COMPUTING

9754/02

Paper 2

Sep 2009

2½ hours

Additional Materials: Answer Paper

READ THESE INSTRUCTIONS FIRST

Write your Centre number, index number and name on all the work you hand in.
Write in dark blue or black pen on both sides of the paper.
You may use a soft pencil for any diagrams, graphs, tables or rough working.
Do not use staples, paper clips, highlighters, glue or correction fluid.

Answer **all** questions.

At the end of the examination, fasten all your work securely together.
The number of marks is given in brackets [ ] at the end of each question or part question.

Answer **all** questions.

A large national electrical appliances company maintains an extensive inventory of appliances for sale in a country. The company has twelve specialised retail stores targeting the needs of different market segments. Six of these stores are housed in a large mall in the capital, but the other six are in different cities in the country.

1 The six stores in the capital are linked using a LAN, while the other six are linked via a WAN.

(a) Explain the difference between a LAN and a WAN. [2]

(b) Describe the difference between using a bus topology and a star topology on the LAN giving an advantage and a disadvantage of each. [6]

(c) Wireless technology has become more popular in recent years. Describe two reasons why the company will not replace their LAN network with a wireless one. [4]

2 A computerised version of the company's catalogue is to be produced. This will be available to registered customers over an intranet.

(a) Explain the advantage of making the catalogue available on an intranet rather than the internet. [6]

(b) It will be necessary for the catalogue to allow different methods of searching for specific information. Describe two ways by which users of the system might be able to search the catalogue for information on a specific appliance, giving one advantage and one disadvantage of each method. [6]

3 Entry to the store is through a set of computer controlled doors. The environment inside the store is air conditioned and the humidity is controlled, making it necessary to have the doors shut as much as possible.

(a) Describe the hardware necessary to allow the computers to collect information to allow the safe operation of the doors. Your answer should refer both to times when the store is open and closed to the public. [4]

(b) Using pseudocode, or otherwise, devise an algorithm to control the automatic doors. [10]

The company has decided to offer an in-house credit system by issuing privileged customers with an in-house credit-card which allows customers to charge their purchases from the stores to the card, up to the customers' credit limits.

4 Each credit card has a six-digit account number, for example:

23765**X**

where **X** is a modulus-11 check-digit for the account number.

(a) What is a check-digit and what is the purpose of including a check-digit at the end of each credit card number? [2]

(b) Devise an appropriate algorithm which will check whether the credit card number is valid. [6]

(c) Using your algorithm, calculate the value of X. [1]

(d) During a sales promotion, the store offers a discount of 15% if a customer's total purchase is greater or equal to $200 but less than $500. A discount of 20% is given if the customer's total purchase is greater or equal to $500. For customers who had exceeded their credit limits, the supervisor's approval is required. Create a decision table or tree to represent the above conditions and actions. [5]

The company has to update their customer's credit transactions file to the customer's master file at the end of every month to generate the credit bills. An outline description of a 2-way merge operation is shown below where all the records in 2 input files (infile1, infile2) are merged to form a single output file (outfile).

```
Algorithm Merge (infile1, infile2, outfile)
Read the 1st record of each input file.
While at least one file is not exhausted do
Select the record with the lowest key.
Append this record to outfile.
Read the next record from the corresponding input file.
```

5 (a) What preconditions, if any, are required before the above merge routine can be successfully carried out? [4]

(b) At what point does a serious execution error occur? [3]

(c) Explain how you can correct the above problem. [3]

(d) Modify the algorithm Merge to reflect the corrections made. Ensure that the output file is maintained in the same format as the input files. [6]

When a customer order goods over the phone, the cashier will record the order in an order form containing the items ordered and quantity, customer address, delivery date and time and the amount payable. A copy of this form will be given to the store man who will pick the goods and generate a delivery order (DO). The DO will be given to the delivery man who will deliver the goods. The customer on collecting the goods will sign on the DO and return a signed copy to the delivery man. On his return, the delivery man will give the DO to the accounts department who will generate an invoice. Invoices are kept in a file until the next day where they will be mailed to the customers.

6 (a) Draw a data flow diagram of the above processes. [8]

(b) Goods in the warehouse are divided into 2 main categories – Kitchen appliances (e.g. kettle, toasters and ovens) and Entertainment products (e.g. LCD television, mp3 players and gaming consoles).

(i) Draw a class diagram of the above showing inheritance, their private attributes and public methods. [6]
(ii) What is the purpose of a public method? [1]
(iii) What is the difference between a class and an object? [2]

(c) In relation to the diagram in part (b), explain the terms:

Encapsulation; [2]
Inheritance; [2]
Data hiding; [2]
Polymorphism. [2]

7 The records of customers held in the transaction file need to be sorted into numerical order of key field (a four digit customer number) before the transaction file is used.

(a) Explain how a quicksort can be used to sort the customer numbers into order, smallest first, using the following numbers as an example.

5342 2111 1345 9022 7333

[5]

(b) Two methods were considered to sort the transaction file, a bubble sort or a quicksort. With reference to the nature of the file to be sorted explain how a decision can sensibly be made. [2]

~ End of Paper 2 ~