YISHUN JUNIOR COLLEGE
2008 JC2 PRELIMINARY EXAMINATION

H2 COMPUTING **9754**

PAPER 1 **18 - 08 - 2008**

Monday 0800 - 1100

TOTAL MARKS

120

TIME 3 hours

INSTRUCTIONS TO CANDIDATES

Answer **all** the questions.

Begin each question on a fresh sheet of paper.

INFORMATION FOR CANDIDATES

The number of marks is given in brackets [ ] at the end of each question or part question.

The use of an electronic calculator is expected, where appropriate.

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

1a) Describe an application for each of the following input/output devices.

i) microfiche reader

ii) scanner

In each case, explain why the use of the device is appropriate. [4]

b) A mainframe computer with magnetic disk and tape backing storage, one printer and a number of interactive terminals, runs a multi-access operating system. A stand-alone microcomputer for one user has a thumb-drive and a printer. Suggest some tasks that the mainframe computer can do better than the microcomputer.
Give reasons for your answers. [4]

c) When a computer is switched on, “bootstrapping” is performed. What is bootstrapping? [2]

2a) Explain the role each of these components of the Central Processing Unit in the operation of the processor,

i) Program Counter

ii) Accumulator

iii) Control Bus

iv) Address Bus

v) Instruction Register [5]

b) Explain the Fetch-Execute cycle in the operation of the processor. Indicate the differences between these two cycles. Give an example of their difference. [3]

3a) With the help of diagrams, describe a fully indexed file. [4]

b) Explain how a record may be added to a fully indexed file. [2]

4) A typical business organisation would normally include systems such as payroll, accounts, inventory, sales and marketing, etc.

a) Instead of using a conventional filing system, explain why, a database approach would be preferable. Outline the advantages of using a database management system in such an environment. [5]

b) Does the use of a database management system lead to any problems which you would not expect to occur with individual files? [2]

5a) What is artificial intelligence? [1]

b) Describe an expert system used for the diagnosis of a medical problem. [4]

c) State the benefits of using the expert system by a general practitioner. Are there any possible drawbacks? [3]

6a) What is a 'transcription error' in data processing? [1]

b) Detail a method to minimise 'transcription error'. [5]

c) An analyst is considering using *Control Totals* and *Hash Totals* to detect and prevent corrupted or missing data in a batch payroll processing environment.

i) What is the fundamental difference between a Hash Total and a Control Total? [1]

ii) Explain the process of applying such checks to the batch processing of the payrolls. [3]

iii) Suggest a possible field suitable for Control Total and a field for Hash Total. [2]

7) In order to operate a new mouse attached to a computer system a device driver is required.

a) What is the purpose of a device driver? [2]

b) Why is it not always provided as part of the operating system? [2]

c) What type of programming language is normally used to write device drivers? [1]

d) Give two reasons for your choice of language type. [2]

8 a) Describe briefly the following two functions provided by an operating system.

i) File Management. [3]

ii) Input/Output Management. (the description should include DMA, buffers and interrupts) [3]

b) An operating system supports multiprogramming and the system is used to run both batch and interactive work.

i) Distinguish between interactive and batch processing. [2]

ii) How does the scheduler make it possible for the two types of jobs to be run in the system concurrently? [4]

9a) Backus Naur Form (BNF) is used by compiler writers to express the syntax of a programming language. The syntax for a part of one such language is written in BNF as follows:

<expression> ::= <integer> | <integer> <operator> <expression>

<integer> ::= 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9

<operator> ::= + | - | * | /

Do the following expressions conform to this grammar? Support your answer.

i) 4 * 9

ii) 8 + 6 / 2

ii) - 6 * 2

iv) (4 + 5) * 5 [4]

b) i) Using a stack express the following infix expression ((k + j) * (a – g)) / (e + b) in reverse polish form. [4]

ii) Give two advantages of reverse polish notation. [2]

iii) Draw the tree for the above expression. [2]

iv) Provide the algorithm for preorder traversal. [3]

v) Give the output for the preorder traversal of the above expression. [2]

10a) Develop a RECURSIVE procedure **X** which prints the digits of an integer *num*, in the reverse order. Thus given the integer 2345, it should print: 5432 . [5]

b) Why is an interpreted program less efficient than a compiled program in

i) executing loops,

ii) detecting syntax errors? [4]

11. a) Explain the differences between a class and an object. [2]

b) Give three advantages of object-oriented programming. [3]

c) What are Abstract Base Classes in C++ programming? [3]

d) An important feature of object oriented programming is inheritance.

i) Explain what is meant by inheritance. [2]

ii) List and explain two advantages of using inheritance. [4]

12 A heap is a complete binary tree such that the value stored at each node is less than or equal to the values stored at its children.
The priority values given to a series of jobs waiting to use the printer are as follows:

5, 6, 3 , 7, 4

a) Draw the heap for the given values. [4]

b) Show the array representation of these values. [2]

c) Using the heap and array, explain how the print jobs can be selected in order of priority. [4]

THE END