Surname		Other Names	
Centre Number		Candidate Number	
Candidate Signature			

General Certificate of Education
June 2003
Advanced Level Examination

COMPUTING   CPT5
Unit 5   Advanced Systems Development

Monday 16 June 2003 Morning Session

In addition to this paper you will require:
   a calculator.

Time allowed: 1 hour 30 minutes

Instructions
- Use blue or black ink or ball-point pen.
- Fill in the boxes at the top of this page.
- Answer **all** questions in the spaces provided. All working must be shown.
- Do all rough work in this book. Cross through any work you do not want marked.

Information
- The maximum mark for this paper is 65.
- Mark allocations are shown in brackets.
- You will be assessed on your ability to use an appropriate form and style of writing, to organise relevant information clearly and coherently, and to use specialist vocabulary, where appropriate.
- The degree of legibility of your handwriting and the level of accuracy of your spelling, punctuation and grammar will also be taken into account.

Answer **all** questions in the spaces provided.

1   Give **two** fact-finding techniques that a systems analyst could use.

1..

2..

(2 marks)

2   (a)   An insurance company wishes to enter data from hundreds of proposal forms filled in by customers each day. Describe a suitable method of data input. Justify your choice.

Method:...

....

Justification: ....

....

(2 marks)

(b)   Explain a suitable method that could be used to reduce the number of errors made at this stage.

....

....

(1 mark)

3 Customer payments are processed by a computer system that stores customer accounts on magnetic disk in a database, **Customer Accounts**. The amount paid by a customer is encoded on a **payment stub**. A process, **Process Payments**, is then applied to batches of **payment stubs** and the database **Customer Accounts** updated. A **progress report** is sent to a **VDU**. The system is controlled by **commands** from a **keyboard**.

(a) Complete the diagram shown in **Figure 1**.

Payment Stubs

MICR reader
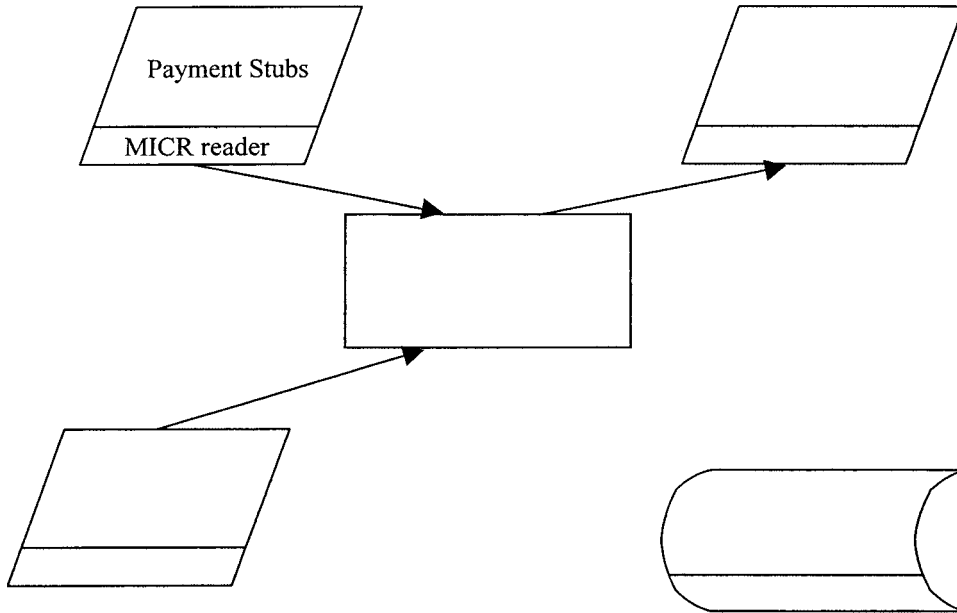
Figure 1

(5 marks)

(b) Name this type of diagram.

....

(1 mark)

(c) What encoding method is used for the payment stubs?

....

(1 mark)

7

TURN OVER FOR THE NEXT QUESTION

Turn over ▶

4 A company wishes to replace its existing data processing system with a more up-to-date system. After consultation, two alternative methods for converting from the old to the new system are proposed, *parallel* and *phased*.

(a) What is meant by:

   (i) parallel conversion?

....

....

(1 mark)

   (ii) phased conversion?

....

....

(1 mark)

(b) State **two** tasks that may have to be carried out when converting from the old to the new system.

1 ....

....

2 ....

....

(2 marks)

(c) The company wishes to assess how maintainable the new system will be. Give **three** questions for the company to put to the developers of the new system to help in this assessment.

1 ....

....

2 ....

....

3 ....

....

(3 marks)

5 A recent government white paper proposes a national identity (ID) card scheme backed by a central national database for all citizens who are legally resident in the UK.

(a) Describe **two** different ways that basic information such as *name*, *address* and *unique personal number* could be recorded on an identity card in machine-readable form.

1 ....

....

2 ....

....

(2 marks)

(b) If an identity card containing just the basic information mentioned in part (a) was stolen, it would be easy for someone to use another person's identity. Describe **one** way that the proposed scheme – ID card, card reader and central database – could be improved to make it much harder for someone to pass as someone else.

....

....

....

....

(2 marks)

4

TURN OVER FOR THE NEXT QUESTION

6 **Figure 2** below shows part of a video editing computer system. The digital video camera records video and audio onto magnetic tape cassette using a digital format called **DV**. When the video camera is set to play mode the video and audio data are retrieved from the magnetic tape cassette at a rate of 3.6 Megabytes per second (MB/s). The storage capacity of a DV tape is 13 Gigabytes (GB).

Figure 2

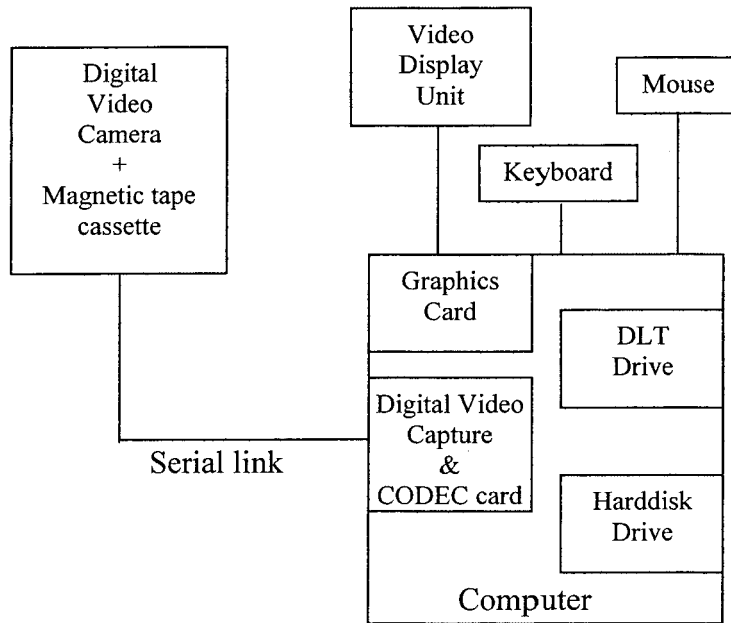**Table 1** below shows typical characteristics of four storage media, DLT magnetic tape, magnetic hard disk, Compact Disk-Recordable, Digital Versatile Disk-Recordable.

Medium	Data Transfer Rate Megabytes per second	Storage Capacity Gigabytes
Digital Linear Tape (DLT)	6	40
Magnetic Hard Disk	100	30
CD-R	0.176	0.635
DVD-R	1.25	4.37

Table 1

(a)   Which of the four media shown in **Table 1** is most suitable for storing the video and audio data stream obtained by the computer from the video camera in real time, without compression, so that the data can be accessed for editing purposes using random access? Justify your answer.

Medium: ....

Justification: ....

....

....

(2 marks)

(b)   A CODEC (Coder-Decoder) is often used to compress (and decompress) video and audio data.

(i)   On some video-capture and editing systems the CODEC is entirely software-based whereas in others the CODEC is implemented in hardware and software on a plug-in board. Why is the hardware and software CODEC preferred to the software only CODEC?

....

....

(1 mark)

(ii)   Why must a CODEC be used if a movie from the video camera is to be stored on DVD-R?

....

....

(1 mark)

(c)   What purpose might the DLT drive be used for?

....

....

(1 mark)

5

TURN OVER FOR THE NEXT QUESTION

Turn over ▶

7 The United Kingdom's National Health Service was created to provide health care to the nation through:

- hospitals
- health centres/GPs' (doctors') surgeries
- pharmacies (chemists).

The UK government is proposing to computerise and network the entire National Health Service (NHS) so that it will be possible to have on-line *access to the system at a level of security relevant to their status* for anyone who

- works for the NHS
- uses its services
- works at a branch of government responsible for the NHS.

Patient records will be stored in multi-user distributed relational databases managed by *Database Management Systems* (DBMS).

- Every person in the UK is assigned a unique numeric key, *the patient reference number*, and is assigned for primary health care to a doctor in a health centre or a GP's (General Practitioner's or doctor's) surgery located in a single building.

- A person's doctor may, if necessary, arrange for the person to see a specialist doctor in a hospital.

- Drugs prescribed for a person by the person's GP for the treatment of an illness are obtained from a pharmacy.

- Every computer in the service of the NHS will be interconnected in *local area networks* (LANs) and the *local area networks* will be interconnected by a *wide area network* (WAN).

(a) Which network type is most appropriate, WAN or LAN, **within** a health centre or GP's (doctor's) surgery? Justify your choice.

....

....

....

(2 marks)

(b) Explain **one** way in which the networked NHS can benefit each of the following. Each benefit **must** be different.

  (i) The patient

....

....

....

(1 mark)

  (ii) A health centre/GP's (doctor's) surgery

....

....

....

(1 mark)

(iii) A pharmacy

....

....

....

(1 mark)

(iv) The UK government

....

....

....

(1 mark)

QUESTION 7 CONTINUES ON THE NEXT PAGE

Turn over ▶

(c)   (i)   What level of the architecture of a DBMS allows the NHS system to be designed to allow *"on-line access to the system at a level of security relevant to status for anyone who works for the NHS"*?

....

(1 mark)

   (ii)   Explain **one** method that DBMSs use in a multi-user system to avoid losing updates to records that are accessed concurrently (at the same time).

....

....

....

....

(2 marks)

(d)   For each of the following give **one** reason why large-scale software systems such as this NHS system could fail. Each reason **must** be different.

   (i)   Perform as its users expect

....

....

....

(1 mark)

   (ii)   Work at all

....

....

....

(1 mark)

   (iii)   Be completed on time.

....

....

....

(1 mark)

8 A lending library uses a relational database to record details of books, book loans and borrowers.

- A unique International Standard Book Number (ISBN) is assigned to each book title such as "The Art of Passing Computing Examinations".
- The library assigns a unique Accession Number to each copy of a book in the library.
- The library assigns a unique Borrower Number to each borrower.

The relational database uses four tables **Book**, **Book Copy**, **BookLoan** and **Borrower** with attributes (primary key is underlined) as follows:

Book(<u>ISBN</u>, AuthorName, Title, NumberOfCopies)

BookCopy(<u>AccessionNumber</u>, ISBN, DateAcquired, ReplacementCost)

BookLoan(<u>AccessionNumber</u>, BorrowerNumber, DateDueBack)

Borrower(<u>BorrowerNumber</u>, Surname, Initials, Address)

(a) Draw an entity relationship diagram for the tables:

   (i) Borrower and BookLoan

(1 mark)

   (ii) Book and Borrower

(1 mark)

(b) Using the SQL commands **SELECT**, **FROM**, **WHERE**, and any others considered appropriate, write an SQL statement to query the database tables for each of the following:

(i) The title of the book with ISBN "1-57820-082-2".

....

....

....

....

(2 marks)

(ii) The name of the author and ISBN of a book with the AccessionNumber 1234.

....

....

....

....

....

(4 marks)

(c) By linking the database with a word-processing package, overdue book reminder letters can be generated when copies of books on loan to borrowers are overdue. What is this process called?

....

(1 mark)

9

TURN OVER FOR THE NEXT QUESTION

Turn over ▶

9 **Figure 3** below shows part of the logical layout of an Ethernet-based local area network consisting of several desktop PCs connected using a bus topology. The network is split into two *segments* linked by a bridge.
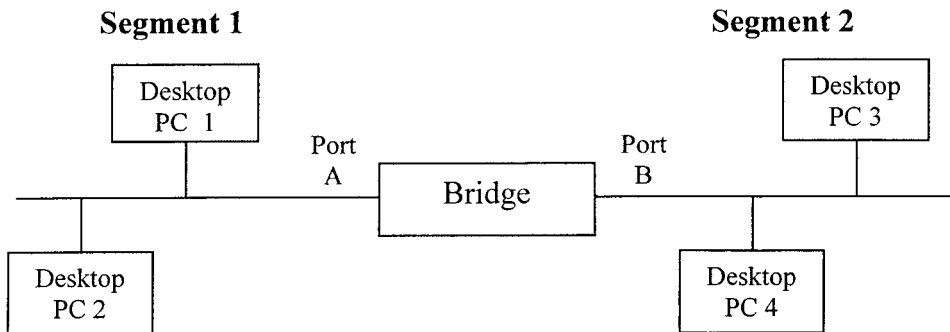

Figure 3

(a) (i) Why is is necessary sometimes to split local area networks based on a bus topology into two or more segments?

....

....

....
(1 mark)

(ii) Describe the involvement of the bridge in **Figure 3** in traffic management on the Ethernet segments.

....

....

....

....
(2 marks)

Turn over ▶

(iii) The network in **Figure 3** is physically realised using two hubs, a bridge and twisted-pair cabling to interconnect the desktop PCs. Draw a labelled diagram of the layout of the network that uses these components.

(2 marks)

(iv) The network in **Figure 3** is operated as a *peer-to-peer* network. Explain peer-to-peer networking.

....

....

....

(1 mark)

QUESTION 9 CONTINUES ON THE NEXT PAGE

Turn over ▶

(b) **Figure 4** below shows how three desktop PCs may share via an Ethernet switch and router an ADSL line connection to the Internet.
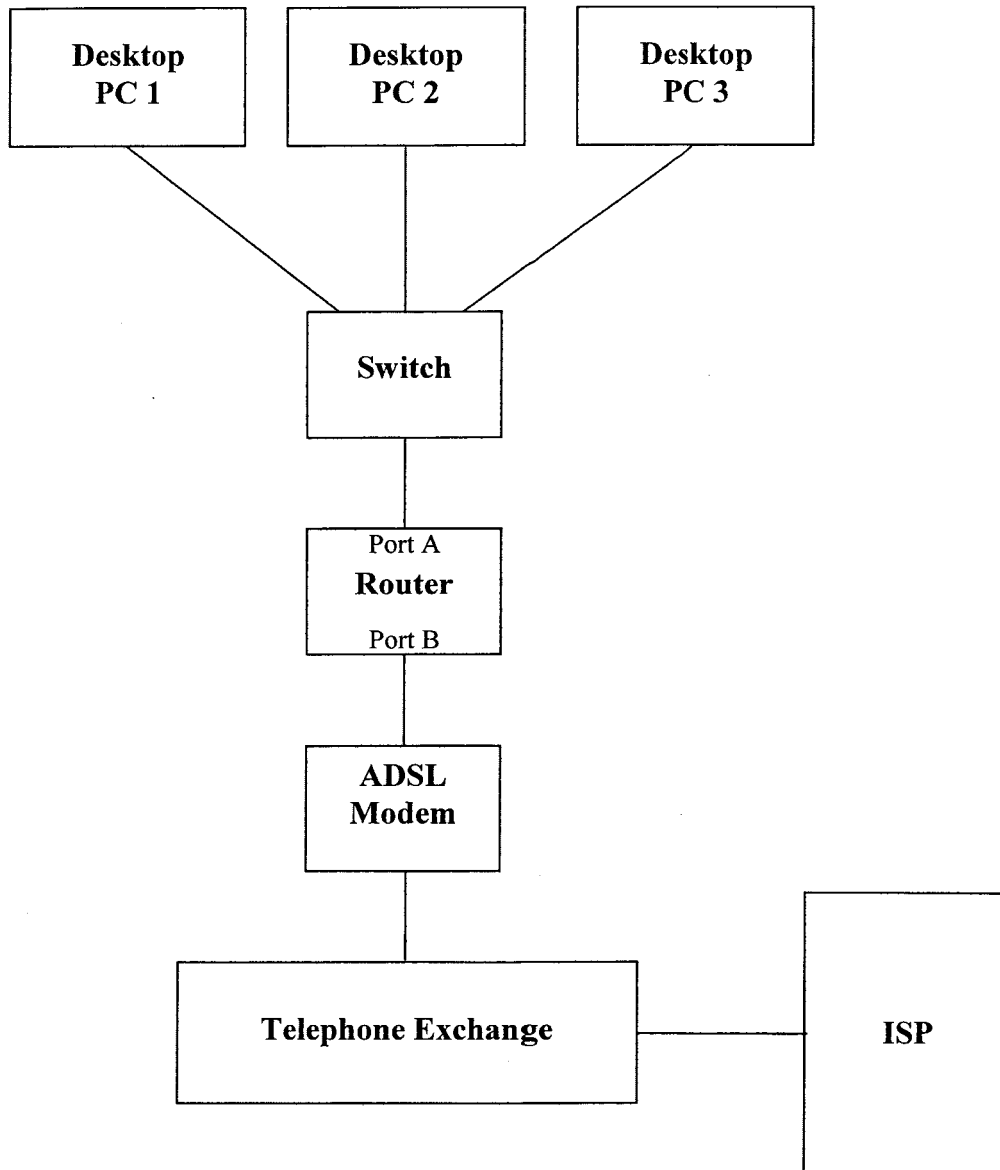

Figure 4

(i) What is the role of an Internet Service Provider (ISP)?

....

....

(1 mark)

(ii)   Give **two** advantages of an ADSL line connection to the Internet over a dial-up line and modem.

1 ....

....

2 ....

....

(2 marks)

(iii) What is a router?

....

....

(1 mark)

(iv)   Port A of the router in **Figure 4** is assigned the IP address 192.168.1.1. Port B is assigned the IP address 213.208.10.146. Which of these IP addresses needs to be registered with the Internet registrar and why?

IP address: ....

(1 mark)

Why? ....

....

(1 mark)

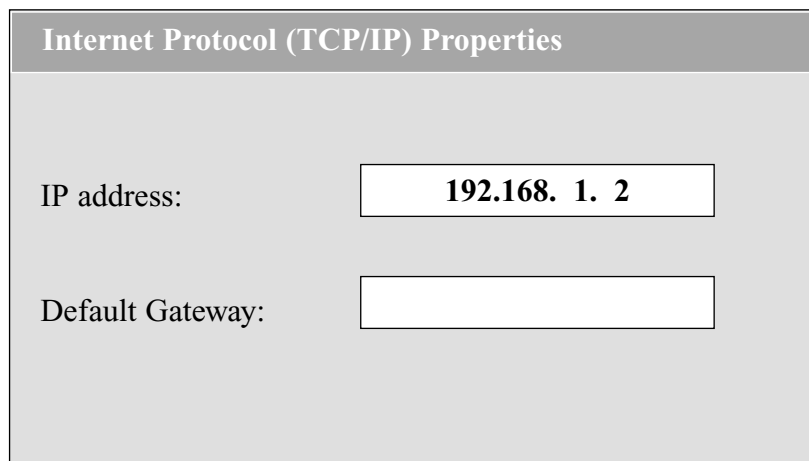| **Internet Protocol (TCP/IP) Properties** |
|---|
| IP address: **192.168. 1. 2** |
| Default Gateway: |

Figure 5

(v)   **Figure 5** above shows part of the TCP/IP configuration window displayed on the VDU of Desktop PC 1. What IP address should be entered for the Default Gateway?

....

(1 mark)

Turn over ▶

(c)   In the client/server model of the Internet a web server offers an HTTP service on port 80. A web browser on a client computer such as Desktop PC 1 connects to the Internet to access a web server www.difficultexaminations.co.uk at IP address 198.112.57.124.

(i)   What is the socket address of the web server's HTTP service?

....

(1 mark)

(ii)   Explain how a web server is able to use ports to service multiple requests for web pages arriving from different clients.

....

....

....

....

(2 marks)

END OF QUESTIONS

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