VICTORIA JUNIOR COLLEGE

JC2 PRELIMINARY EXAMINATION 2009

COMPUTING H2 **9754/01**

Paper 1

Monday **0800 – 1100**
14/09/09 **3 hours**

READ THESE INSTRUCTIONS FIRST

Write your name and class on all the work you hand in.
Write in dark blue or black pen.
You many use a soft pencil for any diagrams, graphs or rough working.
Do not use staples, paper clips, highlighters, glue or correction fluid.

Answer **all** questions.

Begin each question on a new **sheet**. At the end of the examination, you will be informed to hand in some questions separately.
The number of marks is given in brackets [ ] at the end of each question or part question.

You are reminded of the need for good English and clear presentation in your answers.

This paper consists of 5 printed pages.

[Turn over

1 During system analysis, it is necessary to identify those parts of a proposed system which are intended to be computer-based. There will generally be many areas of the proposed system which could be computer-based, but some of these will be implemented by manual procedures.

Choose an industrial or business activity (for example, car manufacture or hospital administration) and

(a) Explain why you might choose not to use computers in some parts of the activity, even though it would be possible to do so. [4]

(b) Discuss the criteria which you would use in deciding which parts of a proposed system should be computer-based. [4]

2 A grocery shop uses a random file to hold, on a computer system, details of about 600 products which are available in the shop. Each item of stock is allocated an arbitrary unique number in the range 1000-9999 which acts as the key field of record in the file. Each record occupies one disc block.

(a) It has been suggested that a suitable way of organizing the file is to subtract 999 from the key field and to store the record in the block with that number.

(i) Explain why this may not be a good way of organizing the file.

(ii) Suggest a more suitable hashing function which could be used, and explain why it has been chosen. [5]

(b) During creation of a random file, a record may hash to a block which already contains a record. Suggest how this record may be added to the file. [3]

(c) The file is backed up and archived. Explain what is meant by
(i) Archiving a file, [2]
(ii) Backing up a file. [2]
(iii) Describe a suitable back-up procedure for the stock file. [2]

3 During a sharing session, an instructor of Victoria Computer Club dismantles a computer system to show its hardware configurations. He describes briefly to the members some of the major components such as Centre Processor Unit (CPU), Control Unit and Arithmetic and Logical Unit (ALU), Buses, Memory Unit and Registers in a computer.

(a) Describe the purpose of the Control Unit and Arithmetic & Logical Unit. [2]

(b) Describe the purpose of the following registers:

(i) Instruction Register
(ii) Program Counter
(iii) Accumulator
(iv) Memory Data Register (MDR) and
(v) Memory Address Register (MAR) [5]

(c) Explain the differences between RAM and ROM. [2]

(d) Explain what is meant by an interrupt. [2]

(e) Describe the steps perform by the CPU when an interrupt occurs. [5]

(f) Describe an appropriate application for each of the following methods of data capture. In each case, explain why the application is appropriate.

(i) Barcode
(ii) Touch screen
(iii) Optical Character Recognition (OCR) [6]

4 (a) The integers held in the array X on one occasion are

8,12,17,18,24,27,28,31,38,39,49

If the list is searched by means of a binary search, state which elements would be accessed, and in what order,

(i) When searching for the number 31 (which is present), and
(ii) When searching for 29 (which is not present)? [2]

(b) If the list contained 200 integers instead of eleven, then state the elements of array X that are examined when searching for an integer which is in the 87th element. [4]

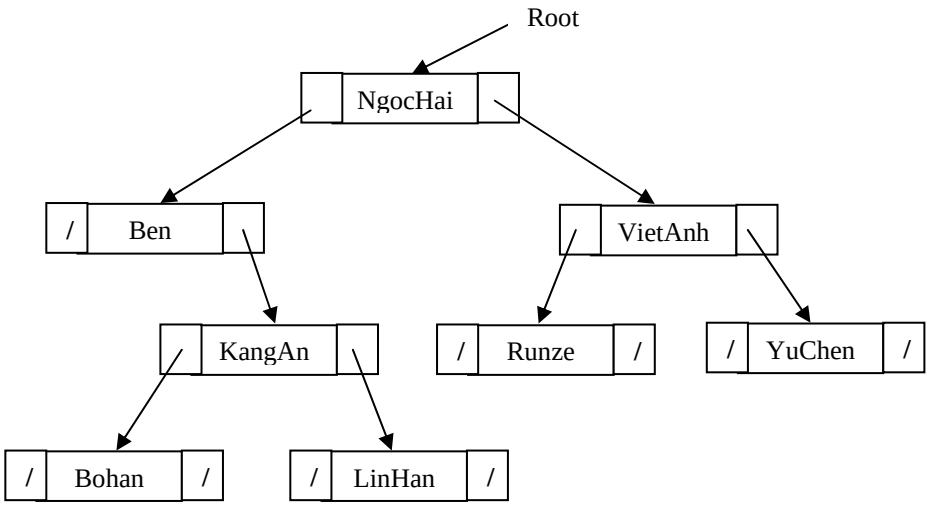
(c) Using pseudocode, write an algorithm which performs a binary search on an array containing a set of integers arranged in ascending order. [8]

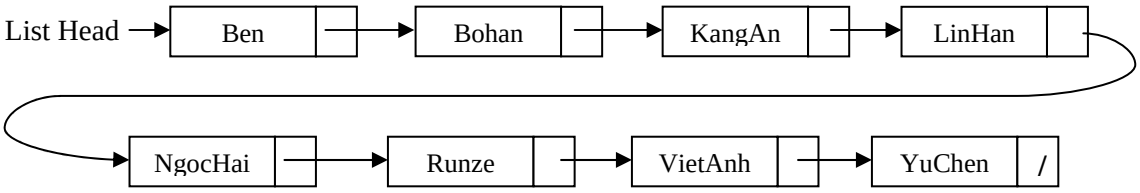
5 (a) Using a diagram show how the algebraic expression A * B + (C – D) / E can be represented by a binary tree. [4]

(b) Show, on your diagram, how your tree can be used to find the reverse Polish form of the above algebraic expression. Write down the reverse polish form. [3]

(c) Using diagrams to help the explanation, or otherwise, show how a computer can use a stack to evaluate the expression from its reverse Polish form. [5]

(d) The diagram shows a binary search tree. There are no duplicate names. A copy of all the names in the tree is required, as a linked list in alphabetical order.





Explain the stages necessary to create the linked list of names in a tree. The answer should be an explanation rather than a detailed algorithm. [9]

6 A building company commissions a software house to produce a system which will control the ordering and delivery of goods to a building site. The system will also produce work rosters for the employees and store the personnel files.

(a) It is decided to produce the software using the technique of top-down design.

(i) Explain why you would expect this technique to lead to fewer errors in the finished software. [3]

(ii) State what modules would need to be created for this system. [4]

(iii) Explain the need for local and global variables and give an example of each in this application. [4]

(b) The goods delivered are identified by inputting a barcode on the delivery note. This barcode must be validated before being entered into the system.

(i) Explain what is meant by validating data. [2]

(ii) Describe two methods of validating the data input from a barcode. [4]

(c) The personnel files will contain a lot of confidential information. Data protection legislation can protect workers against this information being misused.

Explain three measures that could be included in such legislation. [6]

7 A laser disk rental shop is going to write an application, using an object-oriented programming language, to store details of a large collection of different types of DVDs, including music DVDs and movie DVDs.

(a) Explain, using an appropriate example relevant to the above application,

(i) The difference between an object and a class in OOP; [4]

(ii) What is meant by Encapsulation; [2]

(iii) What is meant by inheritance; [3]

(iv) What is meant by polymorphism. [3]

(b) An Abstract Data Type, such as TaskList, is used to store tasks in a to-do list application.

(i) Suggest three operations for such a TaskList ADT. [3]
(ii) Choose a suitable data representation for the TaskList ADT. [3]