WELSH JOINT EDUCATION COMMITTEE
General Certificate of Education
Advanced

CYD-BWYLLGOR ADDYSG CYMRU
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Uwch

345/01

COMPUTING CP5

THE COMPUTER, DATA AND APPLICATIONS

A.M. TUESDAY, 19 June 2007

(2 hours)

ADDITIONAL MATERIALS

In addition to this examination paper, you will need a 12 page answer book.

INSTRUCTIONS TO CANDIDATES

Answer **all** questions.

The intended marks for questions or parts of questions are given in brackets [ ]. You are advised to divide your time accordingly. The total number of marks available is 70.

You are reminded of the necessity for good written communication and orderly presentation in your answers.

1. *(a)* A buffer is used when data is entered via a keyboard into the computer.

(i) Explain the role of this buffer. [1]

(ii) Why is the buffer required? [1]

(b) Explain *double buffering* and give an advantage over single buffering. [2]

2. A football club allows seats to be booked over the telephone. Telephone calls are handled by several sales assistants. As each seat is booked a sales assistant types the details into a computerised real-time transaction processing system. A record in the booking file is updated to indicate that the seat has been booked and a copy of the booking is stored in a *transaction log*.

(i) Describe how the system prevents a seat being booked twice. [2]

(ii) Following a system failure, the booking file is damaged and the booking data lost. Explain how the *transaction log* could be used to restore the booking file. [1]

(iii) Other than name, address and telephone number, give **two** other fields you would expect to find in a transaction log record. [1]

3. *(a)* Explain why networks require protocols. [1]

(b) Describe **in detail**:

(i) token passing (within a ring network); [3]

(ii) data collisions and their detection (within a bus network). [3]

(c) Name the device that is required to link two dissimilar computer networks. [1]

4. Operating systems use interrupts to manage tasks.

(i) A task can be in one of **three** states: *ready, running* or *blocked*. Briefly describe **each** of these states. [3]

(ii) What is a computer interrupt? [1]

(iii) Give **two** examples of computer interrupts. [2]

(iv) The operating system is processing an interrupt when another interrupt with a higher priority is generated. Explain **in detail** the sequence of events following the second higher priority interrupt. [3]

5. *(a)* The following diagram is a simplified example of a multi-level index for an indexed sequential file with three levels of indexes.

Explain in detail how **each** of the indexes is used to locate the record with a key value of 4183. [3]

Main Index	
Range of Key Values	Index number
0000-2499	01
2500-4999	02
5000-7499	03
7500-9999	04

Index 02	
Range of Key Values	Index number
2500-2999	021
3000-3499	022
3500-3999	023
4000-4499	024
4500-4999	025

Index 024	
Range of Key Values	Block (bucket) location
4000-4099	block 169
4100-4199	block 170
4200-4299	block 171
4300-4399	block 172
4400-4499	block 173

(b) Random access files use a *hashing algorithm* and an *overflow area*.

Explain **in detail** how a record is located using a *hashing algorithm* when the record is stored in the *overflow area*. [4]

6. *(a)* The table below shows some data stored in an un-normalised database for products and their suppliers.

Product Description	**Product Cost**	**Quantity In Stock**	**Supplier Name**	**Supplier Contact**	**Tel Num**
Garden Bench	£100	9	Wood Benches Direct	Mr Brown	033 345 876
Large Garden Shed	£250	5	Forest Supplies	Ms Lloyd	088 231 786
Patio Seating Set	£500	12	Garden Furniture Company	Mrs Jones	065 231 874
Large Umbrella	£50	17	Garden Furniture Comany	Mrs Jones	065 231 874
Small Garden Shed	£150	3	Forest Supplies	Ms Lloyd	088 231 786
Outdoor Heater	£300	14	Garden Furniture Company	Mrs Jones	065 231 874
.....	.....		.....	.....	

Explain what is meant by the term *data inconsistency*, giving **one** example from the above table. [2]

(b) Explain what is meant by data being in *first normal form*. [1]

7. A government is proposing to build a new motorway that will allow cars to be controlled by computer systems with minimal intervention from the driver. Each car will be fitted with appropriate sensors which will ensure that it can travel safely on the motorway.

(i) Describe **two** uses of feed-back in this system. [2]

(ii) Describe **two** safety features that should be included in this type of system. [2]

8. *(a)* Data can be transmitted using *simplex* and *full duplex*.

(i) Explain what is meant by the term *simplex*. [1]

(ii) Explain what is meant by the term *full duplex*. [1]

(b) Explain the role of a *multiplexor* in a computer system. [1]

(c) Using an example, describe the term *distributed system*. [2]

9. *(a)* In addition to a microphone, explain what hardware is required to input speech into a computer. [1]

(b) Explain **why** this hardware is required. [1]

10. *(a)* Explain the roles of *primary keys* and *foreign keys* in a relational database. [2]

(b) (i) A surgery has several *doctors* and many *patients*. Each *patient* can make one or more *appointments* with a *doctor*.

The surgery receptionist records which *patient* has made an *appointment* with which *doctor* and the time and date of the *appointment*.

Design a **three-table** database in third normal form to handle the information required for this application. Each table should include only relevant information.

You should clearly indicate the table names and any primary or foreign keys that you use. [8]

(ii) Doctors sometimes *visit* patients away from the surgery. The surgery receptionist records which *doctor* is to visit which *patient* and the address, date and time of the *visit*.

Add an extra table to your database design, to accommodate this extra information. [2]

11. In the following question, additional credit (up to 3marks) will be given if your answer demonstrates skill in written communication.

A car manufacturer has thousands of dealerships throughout the world. Mechanics in each dealership repair and service the manufacturer's cars. The manufacturer decides to install a new computer system in all the dealerships' workshops.

The system will allow access to:

- an expert system to diagnose car faults;
- the Internet and the manufacturer's intranet.

Describe how the mechanics could make use of the expert system, the Internet and the manufacturer's intranet.

Describe any advantages for the mechanics, the customers and the manufacturer of installing such a system.

Describe any drawbacks of installing such a system.

[9 + 3]