Surname		Other Names	
Centre Number			Candidate Number									
Candidate Signature												

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General Certificate of Education
January 2005
Advanced Level Examination

ASSESSMENT and QUALIFICATIONS ALLIANCE

COMPUTING **CPT5**
Unit 5 Advanced Systems Development

Monday 24 January 2005 Morning Session

No additional materials are required:
You may use 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.

For Examiner's Use			
Number	Mark	Number	Mark
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			
Total (Column 1) →			
Total (Column 2) →			
TOTAL			
Examiner's Initials			

LEAVE MARGIN BLANK

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

1 Give **two** types of item that should be found in a data dictionary.

1 .....

2 .....

(2 marks)

2

2 What is meant by

(a) Baseband network operation;

.....

.....

.....

(1 mark)

(b) Broadband network operation;

.....

.....

.....

(1 mark)

(c) Synchronous data transmission?

.....

.....

.....

(1 mark)

3

3 A software company, ABC Ltd, proposes that in the future customers who buy ABC Ltd's software will buy only the rights to store and execute this software on ABC Ltd's servers. ABC Ltd will operate an on-line service to its customers to allow its software products to be centrally managed and shared.
A customer at a workstation located anywhere in the world will send commands and data for processing to ABC Ltd's servers which will then return the results of processing to the customer's workstation.

(a) Which type of network, Wide Area Network (WAN) or Local Area Network (LAN), will connect customers to ABC Ltd's on-line service?

.....

(1 mark)

(b) Developing software purely as an on-line service eliminates the need to distribute software on CD-ROM. Describe **three** other benefits to ABC Ltd **or** its customers from this on-line service.

1 .....

.....

.....

2 .....

.....

.....

3 .....

.....

.....

(3 marks)

4

TURN OVER FOR THE NEXT QUESTION

4 A supermarket's Point Of Sale (POS) system operates as follows:

- Product data (**ProductID**, **Price**, **Product Description**) are stored in the database, **Product Database**.
- A **barcode** is present on each shopping basket item.
- A shop assistant **scans** each shopping basket item with a barcode scanner.
- A process, **Calculate Bill**, generates a **Bill** which is presented to the customer.
- The bill is itemised with **Product Description**, **Price** for each item sold.

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

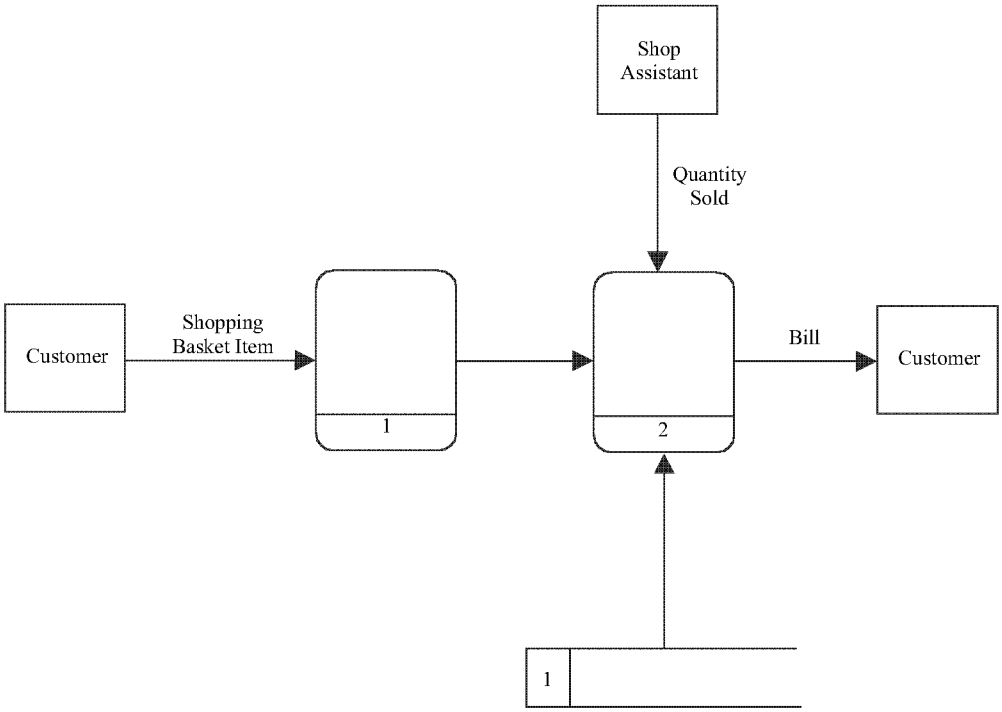

Figure 1

(6 marks)

(b) Give the name for this type of diagram.

.....

(1 mark)

7

5 A holiday travel company provides individually tailored adventure holidays. The holiday travel company has the following generic software packages:

- Database
- Word Processing
- Spreadsheet
- Desktop Publishing
- Presentation package
- Expert system shell

(a) Describe **three** different ways in which computer systems using these packages could assist the holiday travel company in their business. **Each** of your ways **must** require a different software package.

1. Package: .....

   Use: .....

   .....

   .....

2. Package: .....

   Use: .....

   .....

   .....

3. Package: .....

   Use: .....

   .....

   .....

(3 marks)

(b) Data produced by one of the above software packages may be integrated with or shared by another. How could **two** of the above software packages be used in this way to assist the holiday travel company in its work? You **must** state which software packages are used.

.....

.....

.....

.....

(2 marks)

5

6 An electronic mark book stores marks allocated to students' homework assignments in a single file of records with filename, **MarkBook.dat**, using the following record structure:

```
Record
   StudentID : Integer;
   DateOfHomeworkAssignment : String;
   SubjectCode : Integer;
   Mark : Integer;
End;
```

- The file **MarkBook.dat** is stored centrally on a networked file server.
- Teachers write marks to the file **MarkBook.dat** from networked workstations located at various locations in the school.
- An application program, **App1.exe**, exists to enter a student's homework assignment mark.
- An application program, **App2.exe**, exists to print the contents of a specified record or group of records.

(a) After six months in operation, the Maths department requests that the record structure of **MarkBook.dat** be extended to include a student name field, **StudentName**, and an application program written which prints the Maths mark together with the name of the corresponding student. The specifications for applications **App1.exe** and **App2.exe** remain unchanged.

(i) Explain what additional modifications and work will be necessary if the system is to continue to use the existing data and to have versions of the application programs **App1.exe** and **App2.exe** which will perform as specified with the new record structure.

.....

.....

.....

.....

.....

(2 marks)

(ii) The modifications and work to be done are classified as maintenance arising from a change in requirements.

Why is some of this maintenance labelled unproductive?

.....

.....

.....

(1 mark)

(iii) Give **two** examples of other types of system maintenance.

1 .....

.....

2 .....

.....

(2 marks)

(b) If the electronic mark book had been constructed differently by using a DBMS (Database Management System) instead of a file of records, the unproductive maintenance problem would have been eliminated and security improved.

(i) Explain how a DBMS could eliminate the unproductive maintenance problem.

.....

.....

(1 mark)

(ii) Explain how a DBMS could improve security.

.....

.....

(1 mark)

(c) After a year of service the file of records electronic mark book is replaced by a relational database solution with one relation as follows:

`MarkBook(StudentID,StudentName,DateOfHomeworkAssignment,SubjectCode, Mark)`

(i) Explain why this relation is not fully normalised or in BCNF (Boyce Codd Normal Form).

.....

.....

(1 mark)

QUESTION 6 CONTINUES ON THE NEXT PAGE

(ii) Write the fully normalised BCNF solution for this relation.

.....

.....

.....

.....

(2 marks)

(d) In which phase of the system lifecycle are the customer's requirements established?

.....

(1 mark)

11

7 **Figure 2** shows the HTML for a web page that collects name data through a screen-based form before submitting it to a server-based ASP script.

```
<HTML>
  <HEAD>
    <TITLE>
      ABC
    </TITLE>
  </HEAD>

  <BODY>

    <H1>Registering Your Name</H1>
    <FORM ACTION="http://www.abc.co.uk/asp/getname.asp" METHOD=POST>

      <P>Your name: <INPUT TYPE="text" NAME="MyName">
      <P><INPUT TYPE="submit" NAME="submit" VALUE="Send Name">
    </FORM>

  </BODY>

</HTML>
```

Figure 2

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

(6 marks)

6

TURN OVER FOR THE NEXT QUESTION

8 A football club invests in a computerised ticketing system for home matches. In addition to networked computers with hard disk storage, keyboard, mouse and VDU, the system designer of the football ticketing system has the following hardware to choose from:

Magnetic Stripe reader
Ink-jet printer
Barcode scanner
Iris scanner
Digital still camera
Smart card reader

Spectators who have pre-paid by credit card before the day of a match will only have to insert their credit card into a machine situated outside the football stadium to obtain their entrance ticket.

Other spectators will pay on the day of the match for their entrance ticket at ticket booths situated outside the football stadium or use a season ticket which is pre-purchased at the beginning of the season and used for every home match.

A season ticket holder's ticket may be pre-loaded with electronic cash which can be spent inside the stadium on refreshments.

Spectators must present a valid ticket before being allowed into the club's stadium.

Each spectator is allocated a numbered seat in the stadium.

The system must prevent a spectator from gaining admittance to the stadium if the spectator has been banned from the stadium.

The system must record the number of spectators inside the stadium.

Figure 3 shows an example of a ticket purchased on the day of a match.

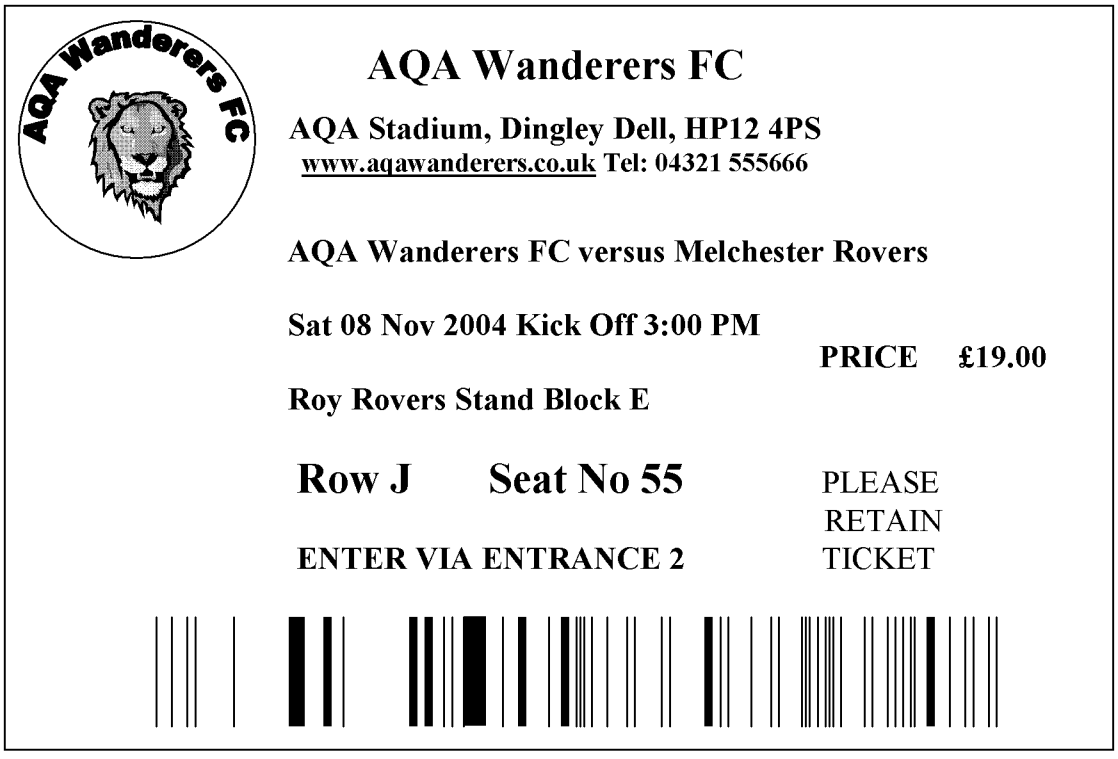

Figure 3

Give **one** possible **use** of each hardware device in this computerised ticketing system.

(a) Magnetic Stripe reader .....

.....

.....

(1 mark)

(b) Ink-jet printer .....

.....

.....

(1 mark)

(c) Barcode scanner .....

.....

.....

(1 mark)

(d) Iris scanner .....

.....

.....

(1 mark)

(e) Digital still camera .....

.....

.....

(1 mark)

(f) Smart card reader .....

.....

.....

(1 mark)

6

9 A teacher of Advanced Level Computing uses a relational database to record details of

- Students
- Work done by students on their Advanced level project
- Marks awarded for the system life cycle phases of a student's project
- Description and maximum mark for each system life cycle.

The teacher assigns

- A unique student identifier to each student
- A unique identifier to each system life cycle phase.

Work done by a student on a project is carried out

- On more than one date
- On different system life cycle phases on different dates
- On no more than one system life cycle phase on any particular date
- In only one time period on any particular date.

Students submit their work for assessment after completing each phase of the system life cycle.

The relational database uses four tables:

Student(StudentID, FirstName, Surname, DateOfBirth)

WorkDone(Date, StudentID, StartTime, LifeCyclePhaseID, DescriptionOfWorkDone, TimeSpent)

MarkAwarded(StudentID, LifeCyclePhaseID, DateSubmitted, Mark, DateMarked, TeachersComments)

LifeCyclePhase(LifeCyclePhaseID, LifeCycleName, MaximumMark)

(a) Draw an Entity-Relationship (E-R) diagram for the tables:

(i) Student and WorkDone

(1 mark)

(ii) Student and MarkAwarded

(1 mark)

(iii) LifeCyclePhase and MarkAwarded

(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 first name and surname of every student;

.....

.....

.....

(1 mark)

(ii) The first name and surname of every student together with the mark awarded for the phase of the system life cycle with LifeCyclePhaseID = 1, presented in ascending order of student surname.

.....

.....

.....

.....

.....

.....

(5 marks)

9

10 **Figure 4** shows the TCP/IP *protocol* stack applied to a LAN (Local Area Network).

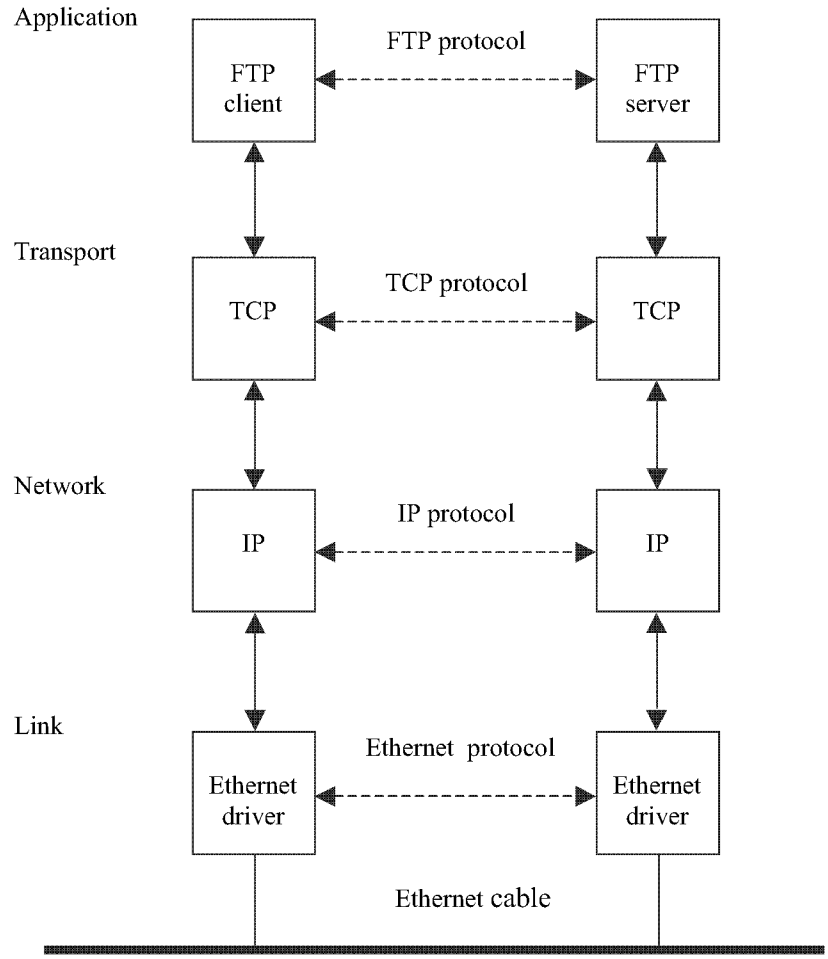

Figure 4

(a) What is a protocol?

.....

.....

(1 mark)

(b) What is the topology of this local area network?

.....

(1 mark)

(c) State a suitable type of network cable for the physical connections of this LAN.

.....

(1 mark)

The IP protocol layer uses IP addressing to route packets.

(d) Give **two** examples of an IP address that could belong to the same LAN.

1 .....

2 .....

(2 marks)

(e) Which part of your IP addresses identifies

(i) the LAN;

.....

(1 mark)

(ii) the host on this LAN?

.....

(1 mark)

(f) The Ethernet protocol layer uses Ethernet MAC (Media Access Control) addressing to route Ethernet frames. What is an Ethernet MAC address?

.....

(1 mark)

(g) Describe **two** tasks performed by the TCP protocol layer

1 .....

.....

2 .....

.....

(2 marks)

(h) Give **one** example of another type of application found in the Application layer.

.....

(1 mark)

(i) If two local area networks are connected through the Internet each must have a registered public IP address.
Name the **type** of organisation responsible for recording the allocation of public IP addresses.

.....

(1 mark)

12

END OF QUESTIONS

THERE ARE NO QUESTIONS PRINTED ON THIS PAGE