

GCE

Specimen Papers with Mark Schemes

**Edexcel Advanced Subsidiary GCE in
Computing (8106)**

First examination 2001

Edexcel Advanced GCE in Computing (9106)

First examination 2002

January 2000

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Mark Schemes

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The GCE awarding bodies have prepared new specifications to incorporate the range of features required by the new GCE and subject criteria. The specimen assessment material accompanying the new specifications is provided to give centres a reasonable idea of the general shape and character of the new planned question papers in advance of the first operational examination.

6271/01

Edexcel GCE

Computing

Unit Test 1 Computer Systems

Advanced Subsidiary / Advanced Specimen Unit Test

Time: 1 hour 30 minutes

Materials required for the examination

Answer Booklet (AB03)

Items included with these question papers

Nil

Instructions to Candidates

Answer ALL questions.

In the boxes on the Answer Book, write the name of the Examining Body (Edexcel), your centre number, candidate number, the subject title, paper reference, your surname, other name(s) and signature.

The paper reference is shown towards the top left hand corner of the page.

Information for Candidates

Marks allocated to parts of questions are indicated in brackets.

Advice to Candidates

You must ensure that your answers to parts of questions are clearly numbered.

You are reminded of the necessity for good English and orderly presentation in your answers. Section B includes marks for quality of written communication.

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Section A

Answer ALL questions in this section.

1. Explain the term *embedded system*. Give examples of devices which might incorporate an embedded system. **(4 marks)**

2. A bank uses a file server, with a number of dumb terminals attached for processing cheque transactions in batch mode and a network of personal computers for producing letters to customers.
 - (a) Briefly describe the features of an operating system for batch processing. **(2 marks)**
 - (b) Give *three* actions which would be carried out by the operating system of a personal computer. **(3 marks)**

3. Access to sensitive data by unauthorised people is of concern to the personnel manager of a hospital.
 - (a) Outline controls which may be used to prevent unauthorised access to terminals. **(2 marks)**
 - (b) Explain how different members of staff may use the same terminal but only have access to facilities and data relevant to them. **(3 marks)**

4.
 - (a) Explain the term secondary (or external) storage and state why it is required. **(2 marks)**
 - (b) List *three* types of secondary storage. Briefly describe an application which would use each type of storage. Justify your choice. **(4 marks)**

TOTAL FOR SECTION A: 20 MARKS

SECTION B

Answer ALL questions in this section.

5. All the offices of an insurance company are within one building. A local area network (LAN) has been set up to enable distributed computing.
- The managers are looking to expand the company into a second building in another city and are exploring the possibility of creating a wide area network (WAN).
- (a) Briefly describe a LAN. **(3 marks)**
- (b) Describe, with diagrams, a star and ring topology. Clearly indicate where the file server and printer would be located. **(6 marks)**
- (c) State *three* benefits an office may expect from using a LAN. **(3 marks)**
- (d) Briefly explain the difference between a LAN and a WAN.
Describe the additional hardware which a WAN would require. **(6 marks)**
-
6. The staff in a company that produces advertising material often require word processing, spreadsheet, database management and graphics facilities. These can be provided by several independent packages or by a single integrated package.
- (a) (i) Give *three* reasons why an integrated package might be preferred. **(3 marks)**
(ii) Give *one* reason why an integrated package might *not* be preferred. **(1 mark)**
- (b) Give *two* examples to illustrate how the staff may make use of the integration facilities of the single integrated package. **(2 marks)**
- (c) When a new spreadsheet is being constructed, an individual cell within the spreadsheet may have a label entered into it.
State *three* other types of entry which can be made. **(3 marks)**
- (d) The manager of the company wishes to process the accounts using a computer.
Compare the advantages and disadvantages of using a customised integrated package rather than an accounts package which has been produced commercially. **(9 marks)**

TOTAL FOR SECTION B: 36 marks + 4 marks for quality of written communication

= 40 MARKS

END

6272/01

Edexcel GCE

Computing

Unit Test 2 Design and Organisation of Information Systems

Advanced Subsidiary / Advanced Specimen Unit Test

Time: 1 hour 30 minutes

Materials required for the examination

Answer Booklet (AB03)

Items included with these question papers

Nil

Instructions to Candidates

Answer ALL questions.

In the boxes on the Answer Book, write the name of the Examining Body (Edexcel), your centre number, candidate number, the subject title, paper reference, your surname, other name(s) and signature.

Information for Candidates

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Section A

Answer ALL questions in this section.

1. (a) Explain the difference between data and information, giving a valid example of each. **(2 marks)**
(b) State *two* qualities of useful information. **(2 marks)**
-
2. (a) Briefly describe *two* applications in which it is appropriate to process a file serially. Explain why serial processing is appropriate in each case. **(4 marks)**
(b) Briefly describe an application which requires serial access to the master file on one occasion and direct access on another. **(2 marks)**
-
3. (a) State *three* ways in which files may be organised on direct access storage devices. **(2 marks)**
(b) Give *two* advantages of using a relational database rather than conventional files. **(2 marks)**
-
4. A software house has been employed to perform a major update of the computing system of an examination board.
(a) Give *two* reasons for requiring good documentation for the new system. **(2 marks)**
(b) Identify *four* sections in the maintenance documentation for the new system. **(4 marks)**
-

TOTAL FOR SECTION A: 20 MARKS

Section B

Answer ALL questions in this section.

5. One stage in the development of a computer system to manage the stock control of a warehouse is to produce a prototype.
- (a) Describe the term prototyping. **(5 marks)**
- (b) Outline the advantages and disadvantages of prototyping for users and systems developers. **(10 marks)**
- (c) State what aspects of development are particularly discussed with the users during prototyping. **(3 marks)**

-
6. A large supermarket has fifty check-out points. Each is equipped with a point of sale terminal incorporating a bar code reading device and is linked to a computer in the stock room.

The supermarket is one of a number of similar supermarkets all supplied from a central warehouse.

Each night the supermarket's computer is connected to the computer in the warehouse to pass on the requirements for the supply of stock.

Fresh food is ordered direct from local suppliers each day according to demand.

- (a) (i) Explain the term barcode **(1 mark)**
(ii) Give *two* advantages of using a barcode reader. **(2 marks)**
- (b) (i) Identify *three* points at which data is captured for the system. **(3 marks)**
(ii) Describe *two* methods of capturing this data. **(2 marks)**
- (c) Explain why the supermarket management might encounter difficulties if it relies only on sales data captured at the point of sale, as a basis for restocking the shelves. **(2 marks)**
- (d) Occasional failures of equipment occur which might affect:
- point of sale terminals;
 - the supermarket computer;
 - the communications links;
 - the warehouse computer.

Discuss how the system could be designed to cope with failures without causing a serious loss of data or making it impossible for the supermarket to operate. **(8 marks)**

**TOTAL FOR SECTION B: 36 marks + 4 marks for quality of written communication
= 40 MARKS**

END

6274/01

Edexcel GCE

Computing

Unit Test 4 Computer Systems Design

Advanced

Specimen Unit Test

Time: 1 hour 30 minutes

Materials required for the examination

Answer Booklet (AB03)

Items included with these question papers

Nil

Instructions to Candidates

Answer ALL questions.

In the boxes on the Answer Book, write the name of the Examining Body (Edexcel), your centre number, candidate number, the subject title, paper reference, your surname, other name(s) and signature.

Information for Candidates

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Advice to Candidates

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Section A

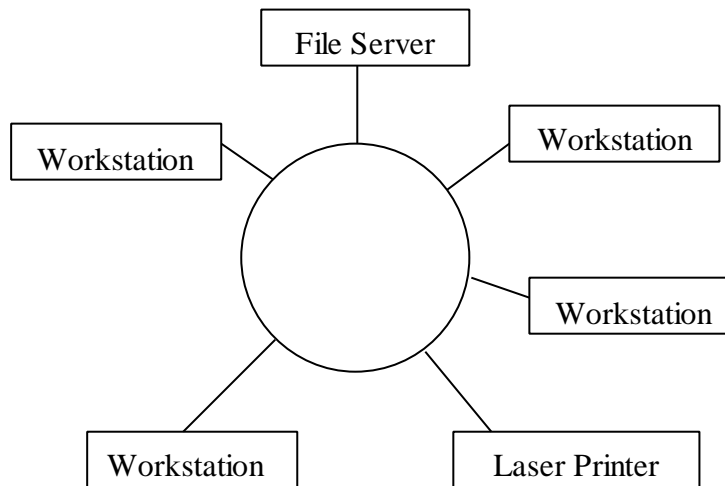
Answer ALL questions in this section.

1. A small company is considering linking into an Internet service. Describe two facilities provided by the service that would be of potential benefit to the company. **(2 marks)**
-

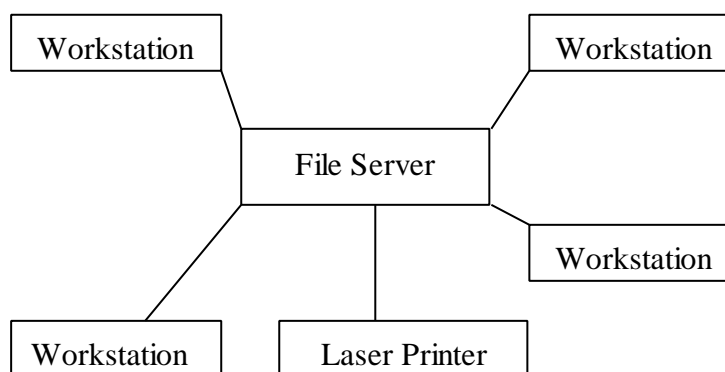
2. A microprocessor system is used to control the temperature of a room. If the temperature within the room is too high the heater is switched off; if it is too low the heater is switched on.

Produce a clearly labelled diagram showing the main components of such a system and explain the function of each of these components within the temperature control system. **(4 marks)**

3. A secretarial agency is to implement a local area network of microcomputers within its main branch. The following two configurations have been suggested:



Configuration A



Configuration B

- (a) State *two* advantages of **B** in comparison with **A**. (2 marks)
- (b) Describe how access to the shared facilities in **A** can be controlled. (4 marks)
- (c) Describe how the network operating system might organise the communications between the file server and the workstations in **B**. (2 marks)
-

4. Consider the following computer systems:

X: a stand-alone personal computer with a monitor, keyboard, printer and disk drive which is used by a family to control and manage their personal finances;

Y: a large interactive, multi-user mainframe computer system, with a number of peripheral devices, which is used in the headquarters of a bank to perform a wide variety of data processing operations.

Identify *two* operating system components which would be required for Y but would not be required for X. Briefly explain the purpose of each component. (6 marks)

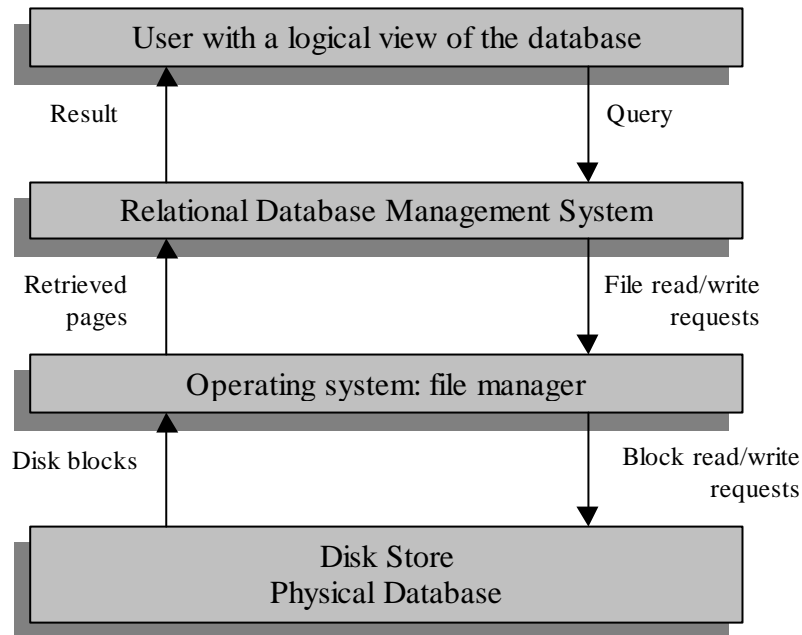
TOTAL FOR SECTION A: 20 MARKS

Section B

Answer ALL questions in this section.

5. A college has a computer-based encyclopaedia of historical information. It includes descriptions and accounts of historical events, and copies of source materials such as newspapers and maps. The historical information is held as data in the form of text, diagrams, pictures, still photographs and continuous videos.
- (a) Describe the hardware required to store and display such an encyclopaedia. **(3 marks)**
 - (b) Describe how a software package could be used to combine text and photographs which have been retrieved from the encyclopaedia into a single document. **(4 marks)**
 - (c) Without writing programs in a high level language, the history lecturers wish to produce interactive computer-based tutorial material for use with the encyclopaedia. Describe a software tool which they could use to accomplish this. **(4 marks)**
 - (d) Describe how the data within the encyclopaedia could be stored and indexed so that it could be easily retrieved. **(7 marks)**
-

6. The following schematic diagram shows the operations carried out when a user enters a query into a relational database system:



- (a) Explain the difference between the user's logical view of the database and the physical database. **(4 marks)**
- (b) The physical database could be organised as:
- fully indexed files;
 - random files.
- Describe how records are organised and accessed in *each* of these file organisations. **(6 marks)**
- (c) For a random file organisation describe the actions performed by the operating system when a user inserts another record into the database. Your description should take into account overflow. **(4 marks)**
- (d) Describe how the operating system would transform the file read/write requests into the block read/write requests for a fully indexed file. **(4 marks)**

TOTAL FOR SECTION B: 36 marks + 4 marks for quality of written communication

= 40 MARKS

END

6275/01

Edexcel GCE

Computing

Unit Test 5 Information Systems Development

Advanced

Specimen Unit Test

Time: 1 hour 30 minutes

Materials required for the examination

Answer Booklet (AB03)

Items included with these question papers

Nil

Instructions to Candidates

Answer ALL questions.

In the boxes on the Answer Book, write the name of the Examining Body (Edexcel), your centre number, candidate number, the subject title, paper reference, your surname, other name(s) and signature.

Information for Candidates

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Advice to Candidates

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Section A

Answer ALL questions in this section.

1. A team of computing specialists has been given the task of designing, coding and implementing software for some of the information systems in a garage.

Identify two methods which could be employed to control the costs within this project. For each method state the activities which would be controlled. **(4 marks)**

2. Telephone requests for a taxi in a city are directed to a communications centre. Each taxi from the fleet is in radio contact with the centre. The centre uses a computerised expert system to identify which taxi will reach the customer in the shortest possible time.

Describe the facts and rules which would have to be contained in the expert system's knowledge base. **(5 marks)**

3. An electronic version of a newspaper is available to subscribers across a computer network. The newspaper consists of sections for home users, foreign affairs, business news, sports, the arts, and readers' letters. Letters can be sent to the editor using electronic mail. Journalists submit their work electronically and it is edited before being made available to subscribers.

Subscribers are initially presented with a screen-based user interface containing a menu of options for accessing the various sections of the newspaper. One of the options enables subscribers to search for key words.

- (a) Identify *three* types of documentation which would be needed for this version of the newspaper. **(3 marks)**
- (b) Describe the facilities of a software development tool which would be necessary to implement the initial screen-based user interface. **(3 marks)**
-

4. Using a single processor, an algorithm to compute the sum of eight numbers held in an array can be expressed as follows:

set sum to zero

set counter to zero

```
┌ WHILE counter < 8 Do
│   increment counter by 1
│   add number [counter] to sum
└ ENDWHILE
output sum
```

The same operation of summing eight numbers can be executed by using four processors in parallel. Describe, using diagrams, how this could be done. **(5 marks)**

TOTAL FOR SECTION A: 20 MARKS

Section B

Answer ALL questions in this section.

5. A system for the production of about one hundred thousand electricity bills per day is required. A number of alternative systems are available for purchase.

The following features of each alternative system have been given numerical weightings to reflect their relative importance:

Feature	Weighting
A: purchase cost	5
B: maintenance and running costs	10
C: user friendliness of the software	3
D: bill printing speed	12
E: quality of printed output	8

The required system is selected as follows:

Step 1	Rank each feature of each alternative system in reverse order of merit.	For example, with regard to feature A, purchase cost, the most expensive system would be given a ranking of 1, the second most expensive a ranking of 2, and so on.
Step 2	Multiply each of these rankings by its respective weighting.	For example, with regard to feature E, which has a weighting of 8, the system with the worst printed output would have a computed value of (1 x 8), the system with the second worst printed output a computed value of (2 x 8) and so on.
Step 3	For each alternative system calculate the total of these computed values. The system with the largest total should be selected.	

- (a) Suggest *three* possible consequences of feature C being given a low weighting. **(3 marks)**
- (b) Comment on the relative size of the weighting given to feature D in comparison to the other features. **(2 marks)**
- (c) State *three* advantages of this method of selecting a computer system. **(3 marks)**
- (d) Identify *five* factors *other* than those listed which should be taken into account before a system is purchased. Justify your suggestions. **(10 marks)**

6. A reference book, containing about half a million words, has been stored in a text file with a view to publishing it in a CD-ROM based package. An index, listing up to five of the most important references to each main word, is to be provided as part of the package.

The following data structures have been considered for this index:

A: a one-dimensional array of fixed length records in alphabetical order with each record containing two fields:

Field One- a word;

Field Two- its page references.

B: a linked list of records with each record containing three fields:

Field One- a word;

Field Two- its page references;

Field Three- a link to the record containing the next word in alphabetical sequence.

C: a binary tree with each node in the tree consisting of a record containing four fields:

Field One- a word;

Field Two- its page references;

Field Three- a pointer to a sub-tree that contains only words that come before it;

Field Four- a pointer to a sub-tree that contains only words that come after it.

- (a) Describe *four* advantages of data structure B in comparison with data structure A as the basis of the software **(8 marks)**
- (b) Describe in outline an algorithm for constructing data structure C. **(6 marks)**
- (c) Describe *one* advantage and *one* disadvantage of data structure C in comparison with data structure B as the basis of the software. **(4 marks)**

TOTAL FOR SECTION B: 36 marks + 4 marks for quality of written communication

= 40 MARKS

END

Mark schemes

Mark schemes

Advanced Subsidiary and
Advanced GCE

Computing

Unit 1 Computer Systems

Unit 2 Design and Organisation of information Systems

Unit 4 Computer Systems Design

Unit 5 Information Systems Development

Advanced Subsidiary / Advanced Level Computing

GENERAL INSTRUCTIONS ON MARKING

When marking this paper, the following points must be observed. The general instructions to Assistant Examiners (booklet U39) details these procedures in full but the following points are worthy of important consideration.

1. Use ticks (in red) in the body of a candidate's response to indicate where marks have been awarded.
2. 'Error carried forward' techniques should be applied when detailed by the mark scheme and as instructed at the standardising meeting. For example, in a question consisting of parts, where the answer to the part (a) of the question is used in part (b), examiners must give consideration to the candidate's use of the incorrect answer to part (a) (which has already been penalised) in part (b). This method ensures that an error is penalised once and once only in a question.
3. When a question consists of a number of parts (i.e. (a), (a)(i), (b) etc), total the ticks to each part question and enter the mark in the margin at the end of the candidate's response to each part question. Add the marks to each part question together and write and encircle this total at the end of the question. Transfer this mark to the front of the script.
4. When a question is a single one, not consisting of a number of parts, total the ticks and write and encircle this total at the end of the question. Transfer this mark to the front of the script.
5. The question totals on the front of the script should be added together, along with any quality of written communication marks, to give a final total. This final total is inserted in the 'For Examiner's use only' box, ringed and initialled. This final total is also entered onto the appropriate mark sheet.
6. Quality of written communication should be marked in Section B of the written papers as follows:

Quality of Written Communication	
4 marks are available in Section B of each written paper	
For 1 mark	The candidate rarely uses specialist vocabulary, but displays reasonably good spelling, punctuation and grammar to communicate with some clarity, relevance and coherence.
For 2 marks	The candidate uses some specialist vocabulary and displays good spelling, punctuation and grammar to communicate, often with clarity, relevance and coherence.
For 3-4 marks	The candidate uses appropriate specialist vocabulary and displays excellent spelling, punctuation and grammar to communicate consistently with clarity, relevance and coherence.

Unit 1 – Computer Systems

Section A

Question 1

An Embedded System is usually a small device (often a single chip) built in to a piece of equipment, and dedicated to a given task. **(1 mark)**

Its purpose is to replace complex mechanical controls, or to impart a greater or lesser degree of automation. **(1 mark)**

Typical domestic examples might be washing machines, video recorders, some central heating systems or most modern cameras.

Commercial examples might be office equipment such as photocopiers, fax machines, process controllers or some machine tools.

Any **two** valid applications from any application area **(2 marks)**

(Total 4 marks)

Question 2

(a) The Operating System is a core set of programs that control the overall operations of the computer, relieving the operator of many of the necessary tasks. A *kernel* or *executive* program is permanently resident in core, and calls in other parts of the O/S as required to carry out specific tasks.

for a description based on **two** valid points **(2 marks)**

(b) Typical tasks of an operating system are:

- Program Scheduling;
- Memory Management;
- Peripheral Allocation;
- File Control;
- Spooling.

One mark for each valid task **(Up to 3 marks)**

(Total 5 marks)

Question 3

(a)

- Terminals for day-to-day transactions may be in “open office”, and accessible by all staff.
- Terminals for more sensitive transactions could be in areas for authorised staff only,
- or have keyboard locks and only authorised staff should have keys.

One mark for each valid control

(up to 2 marks)

(b)

- Systems access will be controlled by passwords at suitable levels.
- Staff engaged in day-to-day processing will have passwords which give them access to the relevant facilities.
- Staff who carry out more sensitive enquiries or more important updates will have passwords permitting them access to these functions.
- Each file (or table) will have an access level related to the user’s password level.
- In some cases, individual fields may also have an access level, so that users may view (or update) some fields, but not others, depending on the user’s security rating.

One mark for each valid point made

(up to 3 marks)

(Total 5 marks)

Question 4

(a) It is storage external to the CPU of the computer. It is required for the following reasons:

- to hold large volumes of data as internal (RAM) storage is relatively limited in capacity;
- to hold software which can be called into RAM as required;
- it is non-volatile so data will not be lost when the computer is switched off.

One mark for each valid point in the explanation

(up to 2 marks)

(b) Types of storage may include:

- magnetic disks (hard, floppy, fixed, removable);
- magnetic tape;
- CD-ROM (read only; rewritable);
- optical disks.

Typical acceptable applications may include:

a payroll application using a hard disk to store details of say 50 employees direct access required, suitable size;

an encyclopaedia application using CD-ROM with fixed data which cannot be corrupted;

a banking application using magnetic tape to hold back-ups off site.

One mark for each of the **three** types of storage

One mark for an application + justification

(4 marks)

(Total 6 marks)

Section B

Question 5

(a) LAN is:

- a number of computers, printers, disc stores, etc.;
- joined by a communications link;
- so that messages and data may be passed around the network.

One mark for each of **three** points in the description

(3 marks)

(b) Expect diagrams showing typical *Star* and *Ring* networks.

Allow **two marks** for each valid attempt that shows the appropriate layout

(One mark for an attempt which is correct but e.g. omits the printer)

(up to 4 marks)

+ **one mark** for correct positions of each of the printer and server

(up to 2 marks)

(6 marks)

(c) Typical benefits are:

- sharing of expensive hardware such as storage units, printers etc.;
- use of common data files;
- use of e-mail etc.

One mark for each of **three** valid benefits

(3 marks)

(d) a LAN:

- the nodes are confined to a single office or site;
- the comms link between nodes (e.g. computers, printers etc.) may be simple cable or fibre optic;
- and each node requires only a network access card to connect to the network.

a WAN:

- nodes may be on different sites;
- a node may also be a single device, or even a complete network in its own right;
- the communication link will be by satellite or dedicated line or telephone connection.

Two marks for a description of each of a LAN and WAN

(it will be possible to score **four marks** for say a LAN provided that the differences are highlighted)

Hardware will include:

- modems;
- external communications links e.g. BT line/dedicated line;
- multiplexers;
- satellite dishes etc. for access to PTT links.

Two marks for each valid hardware unit

(6 marks)

(Total 18 marks)

Question 6

(a) (i) Typical reasons for preferring integrated package:

- Data transfer between applications is easier;
- Standard user interface enables user to learn different parts more easily;
- Training more straightforward – common use of ‘ hot-keys’ etc.

One mark for each correct reason

(up to 3 marks)

(ii) A reason for not using integrated package:

- Some of the required facilities may not be provided.

or other valid reason

(1 mark)

(b) Typical answers will include:

- Client details from the database are used on an invoice generated by the spreadsheet;
- Mailmergers in word processor to existing customers on the client database;
- Confirmation of a payment is produced on the word processor using data from the spreadsheet and the client database.

One mark for each valid response

(up to 2 marks)

(c) Choose three from the following typical examples:

- Numeric;
- Alphanumeric;
- Currency;
- Date and/or time;
- Formula;
- Reference etc.

One mark for each correct example

(up to 3 marks)

(d) Advantages and disadvantages of Customised Integrated Package (IP) versus Commercial Package (CP):

- Use of IP still requires analysis & design (e.g. to put correct formulae in spreadsheet), this is time consuming and expensive for a single user;
- CP system development costs are spread over many users, so cost to an individual is low;
- CP is usually very quick to implement (buy it, install & go);
- System made using IP may be exact fit to user requirements, an CP may only achieve say 90% or so, requiring user to change some procedures;
- CP system will be developed to comply with statutory requirements (e.g. production of VAT returns, End-of-Year Tax returns etc.) and will be updated by supplier as legislation changes;
- IP system may not be tested adequately (especially if developed by user), so undiscovered “bugs” are likely;
- CP system has already been in use by a number of users, so most bugs have been discovered and rectified;
- CP’ s usually have good documentation, plus user “help-line”;
- Used developed IP system may be undocumented (or very poorly).

One mark for each valid reason up to a total of **nine**

(9 marks)

(Total 18 marks)

Plus up to four marks for quality of written communication in Section B

Unit 2 – Design and Organisation of Information Systems

Section A

Question 1

(a) Data is essentially raw facts & figures.

Information is data which has been processed to have some meaningful context.

Typical examples may include:

- Individual transactions are data items, but a month's input of transactions may be processed to produce a report or forecast, which is information;
- Individual weather observations are data, but many observations are processed to produce a weather forecast.

One mark for each example provided that the difference between data and information is made clear **(2 marks)**

(b) Valid responses may include:

- Accuracy;
- Brevity;
- Timelessness;
- Up-to-date;
- Rarity.

One mark for each of **two** valid answers **(2 marks)**

(Total 4 marks)

Question 2

(a) Answers may include:

- File of employees details stored for use on payroll;
- Number of stores which have to be contacted overnight to collect sales data;
- File of members who require a letter to tell them the new membership rates.

Any **two** correct applications **one mark** each

Suitability for serial processing may include:

- File of few records;
- Each and every record needs to be accessed in the application in order.

Any **two** correct responses for **two marks** each **(4 marks)**

(b) Valid applications may include:

- Bank customers – serial for statements, direct for enquiries.
- Public utility – serial for bills, direct for enquiries

One mark for a valid application + **one mark** for the explanation **(2 marks)**

(Total 6 marks)

Question 3

(a) The only possible correct responses are:

- Serial;
- Sequential;
- Random/Direct;
- Index-Sequential.

Two marks for three; one mark for two

(2 marks)

(b) Answers will include:

- Data independence - as a database separates the logical and physical aspects of the system;
- Shareability - different application programs may share the database independently;
- Access Flexibility – data may be accessed on a number of keys, with logical qualifiers such as AND, OR etc.

Any **two** valid responses; **one mark** each

(2 marks)

(Total 4 marks)

Question 4

(a) Answer may include:

- Aids system designed by working to set standards;
- Promotes communication between system developers and users;
- Maintains knowledge of the system in case of loss of key staff.

Any **two** valid answers; **one mark** each

(2 marks)

(b) Some of the following are typically expected:

- A description of the purpose of each routine;
- A Dataflow Diagram or equivalent for each routine;
- Input documents;
- Contents of files with record structures;
- Illustrations of printouts and screen displays;
- Operating instructions for all programs.

One mark for each up to a maximum of **four**

(4 marks)

(Total 6 marks)

Section B

Question 5

(a) A short description along the following lines is expected.

- Prototyping is used to overcome some problems arising from presenting users with a System Specification which they may not understand;
- instead, at a very early stage of system development they are shown a restricted working model of the proposed development;
- the users try out this system and comment back to the developers;
- who may then modify the model;
- this process may continue until a satisfactory model is achieved.

Allow up to **five marks** for a response based on **five points**

Generally there will be **one mark** for each valid point

(5 marks)

(b) Advantages will include:

- Can help to clarify misunderstanding between user and developer at an early stage, before investing too much time in actual development;
- a working model is available to demonstrate to management for feasibility and suitability;
- missing requirements may be recognised;
- model may be used to define system specification;
- prototype may help to identify difficult or confusing areas;
- prototype may help to identify some areas of conflict within the system.

Disadvantages will include:

- must be warned that prototype is not the final system;
- much work remains to be done to design and implement the final system after the prototype is agreed;
- possible high development costs due to constant changes, as the user continually looks for the “ultimate” system;
- development may never end;
- possible inefficiency in the prototype may be retained in the final working version.

One mark **for each valid point up to ten**

(10 marks)

(c) One of the better uses for prototyping is:

- tackling the HCI problems of developing satisfactory;
- screen designs;
- print layouts;
- standard queries.

One mark for each valid aspect

(3 marks)

(Total 18 marks)

Question 6

(a) (i) A series of parallel black and white lines used to represent a code number. **(1 mark)**

(ii) Answers may include:

- data entry less likely to be incorrect;
- data entry quicker than typing in the item price.

One mark for each of **two** valid advantages **(2 marks)**

(b) (i) Answers may include:

- at point of sale;
- from delivery notes in stock room;
- input of data of remaining items on shelves;
- direct receipt of data using a communications link;
- Input from containers of fresh food.

One mark for identifying each of **three** different data capture points **(3 marks)**

(ii) Answers may include:

- bar code reader at the point of sale;
- keyboard input from the delivery notes;
- key-to-disk encoder when stock taking;
- Kimball tags on the fresh food.

One mark for identifying each of **two** data capture methods **(2 marks)**

(c) Answers may include:

- broken bottles/burst bags;
- fresh food thrown away;
- goods beyond their sell-by-date;
- shop lifting;
- will mean that the data capture at POS gives inaccurate picture.

Any **two** valid responses **(2 marks)**

(d) Answers may include:

- be prepared to shut down POS terminals which have faults;
- hard copy price list so that operators can total the sales;
- produce transaction files so that master file is updated just before;
- transmission to central compute;
- perform local backups each night;
- have modem connected to voice line for overnight transmission;
- keep hard copies of regular orders so that items can be replaced;
- telephone communication with local fresh food suppliers;
- take orders information to nearest alternative available site for transmission.

Answer based on **four** points, award **two marks** for each valid response

(8 marks)

(Total 18 marks)

Plus up to four marks for quality of written communication in Section B

Unit 4 – Computer Systems Design

Section A

Question 1

The facilities include:

- the ability to communicate with other companies and customers via Internet e-mail;
- the ownership of a website which could be used to advertise the products or services of the company;
- the ability to search the Internet for information using search engines and browsers;
- the ability to move information about the Internet as copies of files.

Award **one mark** each for the description of **two** facilities

(2 marks)

(Total 2 marks)

Question 2

The diagram should contain:

- a temperature sensor to measure the temperature within the room; **(1 mark)**
- an analogue/digital converter to convert the analogue temperature readings into digital data in the form of binary code for processing; **(1 mark)**
- microprocessor with;
 - a processor unit and a storage unit; **(1 mark)**
 - an input port which accepts data from the analogue/digital converter and an output port which sends signals to the heating equipment. **(1 mark)**

(Total 4 marks)

Question 3

(a) The advantages of B in comparison to A include:

- The passing of messages from one workstation to another or from the file server to a workstation is more secure;
- A fault in a link or a workstation does not affect the rest of the network;
- The file server can prioritise and control the use of shared devices;
- Variable transmission rates between the file server and each workstation are possible.

One mark for each **two** valid advantages

(Max 2 marks)

(b) The access to the shared facilities in A could be controlled in the following manners:

Packets of information are continually circulating in the closed loop. **(1 mark)**

When a message is to be sent from one device to a device which has facilities which are shared amongst the users, or vice-versa, the device sending the message has to wait until a packet is received which is empty. The message may contain instructions to print a file, for example.

(1 mark)

The message is incorporated into the packet and the full packet sent around the network.

(1 mark)

When the device which is to receive the message is ready, it accepts the packet of information.

(1 mark)

Subject to a maximum of **four marks** for this part of the question, award **two marks** for answers which discuss spooling as a means of controlling access to the printer

Alternatively

Slots on mini-packets, which are data structures designed to hold data, circulate in the closed loop. **(1 mark)**

The slotted ring network is a derivative of the token sign network so the remainder of the explanation is the same as above.

(c) The network operating system might organise the communications between the file server and the workstations in B by means of polling in which each workstation is repeatedly interrogated in turn to establish whether it is holding data for transmission. **(1 mark)**

In this situation polling includes the process of collecting the data.

(1 mark)

(Total 8 marks)

Question 4

The following operating system components would be required for Y but not for X:

Scheduling:

Scheduling is carried out by a routine within a multiprogramming operating system. Whenever there is a break in the execution of a job, the scheduler is used to decide which job should continue processing next. The decision is normally based on job priorities and the schedules maintain a priority queue for this purpose.

Store and protection management:

This is necessary to prevent a job accessing storage allocated to another job in the system, and to organise the free storage when new jobs enter the system, when old jobs are deleted, and when active jobs request more storage.

Resource allocation:

The allocation of processor time and storage are examples of resource allocation, which also includes the allocation of peripheral devices and files to jobs. Resource allocation has to be performed carefully to avoid deadlock, where two or more jobs are unable to proceed because each requires a resource held by the other.

Spooling:

Spooling is a method of avoiding some of the problems of resource allocation and of maximising the use of peripheral equipment. It works by making all inputs to the system from certain devices and all outputs from the system and certain devices indirect, through a shared backing storage device.

Time slicing:

Time slicing is concerned with multi-access systems in which a reasonable response time for each user is necessary and so no job is permitted to use the processor continuously for more than a short time when other jobs are waiting for the processing. This is achieved by a clock which interrupts the processor periodically and allows the schedules to become active and to decide which of the other jobs may proceed.

Swapping:

When all the users' jobs together are too large to fit within the available main storage, swapping is used to place inactive jobs temporarily in backing store to make room for others which are ready to proceed. Routines need to exist to decide which inactive jobs are placed in backing store.

Maximum of **three marks** each for the identification and description of **two** appropriate operating system components

For each answer award **one mark** for the identification, though not necessarily the naming, of an appropriate operating system component and a maximum of two marks for a correct description. A correct description, which does not contain the underlined items, should only be awarded **one mark.** (Max 6 marks)

Section B

Question 5

(a) The hardware could consist of:

- a CD-ROM unit for storing text, diagrams, pictures and still photographs;
- a videodisc or laser disk unit for storing the continuous video;
- an appropriate unit which can display high-resolution graphics, text and moving images.

One mark for each of **three** appropriate hardware units

(Max 3 marks)

(b) A desktop publishing package or a graphics package could be used to import the text and photographs from the encyclopaedia. **(1 mark)**

A technique known as cut and paste or object linking and embedding could be used to produce the single document. **(1 mark)**

The text and photographs could be held in a temporary storage area **(1 mark)** known as a Clipboard or Notepad **(1 mark)** during the transfer from the encyclopaedia.

(c) A courseware development tool in the form of an authoring language or scripting language could be used.

(1 mark)

This would normally include a program generator.

(1 mark)

The user could specify parameters for the courseware **(1 mark)** by making selections from screen-based graphical menus or other suitable interfaces. **(1 mark)**

(d) The data within the encyclopaedia could be stored as follows:

- diagrams, pictures and still photographs would be stored separately from text; **(1 mark)**
- continuous videos would be stored separately from all other forms of data; **(1 mark)**
- links could be established between related data items **(1 mark)** by including references **(1 mark)** within the items in the form of hypermedia links **(1 mark)**;
- a full index **(1 mark)** which contains addresses for each data item **(1 mark)** could be incorporated into the encyclopaedia.

(Total 18 marks)

Question 6

- (a) The logical view of the database is the view which is apparent to the user. (1 mark)
In the logical database the data appears to be made up of interrelated parts. (1 mark)
The physical database is the way the database is actually represented on the storage devices. (1 mark)
The physical database is organised as files. (1 mark)
- (b) A fully indexed file is one that contains an index (1 mark) in which there is an entry for every record. (1 mark)
Such an index would be used to permit direct access to records. (1 mark)
A random file is one in which the records are placed at, or linked via, addresses – (1 mark) which are calculated directly from the record keys (1 mark) by means of a key transformation (hashing) algorithm. (1 mark)
- (c) The actions are:
Calculate the address of the record by applying the hashing algorithm to the record key. (1 mark)
If the record already exists then produce an error message. (1 mark)
If the record cannot be accommodated at the address because there is no space then insert a link to a part of the overflow area and place the record there. (1 mark)
If the record can be accommodated at the address then place the record there. (1 mark)
- (d) The index would be searched sequentially (1 mark) for the record key. (1 mark)
If the record key exists then the corresponding address would be noted. (1 mark)
If the record key did not exist then an error message would be produced. (1 mark)

(Total 18 marks)

Plus up to four marks for quality of written communication in Section B

Unit 5 – Information Systems Development

Section A

Question 1

The methods include:

- Gantt charting which could be used to control the employment of the computing specialists within the project;
- Critical path analysis which could be used to control the sequencing of the tasks within the project.

Award **one mark** for each method and **one mark** for each description of the activities which would be controlled **(Max 4 marks)**

Question 2

The facts could include:

- details of the layout of the streets, buildings and area within the city;
- details of normal and rush hour rates of traffic flow along the streets;
- details of road works and traffic diversions;
- up to date locations of each taxi within the fleet;
- up to date details of the workload of each taxi.

The rules could include:

- a method of producing a route for a journey between two places in the city;
- a method of identifying the taxi which should reach the customer in the shortest possible time.

Award **one mark** for each valid fact and rule subject to a maximum of **five marks** **(Max 5 marks)**

Question 3

(a) The types include:

- documentation for readers;
- documentation for journalists;
- documentation for the technical support staff.

Award **one mark** for each type; subject to a maximum of **three marks**

(3 marks)

(b) The facilities include:

- the ability to produce links to various parts of the newspaper;
- the ability to produce text using different colours;
- the ability to produce graphical user interfaces with windows and icons event driven code.

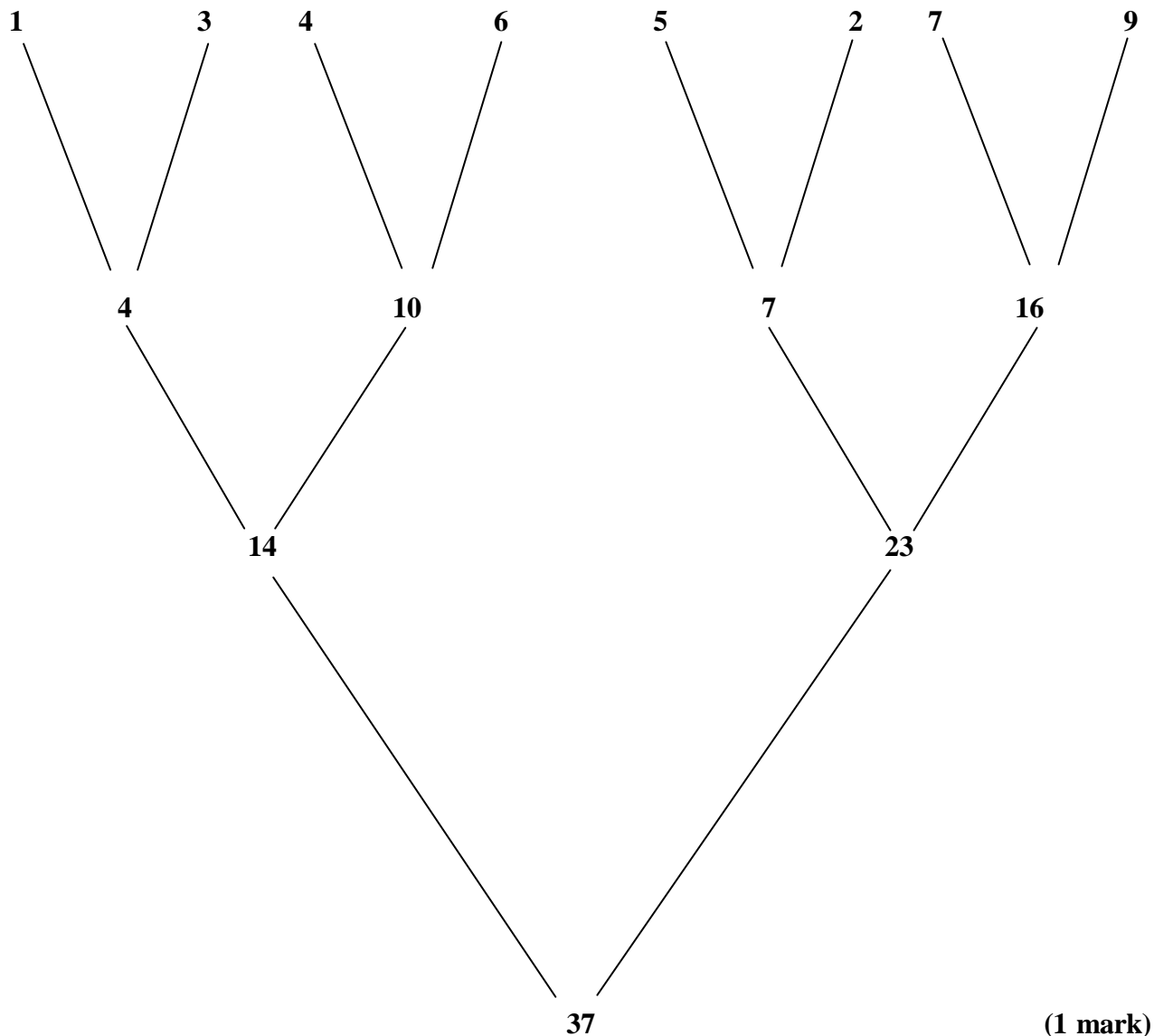
Award **one mark** for each advantage subject to a maximum of **three marks**

(3 marks)

(Total 6 marks)

Question 4

This could be achieved by a method called pairwise addition. The following diagram illustrates the basis of the algorithm.



The first stage of the algorithm is to group the numbers into pairs (1 mark) and form the sum of each pair (1 mark). The additions can be performed in parallel (1 mark). The resulting sums can again be added in pairs. This process continues until a single sum results (1 mark).

(Max 5 marks)

Section B

Question 5

(a) The consequence include:

- the system could be difficult to use;
- the operators and users will need to have been well trained;
- the documentation for the operators and users will have to be extensive.

Award **one mark** for each subject to a maximum of **three marks**

(3 marks)

(b) The bill printing speed is the most important feature
as one hundred thousand bills are required each day

(1 mark)

(1 mark)

(c) The advantages include:

- the evaluations are objective;
- the evaluations are consistent;
- the method can be applied to any application.

Award **one mark** for each of the **three** valid advantages

(3 marks)

(d) The factors could be:

- the robustness of the hardware as the system is to be heavily used;
- the user support available from the vendor as breakdowns need to be rectified quickly;
- the effectiveness of the system as the output needs to be accurate and consistent;
- the convenience of implementing the system as the changeover needs to be seamless;
- the level of training required as this could have an effect on staffing;
- capability for expansion as the number of customers might increase;
- compatibility with other in-house systems as the new system will have to fit into the data processing facilities of the company;
- the trade record of the supplies as the system needs to be reliable;
- the need for working in teams and the roles of the people involved as this has a consequence for recruitment of staff.

Award **one mark** for each of **five** valid factors and **one mark** for each of **five** valid corresponding reasons

(10 marks)

(Total 18 marks)

Question 6

(a) The advantages include:

- A could have been allocated static storage whilst B could be allocated storage dynamically;
- B can be constructed without the need for sorting whilst A cannot;
- B can be more easily updated than A as insertions and deletions can be easily implemented;
- A needs to be allocated consecutive storage locations whilst B does not;
- A has been allocated fixed length records whilst B could have variable length records.

Award **one mark** for the identification of each valid advantage and **one mark** for each corresponding valid explanation subject to a maximum of **eight marks** **(8 marks)**

(b) The outline algorithm could be:

- Repeat the following procedure for each main word; **(1 mark)**
- Start at the root of the binary tree **(1 mark)** and repeat the following process until a null pointer is encountered or the root contains the same word as the one input; **(1 mark)**
- If the node contains a word which precedes the inputted word then move to the root of the left subtree; **(1 mark)**
- If the node contains a word which succeeds the inputted word then move to the root of the right subtree; **(1 mark)**
- When the process is complete insert the appropriate reference at the node or create a new node by replacing the null pointer with a pointer attached to the word. **(1 mark)**

(c) An advantage is:

Single data items can be more quickly retrieved from C than B as a binary sort tree search is employed rather than a sequential search.

Award **one mark** for the identification of a valid advantage and **one mark** for an appropriate explanation **(2 marks)**

The disadvantages include:

- Data structure C would need more memory space than B as it contains two links per node;
- Deletions can be more easily effected from B than C; deletions from C need a more complicated algorithm.

Award **one mark** for the identification of a valid disadvantage and **one mark** for an appropriate explanation **(2 marks)**

(Total 18 marks)

Plus up to four marks for quality of written communication in Section B

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