Past Papers Questions:

Section 1.4: Data: Its Representation, Structure and Management

May/June 2002

6 A file of different types of musical instruments sold in a music shop is to be stored on a computer system. The file is to be stored as a linked list in alphabetical order of the name of the instrument.
(a) Using a diagram, show how such a list would store the instruments: lute, fiddle, guitar, zither. [4]

A telephone company stores details of its customer accounts on a computer file. The file is used to allow the company to calculate and send out bills to its customers at regular times of the year. The file is also used to allow an immediate response to a customer who calls in to make an enquiry about their account.
9 Explain why indexed sequential access to the data would be sensible in this example. [4]

10 Customer records are stored using an 8 digit customer number as key.
Describe an indexing system which could be used to produce such indexed sequential access to the file. [3]

October / November 2002

4 An examination centre holds data about the candidates at that centre.
The data held is

- 4 digit candidate number
- candidate name
- gender
- date of birth
- number of subjects entered.

(a) If there are 200 candidates entered by the centre, calculate the expected size of the file. Show your working and give your answer in suitable units. [6]
(b) State a suitable medium for storing a back-up copy of the candidate file, giving a reason for your answer. [2]

7 (a) Describe how an array is initialised in the memory of a computer. [4]
(b) Describe how an array may be searched serially to find a specific data item. [4]

May/June 2003

4 (a) Explain what is meant by a LIFO data structure. [2]
(b) Draw a simple diagram to show how a stack can be stored in an array. [2]

5 A company employs approximately 2000 workers whose details are stored in a personnel file in a computer system.
Each worker's record has a unique 7 digit identification number.
_ The first digit is from 0 to 5 and refers to the department in which the person works.
_ The second digit is a 0 or a 1 and refers to the sex of the employee.
_ The next two digits refer to the year that the employee joined the company.
_ The last three digits are used to make the identification number unique.

The file is accessed randomly by using a hash table.
(a) Devise a suitable hashing algorithm which limits the degree of redundancy to allow access to the hash table. [2]
(b) State two identification numbers that will cause a collision using your hashing algorithm. [1]
(c) Describe two methods to overcome the problem of collision in part (b). [4]

October / November 2003

5 Details of students in a college are stored in a computer system. Among data items stored are
_ the student's name
_ the student's address
_ the student's date of birth
_ the mark obtained in the last mathematics examination
_ whether or not the student wants to go on a college trip
_ how much the student owes towards the cost of the trip.

(a) The name and address are stored as ASCII characters. Explain what is meant by an ASCII character. [2]
(b) State data types that are suitable for each of the other pieces of data. [4]
(c) Using this example, explain what is meant by each of the following terms.
(i) Field.
(ii) File.
(iii) Record. [3]

May/June 2004

4 (a) (i) Explain what is meant by the character set of a computer. [1]
(ii) Describe how the character set is represented in the computer system. [2]
(b) A stock file in a warehouse has the following fields in each record.
• Name of item.
• Date of last delivery.
• Price of item.
• Whether or not an order is outstanding.
• Number of that item left in stock.

(i) State data types suitable for each of the fields. [5]
(ii) Given that there are approximately 10000 different items in the warehouse, estimate the size of the stock file. You should clearly show all the stages in the calculation. [5]

October/November 2004

4 (a) State the meaning of the terms
(i) serial file; [1]
(ii) sequential file. [1]
(b) (i) Explain how records in a random access file can be accessed using a hashing algorithm. [3]
(ii) Clashing is a problem that can arise when a new record is saved to the random access file. It arises when the hash key of the new record is the same as that of an existing record. Describe two methods for dealing with the problem of clashing. [4]

11 The data stored on the system is both backed up and archived at regular intervals.
(a) Explain the difference between backing up and archiving data. [2]
(b) Give reasons why it is necessary for the company to archive the customer files and the stock files. [3]
(c) Describe a suitable back-up procedure for the stock file. [4]

May/June 2005

3 (a) With the aid of a diagram show how the names
SIHA DIPO GHIA AMOR
can be stored in a linked list in alphabetic order. [4]

(b) The linked list increases in size because of new entries being made. Explain, in whatever form you find appropriate, how the linked list can be searched for the name THEO. [4]

October/November 2005

1 An office worker is responsible for communicating with other businesses and managing the computer systems in the office.

(b) The worker is also responsible for making backup copies of files and for archiving data.
(i) Explain the difference between backing up and archiving. [4]
(ii) Describe a sensible procedure that this worker could adopt for backing up the data files. [4]

May/June 2006

A small business has one shop. It specialises in taking portrait photographs for customers.
Details of customers are stored on paper.
It is decided to buy a stand-alone computer and use it to store customer records in a file.

7 The following fields are to be stored.
- Customer name (to allow customer to be addressed properly when contacted)
- Customer telephone number (so that customer can be contacted when their order has been completed)
- Date of original commission (so that customers are not kept waiting too long)
- Whether or not the order has been paid for.

(a) State a suitable data type for each of the four fields. [4]
(b) It is assumed that there will never be more than 1000 records.
Estimate the total size of the file needed for these records. [4]

October/November 2006

2 A large factory employs many thousands of workers. The workers' times of arrival and departure are noted. At the end of each week the pay for each worker is calculated by a computer system and the pay slips are produced.

(b) The employee file is stored as a sequential file.
(i) Explain what is meant by a sequential file. [2]
(ii) State two reasons why a sequential file is a sensible choice of file type in this case. [2]

7 The communications system used by the company uses circuit switching for the transmission of data between head office and the copywriters.

(b) When texts are transferred large amounts of data are transmitted.
(i) The characters are sent as ASCII characters.

Explain what is meant by an ASCII character. [2]

May/June 2007

A garage sells cars and also has servicing and parts departments.
Details of customers who purchase cars are stored in a file.
Details of cars for sale are stored in another file.

8 The data in the car file is stored in fixed length records.
(a) Explain the relationship between files, fields and records, using examples from the car file. [3]
(b) Explain what is meant by fixed length records. [2]
(c) The data held about each car includes:
- Colour,
- Size of engine,
- Whether or not it has air conditioning,
- Price.

State a suitable data type for each of the items of data listed. [4]

12 The parts department keep details of parts on a random access file which is accessed by means of a hashing algorithm.

(a) Explain the difference between an indexed sequential file and a random access file. [2]
(b) Each part, stored by the parts department, has a 6 digit key:
- The first two digits refer to the model of the car for which it is designed.
- The third digit is used to indicate the year of manufacture.
- The last three digits are used to ensure the key for this part is unique.

(i) Devise a hashing algorithm which would be suitable for storing 10,000 parts. [2]
(ii) State two key values which hash to the same address. [1]
(iii) Describe a method of handling collisions when using a hashing algorithm. [2]

October/November 2007

9 (a) Describe what is meant by taking
(i) a backup of data, [2]
(ii) an archive of data. [2]

(b) The data collected by the survey teams and the results of the processing are both backed up and archived.
(i) Explain why it would be important to take a back up of the results of a survey. [2]
(ii) Explain why it would be important to archive the results of a survey. [2]

May/June 2008

5 (a) Draw a diagram of a linked list to show the codes for the following examination papers when they are stored in numerical order.
9691.01 1276.02 9754.01 9691.03 [4]

(b) (i) Explain what is meant by LIFO and FIFO data structures. [2]
(ii) Give one advantage and one disadvantage of using a linked list structure to store a queue rather than using an array structure. [2]
(iii) Explain why a linked list is a more sensible structure than an array for storing a stack. [3]