

9348/2

A SEPT

COMPUTING

Paper 2

Thursday

24 September 1992

3 hours

ANDERSON JUNIOR COLLEGE
PRELIMINARY EXAMINATIONS

Instructions to candidates:

Answer all questions.

The intended marks for questions or parts of questions are given in brackets [].

This Question Paper consists of 5 printed pages.

[Turn Over

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1. (a) Explain what a protocol is and why it is needed in a computer network. [3]
- (b) Electronic mail messages are usually passed between remote computers over a packet-switched data network. Explain how such a system works and why it is used. [5]
- (c) The owner of a microcomputer system plans to become a subscriber to Teleview. What additional hardware and software might be needed? [3]

2. Recursion is one of the most powerful features of high-level programming languages.

- (a) Explain what recursion is, and how it differs from repetition. [3]
- (b) Give an example of a situation where recursion might be used, and explain why it is appropriate. [3]
- (c) When recursion is used, it places certain demands on the run-time support routines. Describe the nature of these demands. [3]

3. A microprocessor-controlled security system is to be designed for homes. The homeowner has to key in a code consisting of four digits, all different from each other, for example 2056. The same four-digit code has to be keyed in to disarm the system. Because mistakes can easily be made, the system should be capable of ignoring digits which are wrong, until the correct four digits are keyed in consecutively. For example, the sequence 200272056 should disarm the system immediately the 6 has been keyed in. To prevent an intruder from trying all possible combinations, the system will accept only 10 digits; if an eleventh is keyed it will set off an alarm.

- (a) Design an algorithm to carry out this task. [6]
- (b) Suppose the code is allowed to contain the same digit more than once. Difficulties can arise, for example, recognising the code 9192 in the sequence 5919192. Outline any changes to your algorithm which would be needed to cope with this. [4]

[Turn over

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4. The scheduler program for a particular multiprogramming operating system maintains a list of jobs currently in the system. The list shows, among other things, whether each job is ready to run.

The following is part of the algorithm for the scheduler program.

```
move the entry for current job from the front of the
list to the end
```

```
LOOP WHILE job at the front of the list is not ready
to run
    move entry for the job at the front of
    the list to the end of the list
```

```
LOOPEND
```

```
IF job at the front of the list is not the current
job
    copy the current job to backing store
    load the job at the front of the list into main
    store
IFEND
```

- (a) Under what circumstances would the scheduler program be executed? [4]
- (b) Suggest and justify an appropriate data structure for storing the list of programs waiting to run. [2]
- (c) explain what would happen in each of the following circumstances when the scheduler program is executed
 - (i) There is only one program in the list which is ready to run.
 - (ii) There is no program (currently) in the list which is ready to run. [4]
- (d) What method of scheduling is being used by the algorithm? Give an example of an operating system where such an algorithm might be appropriate. Describe briefly an alternative method of scheduling jobs being run together, and suggest when the alternative method might be more appropriate. [7]
- (e) What are the benefits to a programmer of describing an algorithm in pseudocode before coding it in a programming language? [3]

[Turn over

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5. (a) Describe the reports that are produced by Gallup, indicating the form of the information which they give. [6]
- (b) What are the major problems with the old diary system of data collection for the compilation of the UK music charts? [2]
- (c) How does the use of the Dataport machine overcome these problems? [2]

6. A video film hire shop is organised as a club and has about 600 members. The shop keeps a stock of about 2000 video cassettes. Two different formats of cassettes are used and films may be available in one or both of these standard formats. There may be multiple copies of popular titles.

Any video cassette may be hired by a member at a single fixed charge per day. Payment is made when the cassette is hired. About 70 new cassettes are added to the stock each month as and when they arrive by post.

The shop owner wishes to design a computer system to act as a point of sale unit and which will perform the following functions:

- (i) Hold up-to-date details of members and cassettes.
 - (ii) Allow interrogation to determine the whereabouts and dates of return of cassettes holding particular films.
 - (iii) Ensure that only those who have been members for at least 6 months are allowed to have more than 5 cassettes on hire at any time.
 - (iv) Produce an itemised bill for each customer.
- (a) Discuss the files which would be required for this system. For each file, indicate how it is organised and accessed and give details of the fields which it may contain. [6]
- (b) Carefully explain how the files mentioned in (a) above would be used to provide the four listed facilities. [7]
- (c) How would your answers to (a) and (b) have to change if
- (i) different fees were to be charged for different cassettes
 - (ii) the computer had to produce a list at the start of each month of cassettes which were not hired during the previous month? [5]

[Turn over

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7. (a) A much simplified form of the BASIC Language:
IF.....THEN statement is specified by the following
syntax rules, written in BNF notation:

Rule 1: <conditional statement>

::= <line no.> IF <condition> THEN <line no.>

Rule 2: <condition> ::= <variable> <relation> <constant>

Rule 3: <relation> ::= <= 1 < 1 >= 1 > 1 =

Use these rules to analyse the following statements and
specify valid or invalid.

- i) 100 IF K > 5 THEN 150
- ii) 200 IF A > B THEN 250
- iii) 300 IF T = C THEN 350
- iv) 400 IF P >10 THEN 500 ELSE 210 [8]

(b) Modify the rules so that all statements in above
become valid. [2]

8. What is meant by an indexed sequential file and how it
can be accessed? [6]

An insurance company has records for each of its 700,000
clients. Each record contains 300 characters including a 20-
character sort key. If the disk block size is 2,400
characters, how could an index for the file be organised? [2]

Write down the steps that would have to be performed to find
a record with a given key from such a file? [4]

End of Paper

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