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, 20 June 2006

(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 printer can be connected to a computer using a cable that allows sixteen bits to be transmitted at the same time. What name is given to this type of transmission? [1]

(b) A mouse can be connected to a computer using a cable that allows only one bit to be transmitted at a time. What name is given to this type of transmission? [1]

(c) Explain why a modem is required for a computer to communicate using the traditional telephone network. Explain the role of the modem. [2]

2. *(a)* In order to prevent unauthorised access to a multi-user computer system, guidelines are provided on passwords. Apart from regularly changing passwords, describe **two** other guidelines that users should adopt to maintain security on a multi-user computer system. [2]

(b) Encryption is used to protect data from unauthorised users. Explain how the encrypted data can be read by an authorised user. [2]

3. *(a)* Two different types of network topologies are *bus* and *ring*.

(i) Describe what is meant by the term *data collision* on a bus network and describe how a collision is detected. Briefly explain how the network deals with data collisions. [3]

(ii) Explain **in detail** the main features of token passing on a ring network. [3]

(b) A wide area network uses *packet switching*.

(i) Explain **in detail** how *packet switching* works. [3]

(ii) Apart from source and destination address, give **two** other examples of the kind of information that would be contained in a packet. [2]

4. Customers can book airline seats using the Internet. After selecting seats on one page of the website, they then move to a new page to enter their payment details.

(i) Explain how the system stops other customers booking the same flight seats while the original customer is entering their payment details. [1]

(ii) Describe what the system may do to prevent a customer taking too long to enter these details. [1]

(iii) This system is an example of real time transaction processing. A *booking file* contains a record for each seat on that flight and the record is updated as soon as the seat is booked. Describe measures that should be in place to recover the booking file if it became corrupted. [2]

5. *(a)* Explain the term *indexed sequential file* and describe the contents of the index. Give **one** advantage of using an *indexed sequential file* over a standard *sequential file*. [4]

(b) Explain the term *multilevel indexed sequential file* and give **one** advantage of using a *multilevel indexed sequential file* rather than a *random access file*. [3]

(c) Explain **in detail** how a hashing algorithm allows direct access to a record in a random access file. [3]

(d) A simple hashing algorithm is one which converts a four digit input number as follows:

The four digits are added together, the result is divided by 11, and the **remainder** of the division is used as the output from the algorithm.

Calculate the output, if the input is 4275. [1]

6. *(a)* Briefly explain how a multi-tasking operating system manages computer memory using *partitioning*. Describe **one** consequence of the operating system failing to manage memory *partitioning* correctly. [2]

(b) A scheduler is the part of the operating system that decides the order in which tasks are executed by the CPU.

(i) A task can be in one of three states. In each of the following cases, name the state.

(I) The task is waiting to be executed. [1]

(II) The CPU is executing the task. [1]

(III) The task is waiting for a device that is in use. [1]

(ii) One method of scheduling is to take each task in turn and run that task until it has used up the allocated time slice or an interrupt occurs.

(I) Briefly explain the term *time slice* and the role of *interrupts* in this method of scheduling. [2]

(II) Explain how the operating system could use *time slices* to increase the priority of a task. [1]

Turn over for questions 7, 8 and 9

7. A health authority has installed an expert system in local surgeries. Doctors use the system to help with the diagnosis of patients' illnesses.

(a) Describe **two** benefits for the doctor and **one** benefit for the patient of using an expert system. [3]

(b) Describe **two** parts of an expert system. [2]

(c) Describe a typical interaction that the doctor would have with the expert system when trying to reach a diagnosis. [2]

8. *(a)* Relational databases use *primary keys* and *foreign keys*.

(i) Why are *primary keys* important? [1]

(ii) What are *foreign keys* and why are they used? [2]

(b) Pupils in Year 12 at a secondary school have the option of studying several subjects. It is important that the school knows:

- Which subjects each pupil is studying
- The names of all the pupils studying a given subject.

Design a **three-table** database for *pupils*, *subjects* and *pupils studying subjects* in third normal form to handle the information required for this application.

You should clearly indicate the table names and any primary or foreign keys that you use. [7]

(c) The grade achieved by each pupil for each subject also needs to be stored. Alter your database design to accommodate this extra information. (You need only show the table(s) that you change.) [1]

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

Powerful computers are used to model weather patterns and help make accurate weather forecasts. Atmospheric measurements are taken daily including temperature and pressure.

Describe any difficulties of gathering the input required for weather forecasting and explain why analogue to digital converters would be required in this system.

Explain **in detail** why powerful computers are essential to produce weather forecasts and why it is very difficult to produce accurate forecasts.

[7 + 3]