INNOVA JUNIOR COLLEGE
JC2 PRELIMINARY EXAMINATION 2
in preparation for General Certificate of Education Advanced Level
Higher 2

COMPUTING

9754/02

20 Sep 2011

2½ hours

Additional Materials: Writing Paper

READ THESE INSTRUCTIONS FIRST

Write your name and class 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 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 car manufacturing company has its head quarter in Singapore and branches in few cities in other countries.

1 The head office has ten departments and is housed in a large building in central area of Singapore. Each department has a network of computers. It is important that departments within its head office must be able to communicate and the head office must also be able to communicate electronically with branches in other cities.

a) With reference to this example, explain the use of the following:

i) switch; [2]

ii) router; [2]

iii) bridge. [2]

b) The ten departments in the head office are linked using a LAN and the others in different cities are linked via a WAN.

i) Explain the differences between a LAN and a WAN. [2]

ii) Draw diagrams, including servers and clients, to show the three basic network topologies. [6]

c) What is an intranet? Give two ways in which the company might use one. [3]

2 Peter Wong is the chief security officer of the company. He is responsible for all aspects of computer security and computer-related ethical and legal issues.

a) One particular concern is the possible theft of valuable data held in the company's computer system. Describe **three** methods by which the risk of theft can be reduced. [3]

b) Another concern is the accidental loss of data. Describe one method by which the risk of accidental loss can be reduced. [1]

c) Peter has to be careful that the company complies with all the computer related legislation, such as the Data Protection Act. Describe three ways in which the Data Protection Act will apply to the company. [3]

d) There are concerns in the company about computer-related health and safety issues. Describe the likely nature of the concerns and how the problem might be eased. [2]

e) There are also concerns in the company about the possibility of staff being made redundant as the company is quite aggressive in its computerisation. Describe the likely nature of the concerns and how the problem might be eased. [4]

3 The company has a factory in China which manufactures different parts of a vehicle for its own consumption.

a) A part will be deemed fit for use if it passes the following three tests.
- All dimensions are correct;
- Strength tests are passed;
- Paint tests are passed.

If the first test is passed but exactly one of the other two fails, the part is sent for repair. Otherwise the part is rejected.

i) Create a decision table showing all the possible outcomes and results. [4]

ii) Simplify your decision table by removing redundancies. [4]

b) An automatic air-conditioner unit is designed so that it turns on only when a person is in the factory AND the temperature is above a set value (D).

The air-conditioner receives information from two sensors.
1. A motion sensor which returns a value (M) dependent upon a person being sensed in the room.
2. A thermistor (electronic thermometer) which returns the temperature in the room (T).

Describe an algorithm to control the air-conditioner. [6]

c) A robotic vehicle is designed to keep the floor of the factory clean. It is equipped with a ‘map’ of where things are on the floor of the factory, and an algorithm that instructs it where to go next.

i) State two problems that may arise which are not covered by the ‘map’ of the factory floor. [2]

ii) Describe the input and output hardware necessary for the vehicle to be able to move safely. [4]

4 The plant has about 1000 workers and their personnel records are stored in a sequential file. The workers' times of arrival and departure are noted by placing a card in a machine (clocking in) and repeating the process when leaving (clocking off). This machine is not connected to the main computer system, although the information collected will eventually be used as the input to a device which will provide data for the payroll program.

a) The data on the cards consists of a bar code and OCR data. Describe how these two types of data are read by the input device and state what they are used for in this application. [6]

b) At the end of each week the pay for each worker is calculated by the payroll program and the pay slips are produced.

i) Explain what is meant by a sequential file and state two reasons why a sequential file is a sensible choice of file type in this case. [3]

ii) Explain why this is an example of batch processing and give reasons why batch processing is sensible. [4]

c) The files of data stored on the system are both backed up and archived.

i) Explain the difference between backing up a file and archiving a file. [4]

ii) Describe a sensible back-up routine for the worker file. [3]

5 The details of a car parts are stored in a binary tree.

a) Draw the alphabetically ordered binary tree after the following items have been added.

Radio, Visor, Brakes, Tyres, Alternator, Windscreen. [3]

b) Describe an algorithm for the insertion of an item into an alphabetically ordered binary tree. [5]

c) Describe an algorithm that will read your binary tree, producing a list of the parts in alphabetical order. [3]

d) Show how the above binary tree would be implemented using three one-dimensional arrays. [5]

6 The company also owns a travel agency. The travel agency has set up a computerized system to provide an extra service to its customers whereby they can request more detailed information about holidays than is generally available in brochures.

- A customer discusses his/her request for details with a member of staff in the travel agency who is then able to make an enquiry from the system.
- This request is then sent to the holiday information file for matching.
- This brings about the release of holiday information (if available) to the staff member, who then forms it into a customer report, to be given to the customer.
- If the customer is satisfied and wish to make the booking on the spot, the staff will then capture the necessary information in the booking file.
- The travel agency is also interested in how many enquiries/bookings are made about each holiday and so wishes the information held to be updated each time an enquiry or booking is made.

a) Draw a data flow diagram to illustrate this situation. [5]

b) The current system involves the customer talking to a member of staff in the travel agency, who then makes the enquiry on behalf of the customer as described above.
An alternative approach being considered by the travel agency is to install a number of computer terminals so that customers can make enquiries directly.

i) Describe **both** the hardware and software features required in a suitable interface for this application. [5]

ii) Give an advantage and a disadvantage to the customer of this arrangement. [2]

iii) Once in use, how might the success of the design of this system be evaluated? [2]