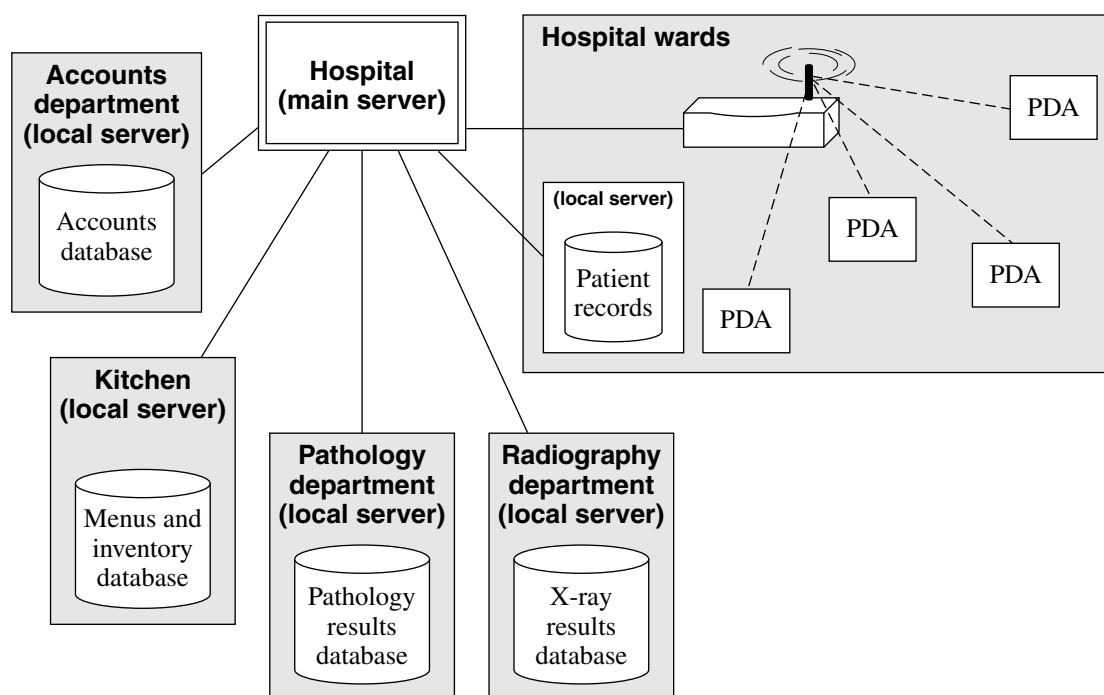
Bakersville Hospital has a new technological solution to assist high-quality care for patients.

A wireless Local Area Network is implemented in the hospital wards. Each member of the medical staff in the wards has been issued with a Personal Digital Assistant (PDA) that has a wireless capability to link via the network to a database of patient records. Medical staff can access and update patient records while at the patient’s bedside.

The wireless system allows medical staff to:

- order blood tests from the pathology department;
- arrange for X-rays with the radiography department;
- check a patient’s diet with the kitchen; and
- update accounts.

To ensure seamless access to data, the hospital administrators have installed a distributed database system that has data stored locally in the relevant departments. The diagram below represents the architecture of the system.



- (a) Describe the strengths and weaknesses of the distributed database system for medical staff and the hospital administrators. 4
- (b) Discuss the technical issues related to the use of wireless communications in the hospital. 5

Section III

40 marks

Attempt TWO questions from Questions 25–28

Allow about 1 hour and 10 minutes for this section

Answer each question in a SEPARATE writing booklet. Extra writing booklets are available.

If you include diagrams in your answer, ensure that they are clearly labelled.

	Marks
Question 25 — Transaction Processing Systems (20 marks) Use a SEPARATE writing booklet.	
(a) (i) Define <i>batch processing</i> and give an example.	3
(ii) Define <i>MICR</i> and give an example of its use.	3
Use the following information to answer parts (b)–(c).	
A cinema allows customers to purchase movie tickets via the internet. Using a web browser, customers select the movie session they wish to see and submit credit card details. The system provides the customer with an image of a ticket which contains a unique bar code. The customer prints the image and brings the hard copy to the cinema. Entry to the movie is via a turnstile capable of reading that bar code.	
(b) (i) Design a suitable web-based data entry screen for the customer to submit data about their choice of movie session, and their credit card details. Indicate clearly what screen elements are being used to input the data (eg, text field, pull-down menu, radio buttons), and justify your choices.	4
(ii) Describe the sequence in which this real-time transaction processing occurs, and identify the main information technology required at each stage.	4
(c) The cinema company wishes to implement a system where customers can purchase tickets via their mobile phones. The customers send a text message containing the movie session they wish to see. An image of the ticket, with a barcode, is downloaded to the customer's phone. The cost of the ticket is added to their phone bill. At the cinema turnstile, the customer displays the image of the ticket and waves the phone over the barcode reader.	6

Identify and discuss the advantages and disadvantages of the mobile phone system, the web-browser system, and a conventional system where tickets are bought at the cinema.

Question 26 — Decision Support Systems (20 marks)

Use a SEPARATE writing booklet.

- (a) (i) Describe how displaying data in a graph or chart would assist decision making. **3**
- (ii) Define an *intelligent agent* and give an example. **3**

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

The table describes information used in an expert system to identify some whale species.

<i>Did the whale have flukes (tail fins)?</i>	<i>Did the whale have a dorsal fin?</i>	<i>What was the size of the whale?</i>	<i>Was the blow aimed forward?</i>	<i>Were one or two blows visible at the same time?</i>	<i>The whale is a . . .</i>
Yes	Yes	Very large	–	–	Blue whale
Yes	Yes	Medium	Yes	–	Sperm whale
Yes	Yes	Medium	No	–	Humpback whale
Yes	No	Medium	–	One	Gray whale
Yes	No	Medium	–	Two	Right whale
Yes	No	Large	–	–	Bowhead whale
Yes	No	Very small	–	–	Narwhal whale
No	No	–	–	–	Beluga whale

- (b) (i) Draw a decision tree to describe the data in the table. **5**
- (ii) Write a rule, that would appear in the knowledge base, to identify a Gray whale. **3**
- (c) A neural network could also be used to identify whales. Compare the ways a neural network and an expert system would identify whales by discussing: **6**
- processing methods
 - user interfaces
 - data formats.

Question 27 — Automated Manufacturing Systems (20 marks)

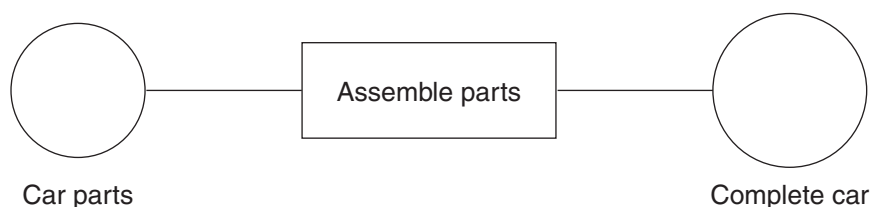
Use a SEPARATE writing booklet.

- (a) (i) Describe a barcode and the operation of a barcode reader. **3**
- (ii) Describe a situation in an automated manufacturing system where it is necessary to convert a digital signal to an analogue signal. **3**

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

CMN is a large company that manufactures many cars per week using assembly-line production. A car consists of many different parts that need to be assembled at different points on the assembly line, using computerised control as well as human workers.

A simple block diagram for the manufacture of a car is shown.



- (b) (i) Refine the block diagram to show more detail of human and computer-controlled tasks, including: **4**
- fitting and adjusting engines
 - welding body
 - spray painting.
- (ii) Identify the type of processing used at CMN as batch, discrete, or continuous, and justify your answer. **4**
- (c) CMN wants to introduce mass customisation, which will enable it to manufacture cars according to customer requirements. Features of the car that can be customised are seat width, interior fabric and colour, exterior paint colour and window tint. **6**

Discuss the issues of introducing mass customisation at CMN. Include in your answer:

- nature of work
- information technologies.

Please turn over

Question 28 — Multimedia Systems (20 marks)

Use a SEPARATE writing booklet.

- (a) (i) Define *morphing* and provide an example of its use. 3
- (ii) Define *sampling rate* and describe how it is used to represent audio data. 3

Use this image of the home page of the *ABC Online* website to answer parts (b)–(c).



© Copyright ABC

- (b) (i) Identify and describe FOUR different multimedia elements, or links to them, on the website. 3
- (ii) Identify the types of software that you would use to design and create a website such as *ABC Online*. Justify your selection of each type of software. 5
- (c) The *ABC Online* website is an example of the merging of many different media on one website. 6

Identify the developments in hardware and telecommunications that have enabled the integration of media, and discuss the issues and implications of this integration.

End of paper