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General Certificate of Education  
 June 2004  
 Advanced Level Examination



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

**CPT5**

Tuesday 22 June 2004 Morning Session

In additional 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.

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			

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

1 (a) In the context of systems development what is *prototyping*?

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

(b) Give **one** reason why software developers use prototyping.

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

2 Software is used extensively in the control and monitoring of systems that have the potential to cause loss of life if the system fails.

(a) Briefly describe **two** different types of control or monitoring software which could endanger life if they fail.

1 .....  
.....  
2 .....  
.....  
(2 marks)

(b) A software system failed shortly after entering service with the customer even though it passed all phases of testing successfully including *acceptance testing*.

(i) What is meant by acceptance testing?

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

(ii) Excluding testing, design flaws or hardware failure, give **another** possible explanation for the failure of this software system.

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

(iii) Name **one** other type of testing that could have been applied to the developed system to discover potential problems.

.....  
(1 mark)

2

5

3 Imagine that you are a systems analyst working for a large company with its own computing facilities. Your company has just taken over a small company.

You are asked to examine the suitability of a computerised system, developed by the small company, with a view to making general use of the system throughout the large company.

Briefly describe **five** factors you would include when you evaluate whether the large company can adapt this computerised system.

1 .....

.....

.....

2 .....

.....

.....

3 .....

.....

.....

4 .....

.....

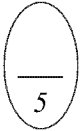
.....

5 .....

.....

.....

(5 marks)



Turn over ►

4 The scripts shown in **Figures 1** and **2** are used to create a database.

```

Create Database "c:\LibraryUser.GDB"
  User "Librarian" Password "Hemingway";

Create Table Borrower
  (BorrowerIdNo Integer Not Null,
  Surname VarChar(20) Not Null,
  Title VarChar(4),
  DateOfBirth Date Not Null,
  FinesOwed Money,
  Primary Key (BorrowerIdNo)
  );
Create Unique Index BorrowerIDNoIndex On Borrower(BorrowerIDNo);

```

**Figure 1**

```

Create View BorrowersWithFines (Name, TotalOfFines)
  As
  Select Surname, FinesOwed
  From Borrower
  Where FinesOwed > 0;

```

**Figure 2**

(a) Name the **type** of scripting language used in **Figure 1**.

.....  
(1 mark)

(b) Name the **three** levels of a Database Management System (DBMS).

1 .....  
2 .....  
3 .....  
(3 marks)

(c) The script in **Figure 2** creates a restricted view, **BorrowersWithFines**, of the **Borrower** table.

(i) Which attribute(field) names of **BorrowersWithFines** will be visible to a user granted access to this view?

.....  
(1 mark)

(ii) Briefly explain what data this view will give a user access to.

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

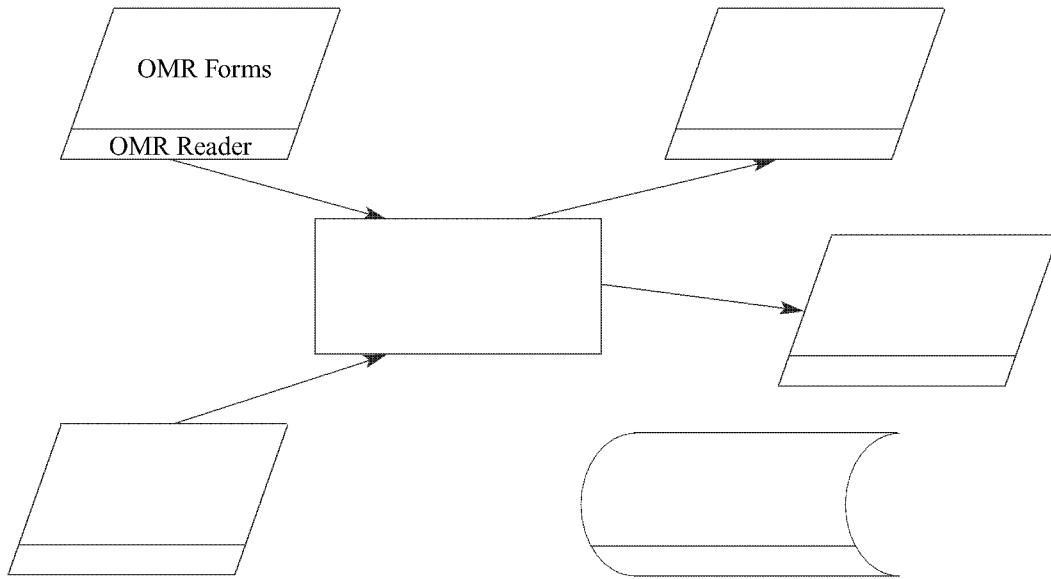
5 A school's computer registration system stores student attendance data on a **magnetic disk** in a database, **StudentRegister**.

A student's daily presence is encoded on an **OMR form**.

A process, **Process Daily Register** is then applied to batches of **OMR forms** and the database **StudentRegister** is updated and a **printed list of absences** produced.

A **progress report** is sent to a **VDU**. The system is controlled by **commands** from a **keyboard**.

(a) Complete the diagram shown in **Figure 3**.



**Figure 3**

(6 marks)

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

.....  
(1 mark)

(c) What encoding method is used for the OMR forms?

.....  
(1 mark)

6 An international charity provides humanitarian aid to areas which suffer a disaster such as an earthquake. It has the following generic software:

- 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 international charity in achieving this task. Each way should use a **different** package.

1 .....

.....

.....

.....

2 .....

.....

.....

.....

3 .....

.....

.....

.....

(3 marks)

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

.....

.....

.....

.....

(2 marks)

7 A student researching for an essay is advised to use the Internet to find sources of information. The student has Internet access to the following research tools:

- Internet Search Engine
- Usenet
- Internet Relay Chat (IRC)

What could **each** tool be used for in researching for this essay?

(a) Internet Search Engine .....

.....

.....

*(1 mark)*

(b) Usenet .....

.....

.....

*(1 mark)*

(c) IRC .....

.....

.....

*(1 mark)*

3

**TURN OVER FOR THE NEXT QUESTION**

**Turn over ►**

8 In addition to networked computers with hard disk storage, keyboard, mouse and VDU, the system designer of an airport ticketing and security system has the following hardware to choose from:

- Magnetic Stripe reader
- Ink-jet printer
- Barcode scanner
- Iris scanner
- Digital still camera
- Smart card reader
- Optical Character Recognition system

Passengers with hand baggage only and who have pre-paid by credit card insert their credit card into a machine which issues each passenger with a boarding pass.

Passengers must present a valid boarding pass and a valid passport at security control before being allowed into the aircraft's boarding lounge.

Figure 4 shows an example of a boarding pass.

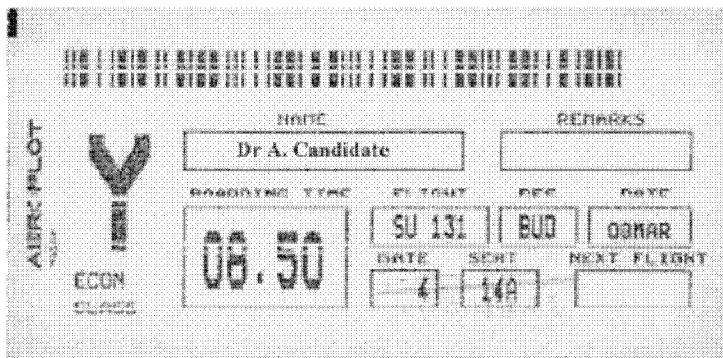


Figure 4

Give one possible use of each hardware device in this airport ticketing and security 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)*

(g) Optical Character Recognition system .....  
.....  
.....  
*(1 mark)*



**TURN OVER FOR THE NEXT QUESTION**

**Turn over ►**

9 A swimming club organises swimming gala competitions.

A gala consists of

- more than one race
- races of different swimming strokes, e.g. breast stroke, front crawl
- races at more than one distance for a given stroke
- races with more than one swimmer.

A race has a

- specified swimming stroke
- set distance
- more than one swimmer.

A swimmer may

- swim in more than one race
- swim one swimming stroke in one race and a different stroke in another race
- swim in races of different distances.

A swimming club uses a relational database to record details of

- swimmers
- swimming galas
- swimmers entered for a race in a gala
- swimming strokes swum by swimmers.

The swimming club assigns a

- unique swimmer number to each swimmer
- unique number to each gala
- number to each race in a gala which is unique **only** within the particular gala, e.g. 100 metres breast stroke race is assigned the number 1
- unique number to each swimming stroke that swimmers may swim in a race, e.g. breast stroke is assigned the number 1.

The relational database uses five tables:

**Swimmer**(SwimmerNo, FirstName, Surname, DateOfBirth)

**Gala**(GalaNo, GalaDescription, DateOfGala, Venue)

**GalaRace**(GalaNo, RaceNo, StrokeNo, Distance, SwimmerNoOfWinner, WinningTime)

**GalaRaceSwimmer**(GalaNo, RaceNo, SwimmerNo, EntryFeePaid, TimeRecordedForRace)

**Stroke**(StrokeNo, StrokeDescription)

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

(i) Gala and GalaRace

(1 mark)

(ii) GalaRace and GalaRaceSwimmer

(1 mark)

(iii) Stroke and GalaRace

(1 mark)

(iv) Gala and Swimmer

(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 surname of the swimmer with SwimmerNo = 6.

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

(1 mark)

Turn over ►

(ii) The SwimmerNo for each swimmer in race with RaceNo = 5 and gala with GalaNo = 2, presented in ascending order of TimeRecordedForRace.

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

*(3 marks)*

(iii) The surname of the winner of each race in gala with GalaNo = 4.

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

*(3 marks)*

**TURN OVER FOR THE NEXT QUESTION**

**Turn over ►**

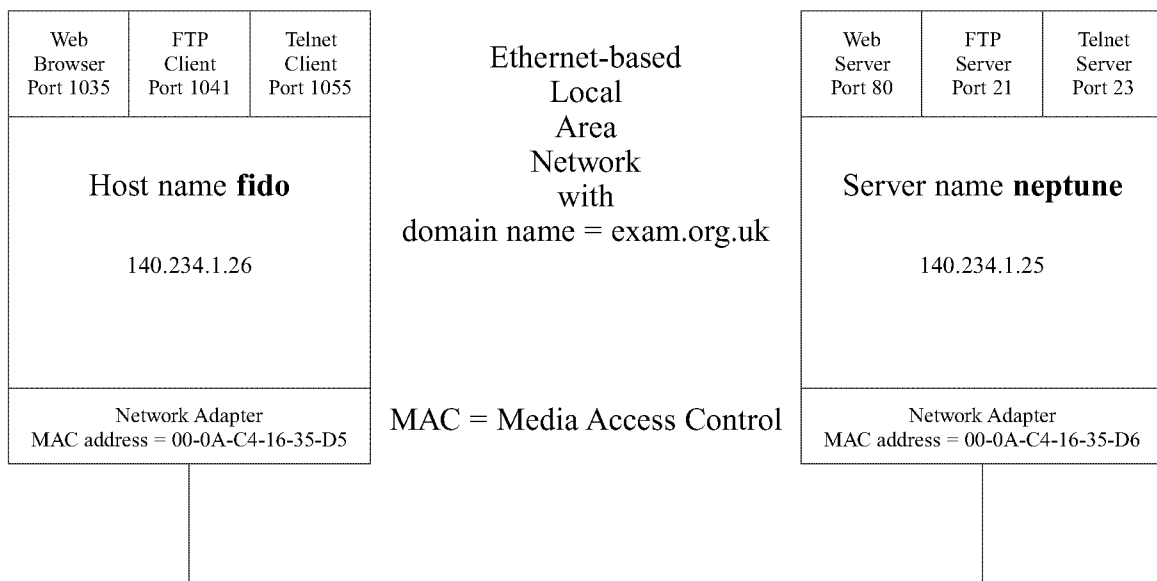
- 10** A local area network (LAN) connects a host with host name **fido** and an application server with server name **neptune** as shown in **Figure 5**.

The application server is executing three services:

- Web server
- FTP server
- Telnet server.

The host **fido** is executing three applications:

- Web browser
- FTP client
- Telnet client.



**Figure 5**

Figure 6<sup>1</sup> shows a part of the graphical user interface generated on **fido**'s VDU by one of the applications executing in **fido**.

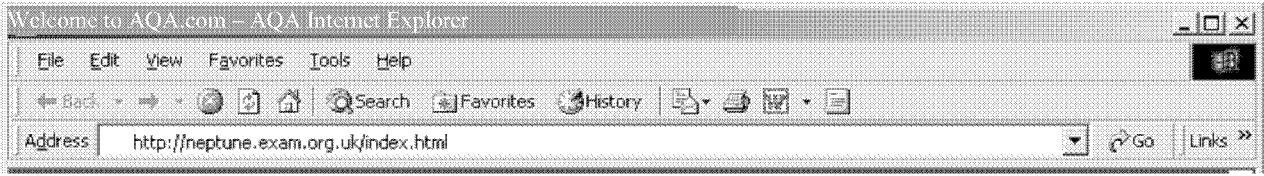


Figure 6

- (a) (i) What application, executing in **fido**, generated the graphical user interface shown in **Figure 6**?

.....  
 (1 mark)

- (ii) Complete the following simplified Ethernet frame that will be sent to the server when the URL shown in **Figure 6** is requested.

Source Port No	Destination Port No	Source IP Address	Destination IP Address	Source MAC Address	Destination MAC Address
		140.234.1.26	140.234.1.25	00-0A-C4-16-35-D5	00-0A-C4-16-35-D6

(1 mark)

- (b) IP addresses consist of a Network ID and Host ID.

What is **fido**'s:

- (i) Network ID? .....

(1 mark)

- (ii) Host ID? .....

(1 mark)

**QUESTION 10 CONTINUES ON THE NEXT PAGE**

<sup>1</sup> and Internet Explorer are registered trademarks of Microsoft Corporation

**Turn over** ►

- (c) **Figure 7** shows a Telnet session initiated by **fido**.  
**Figure 8** shows the output from a command **netstat**.

```
C:\>Telnet 140.234.1.25
neptune login: aqa
password:
logged in to neptune 12/05/2004 10:23am
neptune $>ls
home/ cgi-bin/ index.html www/ mail/ fromChil/
```

**Figure 7**

Protocol	Local Address	Foreign Address	State
TCP	140.234.1.25.23	140.234.1.26.1055	Established
TCP	*.23	*.*	Listening

**Figure 8**

- (i) At which computer was the **netstat** command run? Justify your answer.

Computer:..... (1 mark)

Justification: .....  
..... (1 mark)

- (ii) For the established Telnet connection, what is the socket address used by the

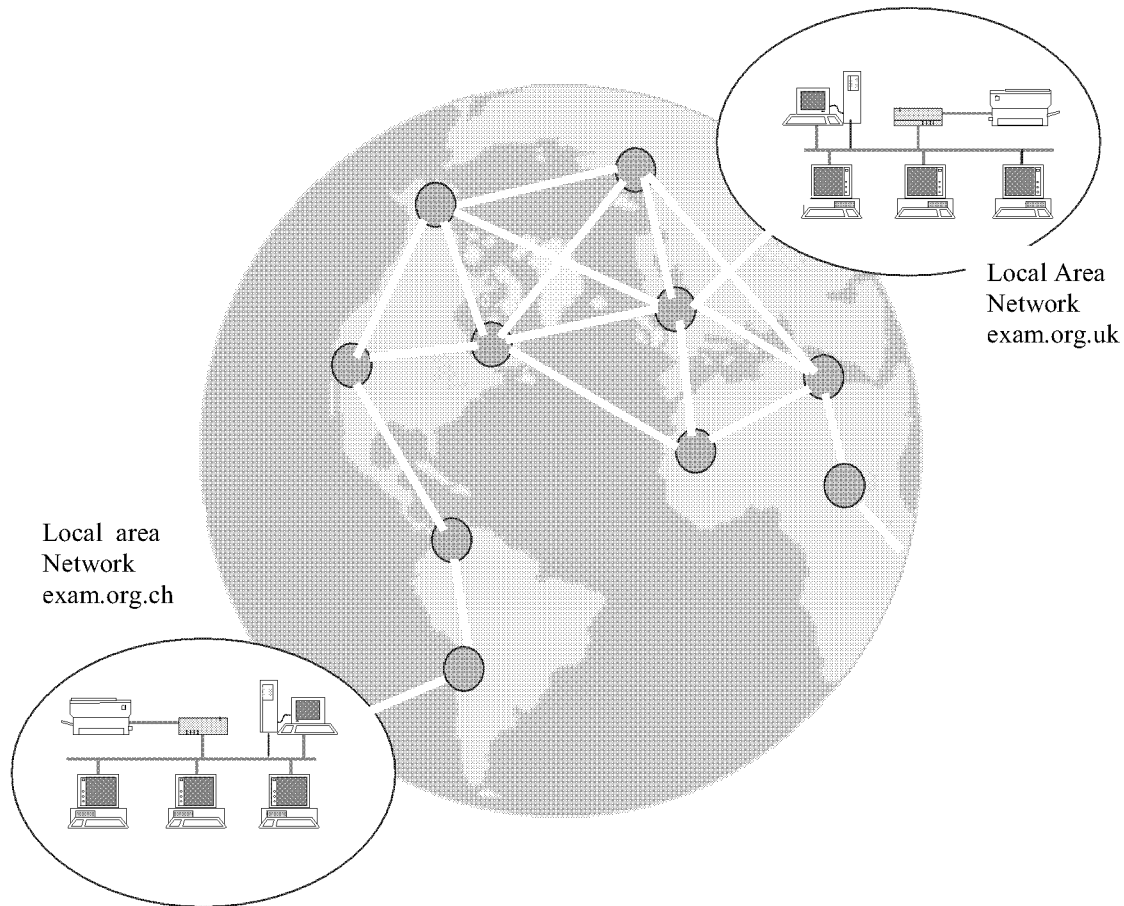
A. Telnet server?..... (1 mark)

B. Telnet client?..... (1 mark)

- (iii) State **one** purpose that Telnet may be used for.

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

- (d) The LAN exam.org.uk is connected to a wide area network (WAN) so that examination documents may be transferred between hosts on the organisation's Chilean branch's LAN and hosts on the UK branch's LAN as shown in **Figure 9**.



**Figure 9**

- (i) What is the most appropriate protocol to use on a host in the Chilean LAN for transferring exam documents from the Chilean LAN to the **fromChil** folder on the UK server neptune?

.....  
(1 mark)

- (ii) Each LAN is connected to an access point on the WAN using a copper link provided by the local telephone company. Name **one** type of connection from the LAN to this access point that could be used for data transmission rates in excess of 100kbits/s.

.....  
(1 mark)

**QUESTION 10 CONTINUES ON THE NEXT PAGE**

**Turn over ►**

(iii) The WAN operates in Asynchronous Transmission Mode (ATM).  
Explain why an ATM WAN behaves more like a circuit-switched network than a packet-switched network.

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

*(2 marks)*

**END OF QUESTIONS**

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