



GCE A level

345/01

COMPUTING CP5

THE COMPUTER, DATA AND APPLICATIONS

P.M. FRIDAY, 13 June 2008

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.
 - (i) State the computer term for an area of memory where data is temporarily stored while being transferred between a keyboard and a computer. [1]
 - (ii) Give a different example of where such an area of memory would be used in a computer system, stating clearly the relative speeds of the devices concerned. [2]

2.
 - (a) Wide area networks can use *circuit switching* or *packet switching* to transmit data from a source work station to a destination work station.
 - (i) Explain **in detail** how data is transmitted from source to destination using *circuit switching*. [2]
 - (ii) Explain **in detail** how data is transmitted from source to destination using *packet switching*. [3]
 - (iii) State **one** advantage of using *packet switching* rather than *circuit switching*. [1]
 - (b) A *ring* network uses a *token* to communicate with other stations on the network. The *token* is continuously passed from station to station.
 - (i) Give **one** disadvantage of a ring network topology compared to a bus network. [1]
 - (ii) When data is being transmitted, the token will contain actual data and check data. State another item that must be included in the token. [1]
 - (iii) Explain **in detail** how data is sent from the source to the destination using *token passing* on a *ring* network. [3]

3. A holiday company allows customers to search for holidays using the company's website. After the customer has selected a holiday they move to a new page where they can book the holiday. The *master file* is then updated to indicate that a booking has been made. A copy of every booking transaction is stored in a separate file called a *transaction log*.
 - (i) Explain how the system would stop two customers booking the same holiday. [1]
 - (ii) If the *master file* becomes corrupted, the holiday company would not know which customer had booked which holiday. Explain **in detail** how the *transaction log* could be used to restore the corrupted master file. [2]

4. The operating system of a multi-user computer has to manage the computer's resources.
 - (i) Explain **in detail** how the operating system uses *time slicing* to allocate processor time to user tasks. [2]
 - (ii) *Partitioning* is used when allocating main memory. Explain **in detail** the term *partitioning*. [2]
 - (iii) Explain the meaning of the computer term *interrupt* and give **two** examples of situations where interrupts may occur. [3]

5. (a) A particular *indexed sequential file* uses a **three level** index. Explain **in detail**, with the aid of a diagram how a record is located using the three indexes. [3]
- (b) Give **one** advantage of using an *indexed sequential file* rather than a *direct access file*. [1]
- (c) Explain **in detail** how a record is located using a hashing algorithm when the record is stored in the overflow area. [4]
- (d) How will accessing a record in the overflow area affect the access time? [1]
6. Each year students enrol on many college courses. The data is stored in a database which has not been normalised; some of the data is inconsistent. An example of the data is shown below.

Student Number	Name	Address	Tel Num	DOB	Course Title	Course Cost	Start Date
101	Ian Smith	22 Apple Drive	0111 555444	29/07/88	AS Level Physics	£200	08/09/07
101	Ian Smith	22 Apple Drive	0111 555444	29/07/88	AS Level Chemistry	£200	08/09/07
123	Jane Jones	31 Farm Road	0123 656565	17/03/87	GCSE Mathematics	£95	15/09/07
101	Ian Smyth	22 Apple Drive	0111 555444	29/07/88	AS Level Photography	£350	08/09/07
123	Jane Jones	31 Farm Road	0123 656565	17/03/87	GCSE English	£95	15/09/07
123	Jane Jones	31 Farm Road	0123 656565	17/03/87	GCSE Spanish	£95	15/09/07
136	Harry Stien	44 Tree Street	0499 333242	22/05/71	GCSE Spanish	£95	15/09/07
123	Jane Jones	31 Farm Road	0123 656565	17/03/87	GCSE History	£95	15/09/07
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- (a) Using an example of inconsistent data from the above table, explain what is meant by the term *data inconsistency*. [2]
- (b) How could the possibility of this database containing inconsistent data be removed? [1]
- (c) A definition of third normal form is '*data items are dependant on the primary key only and dependant on the whole of the primary key*'. [1]

Using an example from the above data, which is not normalised, explain why this data is not in third normal form. [1]

7. Car engines are controlled by a computer system called the *engine control unit (ECU)*. The ECU has several inputs.
- (a) (i) The ECU uses *feed-back* to control the engine. Explain **in detail** what is meant by the term *feed-back*. [2]
 - (ii) Describe **one** benefit of using a computer system to control the engine. [1]
 - (b) (i) Explain the difference between analogue and digital signals. [1]
 - (ii) One input to the ECU is the engine temperature. Explain why analogue to digital conversion will be required to monitor the engine temperature. [1]
8. (a) Data can be transmitted along a data line in two different ways, either one bit after the other or by simultaneously transmitting more than one bit at the same time. State the name of **each** of these data transmission methods. [1]
- (b) Data can be transmitted along a data line in both directions at the same time. State the name of this data transmission method. [1]
- (c) Explain the need for *multiplexing* in a computer system. [1]
9. (i) A recording company has recording artists who produce albums. Each album contains many singles and each recording artist produces many albums.
- The company need to know which artist has released which album and what singles are on each album.
- Design a **three-table** database for recording artists, albums and singles in third normal form to handle the information required for this application.
- You should clearly indicate **suitable** table names and any primary or foreign keys that you use. [8]
- (ii) The recording artists also release downloads which are **not** released as singles or contained on any album. Add an extra table to your database to accommodate this extra information. [2]

10. (a) (i) Explain what is meant by the term *data encryption*. [1]
- (ii) Explain **in detail** how encrypted data can be read by the appropriate person. [2]
- (b) Many large organisations carry out disaster planning for their computer systems. Describe **two** elements of disaster planning which can allow an organisation to quickly recover following a disaster to their computer system. [2]

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

11. Engineers have designed a new aeroplane called UltraJet that will be the biggest aeroplane ever produced. The pilots will require training before they can fly the UltraJet prototype.

The engineers have also used complex software and powerful computers to create a flight-training simulator to train UltraJet pilots.

Explain why powerful computers are essential for flight-training simulators and describe the difficulties in producing a realistic simulator. Also describe the benefits of using flight-training simulators to train UltraJet pilots. [7 + 3]