

VICTORIA JUNIOR COLLEGE

JC2 PRELIMINARY EXAMINATION 2009

COMPUTING H2

9754/02

Paper 2

Thursday

24/09/09

1400 – 1630

2½ 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 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.

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

RENT-A-CAR is a company whose main function of the business is to hire cars to customers. The business has a range of different types of cars which can be hired for periods from one day to four weeks. The Head Office of the business is in the centre of a town where customers can call in or ring to arrange the hire of a car. The Managing Director is based at this office, as is the main administration office. The cars are kept at a yard which is situated in a purpose-built industrial area on the outskirts of the town. As the sole agent of vehicles made in China, the company also has sale departments in China and countries of South East Asia.

The company uses stand-alone computers all built to the same specification. Each office desk holds a computer and there are ten computers spread through the Head Office.

- 1 The company is seeking to improve its working practices and connectivity, both in the company and with the outside world. The solution chosen involves the use of both a LAN and a WAN.

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

(b) Describe two advantages to the company of networking the computers. [4]

Two of the options available are a star or a bus network topology on the LAN.

(c) Explain why a bus network topology is recommended by comparing the advantages and disadvantages of a star topology and a bus topology. [5]

(d) Use a simple diagram to show a bus topology. Label three key features on the diagram. [3]

(e) The network designer can possibly make use of the following network hardware:

(i) Switch;

(ii) Bridge;

(iii) Router.

Explain the purpose of each of these items of hardware. Give one situation where each could be used. [6]

- 2 When customers call in or ring to arrange the hire of a car, details of booking are input at the terminal. All details of booking, whether via Internet or input through terminals is matched against a stock file of the cars being kept in the yard to check for availability of car.
- (a) With reference to these examples, explain the need for and describe the main characteristics of a
- (i) multi-user operating system [3]
 - (ii) distributed operating system. [3]
- (b) Explain the need for
- (i) virus checking,
 - (ii) data compression,
- in this application. [4]
- (c) Each record in the stock file has fields for a unique Identification Number, description and quantity for each car in stock.
- (i) Explain why a random organization would be appropriate for the stock file used in this application. [3]
 - (ii) Describe an algorithm that will update a record in the stock. [5]
- (d) The description is stored in a fixed length field using ASCII characters.
- (i) Explain what is meant by the term fixed length field. [2]
 - (ii) Describe how characters are stored in ASCII format. [2]
- (e) The Identification Number is always two uppercase letters followed by two digits. The description can consist of uppercase and lower case letters and spaces. The quantity in stock can consist of up to three digits. Write down the definition for this record in Backus-Naur form. [4]
- (f) It is decided to include the cost in this record. The cost will consist of one or more digits, followed by a decimal point, followed by two digits. Examples are
- 0.27, 23.40 and 150.00.
- Write down the definition for this cost in Backus-Naur form. [3]

3 The company plans to create a computer system to store data on:

- Customers
- Cars
- Car insurance

Each customer can hire more than one car.

Every car needs car insurance.

The detail about a customer hiring a car is called a rental contract.

A solution is to create a database with four tables, customer, rental-contract, car, insurance.

- (a) For each table specify the attributes required and state the primary key for each table. [8]
- (b) Draw an E-R diagram to show the relationships between the four tables. [4]
- (c) The managing director narrates the rules that the company applies to its customers renting a car as follows:

“If a customer reserves a subcompact and finds on arriving that we don’t have one, that customer gets a free upgrade to the next-sized car. Customers also get a free upgrade from their reserved car size if their company has an account with us. There’s a discount for membership in any of the frequent flyer clubs run by cooperating airlines, too. “

Develop an optimized decision table showing the possible outcomes and results. [8]

4 The company decides to have a showroom in Singapore to display some of the cars that it offers for hire. As the showroom does not have room to display all the different models , a number of enquiry terminals are available for customers to study details and pictures of the cars and to access current information about price, availability and number available.

Customers use a menu based interface when they use a terminal. The technician employed by the store to maintain the system uses a command line interface.

Describe each of these types of interface and explain why each is appropriate to the particular user. [6]

- 5 Details about the car types are stored in a linked list using Abstract Data Type (ADT).

The linked list ADT has the following operations defined:

create(L) – creates an empty linked list L;

insert(L, item, P) - insert new value, item, into linked list L so that it is at position P in the linked list;

delete(L, P) – delete the item at position P in the linked list L;

read(L, P) – returns the item at position P in the linked list L;

isEmpty(L) – returns true if linked list L is empty.

A list, newList, is created and the following operations are carried out:

insert(Newlist, Saloon,1);

insert(Newlist, MPV,1);

insert(Newlist, Wagon,2);

delete(Newlist,2)

- (a) Draw a diagram to show the state of the linked list after the above operations have been carried out. [4]
- (b) Write the instructions that would search a car type in NewList. [2]
- (c) Write an algorithm that could be used to implement the ‘delete’ operation. [5]
- (d) Show how to implement the following operations for a queue ADT, called QueueList, using the list ADT operations:
- (i) add item to queue
 - (ii) delete item from queue [6]
- 6 The company has also decided to run a site on the Internet allowing booking of car by the customers. Customers can select car from a catalogue and complete the transaction from their remote locations. Payment is then made by the customer forwarding their credit card details.
- (a) Describe problems that could arise for both the customer and the company using this method of payment. [2]
- (b) Describe methods that could be used to overcome the problems. [6]

~ End ~