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General Certificate of Education  
 January 2003  
 Advanced Level Examination



**COMPUTING**  
**Unit 5 – Advanced Systems Development**

**CPT5**

Thursday 23 January 2003 Morning Session

**No additional materials are required.**  
 You may use a calculator.

| For Examiner's Use  |      |        |      |
|---------------------|------|--------|------|
| Number              | Mark | Number | Mark |
| 1                   |      |        |      |
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| Total (Column 2)    | →    |        |      |
| TOTAL               |      |        |      |
| Examiner's Initials |      |        |      |

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 Name **one** manual other than the user manual that would be provided with a new software system.

.....  
(1 mark)

2 State **two** reasons why a software system will require maintenance.

1 .....

2 .....

(2 marks)

3 A city council wishes to reduce the number of private cars entering the city centre. A car rental scheme is proposed whereby users in the scheme (registered users) can use one of the rental cars:

- parked outside the city
- parked in the centre of the city.

The rental cars will not use conventional key locks or ignition keys. Instead, the rental car will use a computer system in the car, together with a remote computer system, to

- identify a registered user automatically before they will be allowed to enter the car and drive it away.
- charge the user's account, stored on a remote computer system, automatically for the cost of the hire.

The cost of the hire will be directly related to

- the quantity of electrical energy consumed by the car's electric battery-powered engine.

(a) Explain how the computer system in the rental car together with the remote computer system could identify a registered user.

.....  
.....  
.....  
.....

(2 marks)

1

2

(b) How could the accounting information for a journey be relayed to a remote computer system that handles users' rental accounts?

.....  
.....  
.....  
.....

*(2 marks)*

(c) Suggest **one** reliable way the system could supply the user with an electronic record for a journey.

.....  
.....

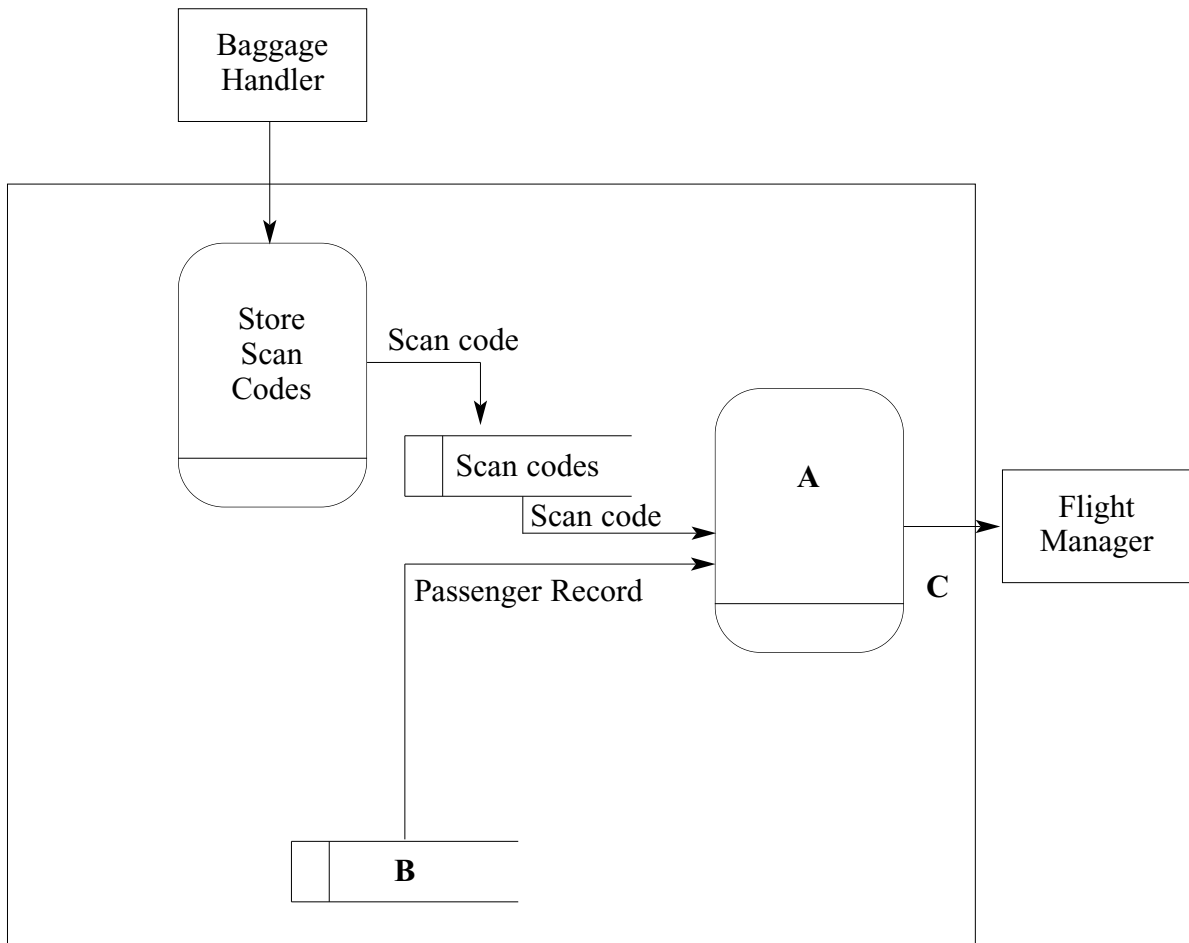
*(1 mark)*



**TURN OVER FOR THE NEXT QUESTION**

**Turn over ►**

- 4 During systems analysis a *data flow diagram* may be used to represent all or part of a system. **Figure 1** is an outline of a data flow diagram for a part of an airport baggage handling system. This part prints a report of details of luggage that has failed to be loaded onto the aircraft. The baggage handlers scan the luggage as they load it onto the aircraft storing the details in a hand-held device. The details are then processed against a master file for the particular flight and the results presented to the flight manager.



**Figure 1**

- (a) Give an appropriate label to **each** of the elements A to C in **Figure 1** above.

A ..... B .....

C .....

(3 marks)

- (b) What hand-held device might the baggage handlers have used to scan each item of luggage?

.....

(1 mark)

(c) State a suitable type of printer for printing the missing luggage report onto multi-part stationery.

.....  
(1 mark)



5 E-mail may be more easily intercepted and altered than paper mail without the knowledge of either the sender or the recipient.

(a) Give **one** reason that supports this statement.

.....  
.....  
(1 mark)

(b) A single shared key system to encrypt and decrypt messages is not generally used for encrypted mail sent across the Internet. Instead, a two key system is used consisting of:

- A *public* key, which is made publicly available.
- A *private* key, which is held only by its owner and should never be publicly enclosed.

(i) How is this two-key system used to encrypt and decrypt e-mails?

.....  
.....  
.....  
.....  
(2 marks)

**QUESTION 5 CONTINUES ON THE NEXT PAGE**

**Turn over ►**

(ii) Holders of a digital certificate can digitally sign an e-mail to prove its origin and authenticity. How is this two-key public/private key system used to digitally sign an e-mail?

.....  
.....  
.....  
.....

(2 marks)

6 (a) Distinguish between a database and a database management system (DBMS).

.....  
.....  
.....

(2 marks)

(b) Name the **three** levels in the three level architecture of a DBMS.

1 .....  
2 .....  
3 .....

(3 marks)

(c) (i) What is meant by *unproductive maintenance* in the context of a flat-file database?

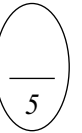
.....  
.....

(1 mark)

(ii) Why does a DBMS overcome this problem of unproductive maintenance?

.....  
.....

(1 mark)



(d) In a multi-user DBMS concurrent access is allowed to each data item. However, some users are not allowed access to every data item.

(i) What is meant by concurrent access?

.....  
(1 mark)

(ii) Why must concurrent access be controlled in a multi-user DBMS?

.....  
(1 mark)

(iii) Explain the role of a Data Definition Language (DDL) in the context of a DBMS including **how** a DDL is used to specify the data items to which each user has access.

Explanation: .....  
.....  
.....

How: .....  
.....  
(3 marks)

**TURN OVER FOR THE NEXT QUESTION**

**Turn over ►**

7 Study **Figure 2**, Example.htm, below.

```
<HTML>
  <HEAD>
    <TITLE>Two Ways of Sending Data</TITLE>
  </HEAD>

  <BODY>
    <a HREF="Process.asp?myname=Fred">Click here</a>
    <P>
      <FORM method="POST" ACTION="Process.asp">
        Please enter your name:
        <INPUT name="myname" size=10>
        <P>
          <INPUT type=submit value=SEND>
        </P>
      </FORM>
    </BODY>
  </HTML>
```

**Figure 2: Example.htm**

- (a) With reference to **Figure 2**, draw a labelled diagram to show the appearance of the web page when viewed through a web browser.

(5 marks)



- (b) A server-side script, Process.asp, processes the data posted by the web browser. Process.asp is shown in **Figure 3**.

```

<HTML>
  <HEAD>
    <TITLE>Form and Query String processing</TITLE>
  </HEAD>

  <BODY>
    <%
      AVariable = Request ("myname")
      Response.Write AVariable
    %>
  </BODY>
</HTML>

```

**Figure 3: Process.asp**

- (i) What is the value assigned to the variable *AVariable* when this script executes if the user:
- (A) clicks the hyperlink in **Figure 2**  
 .....  
 (1 mark)
- (B) clicks the SEND button after typing the name James?  
 .....  
 (1 mark)
- (ii) What value is sent to the user's browser when the user:
- (A) clicks the hyperlink in **Figure 2**  
 .....  
 (1 mark)
- (B) clicks the SEND button after typing the name James?  
 .....  
 (1 mark)

**QUESTION 7 CONTINUES ON THE NEXT PAGE**

**Turn over ►**

(c) Both Example.htm and Process.asp (**Figure 2** and **Figure 3**) were created on a client computer and then uploaded to a folder D:\AQA\WWWRoot on a web server. The web server has been configured to present this folder to the World Wide Web as the web site with domain name www.example.co.uk.

(i) What protocol would have been used to upload the files Example.htm and Process.asp?

.....  
(1 mark)

(ii) What URL was used in the browser's address line for the browser to load the web page Example.htm?

.....  
(3 marks)

(iii) What other service should the web server support to allow the owner of the web site to access the web server from a remote location in order to create a sub-folder ASPScripts in D:\AQA\WWWRoot?

.....  
(1 mark)

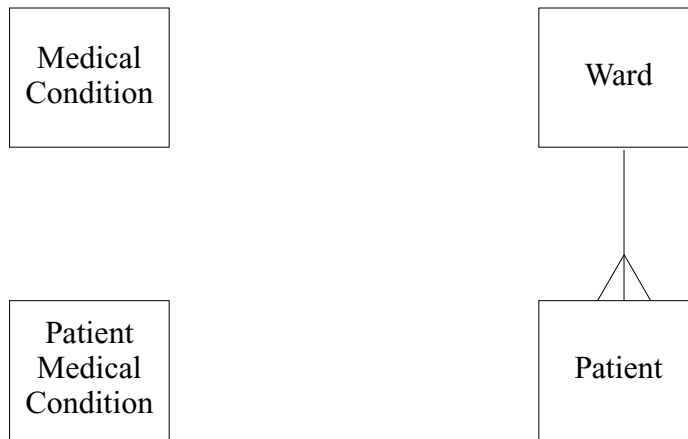
8 A hospital stores details of its wards, patients and their medical condition in a database in a way that will allow information about these details to be extracted. The data requirements are defined as follows.

- Each patient is assigned a patient number (unique), surname, forename, address, date of birth and gender.
- Each ward has a number of beds.
- Each ward is assigned a ward name (unique), name of the nurse in charge and the number of beds it possesses.
- Each medical condition that the hospital can treat is recorded.
- Each medical condition is assigned a medical condition number (unique), name and the recommended standard treatment.
- Each patient may suffer from one or more medical conditions.
- A particular medical condition may be attributed to more than one patient.
- The medical conditions of each patient are recorded.
- Each ward has zero or more patients.
- A patient can be assigned to only one ward at any one time.
- Each ward may have patients with different medical conditions.

Four entities for the hospital database are

**Ward, Patient, MedicalCondition, PatientMedicalCondition**

- (a) Using the partially complete entity relationship diagram shown in **Figure 4**, as an aid, show the degree of **three** more relationships which exist between the given entities.



**Figure 4**

*(3 marks)*

- (b) Using the following format

**TableName(PrimaryKey, Non-keyAttribute1, Non-keyAttribute2, etc)**

describe tables, stating all attributes, for the following entities underlining the primary key in each case.

(i) Ward ..... *(1 mark)*

(ii) Patient .....  
..... *(2 marks)*

(iii) MedicalCondition .....  
..... *(1 mark)*

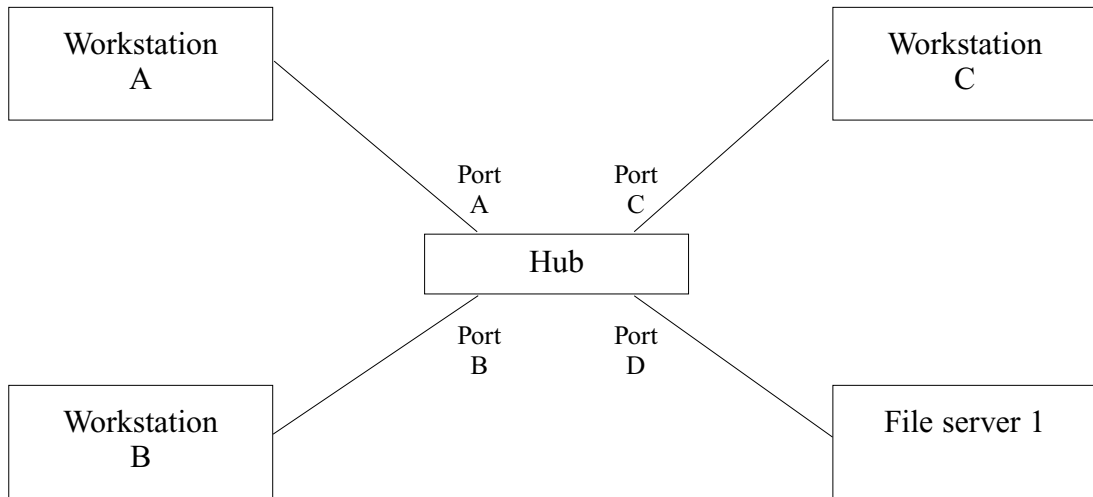
(iv) PatientMedicalCondition ..... *(2 marks)*

- (c) Using the SQL commands **SELECT, FROM, WHERE**, write an SQL statement to query the database tables for the forename, surname and medical condition number of all patients in Victoria ward.

*(3 marks)*

**Turn over ►**

- 9 **Figure 5** below shows the physical layout of a small local area network consisting of three workstations and one file server interconnected via a hub. The network is Ethernet-based.



**Figure 5**

- (a) The network in **Figure 5** behaves as a bus network. Draw a carefully labelled diagram of the bus equivalent of the hub-based network of **Figure 5**.

(2 marks)

- (b) (i) Three more workstations – D, E, F – and another file server – File Server 2 – are added but network users complain that the performance of the network is now very slow. In terms of the operation of this network what is the most likely cause for the slowing of the network, assuming no hardware faults?

.....  
.....

*(2 marks)*

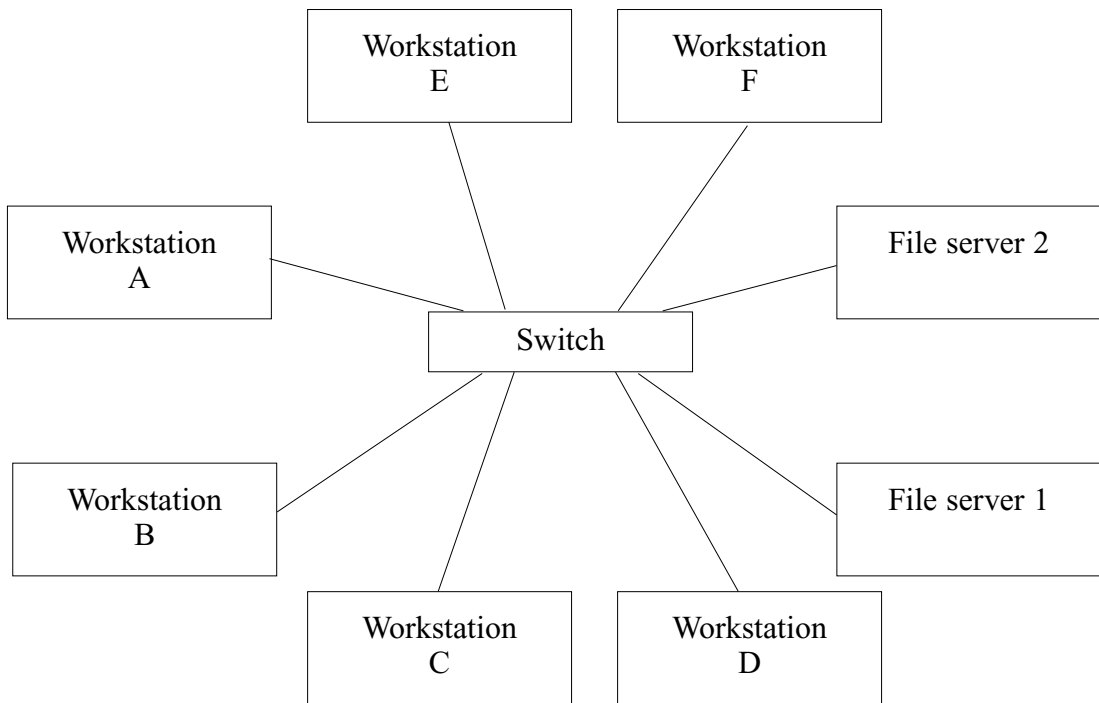
- (ii) To overcome this problem the network is split into two segments and bridged by a bridge with two ports, Port 1 and Port 2. Draw a carefully labelled diagram of the physical configuration of this new network.

*(2 marks)*

**QUESTION 9 CONTINUES ON THE NEXT PAGE**

**Turn over ►**

- (c) **Figure 6** shows another way that the computers in the local area network can be connected. The network uses switched Ethernet.



**Figure 6**

- (i) Explain how the operation of switched Ethernet differs from that of hub-based Ethernet.

.....  
.....  
.....

*(2 marks)*

- (ii) What is the advantage of the switched-based network in **Figure 6** compared with the hub-based network in **Figure 5** for the same number of computers?

.....

*(1 mark)*

**END OF QUESTIONS**