**NANYANG JUNIOR COLLEGE**

**JC2 PRELIMINARY EXAMINATION**

Higher 2

**COMPUTING** **9597/02**

Paper 2 **16** **September 2019**

**3 Hours**

Additional Materials: Answer Paper

**READ THESE INSTRUCTIONS FIRST**

Write in dark blue or black pen on both sides of the paper.

You may use an HB pencil for any diagrams, graphs, tables or rough working.

Do not use staples, paper clips, glue or correction fluid.

Answer **all** questions.

At the end of the examination, fasten your work securely together.

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

This document consists of **4** printed pages.

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| **1** | | **(a)**  **(b)** | | Database management systems are aimed at solving a number of problems associated with traditional file-based systems. Describe three such problems and explain how they are solved by database management systems. [6]  A national car hire company uses a relational database. Cars are available for hire from a large number of depots around the country. Two entities (or records) are CARS-FOR-HIRE and DEPOTS.  **(i)** Suggest four attributes (or fields) associated with the entity CARS-FOR-HIRE. [4]  **(ii)** Draw a diagram showing the relationship between the entities CARS-FOR-HIRE and DEPOTS. [1]  **(iii)** State one other entity which is related to either or both of the original entities. Describe the relationship(s). Suggest an attribute for this entity. [4] |
| **2** | | A stack is to be implemented using an array of 20 elements. | | | | |
| **(a)**  **(b)**  **(c)**  **(d)** | | Describe an algorithm to remove an item from a stack and place it in a variable x. [4]  With the aid of examples, explain what nested functions or nested subroutines are. [3]  Explain with the aid of diagrams or otherwise, how a stack can be used by the operating system to process “nested functions” or “nested subroutines”. [5]  Outline the data attributes and member functions for a class stack abstract data type. You need not go into details as to how they will be implemented. [6] | | |

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| **3** A large national electrical appliances company maintains an extensive inventory of appliances for sale in a country. The company has twelve specialised retail stores targeting the needs of different market segments. Six of these stores are housed in a large mall in the capital, but the other six are in different cities in the country.  The six stores in the capital are linked using a LAN, while the other six are linked via a WAN. | | | | | |
|  | **(a)**  **( (b)**  **(c)**  **(d)** | Explain the difference between a LAN and a WAN. [2]  Wireless technology has become more popular in recent years. Describe two reasons why the company will not replace its LAN network with a wireless one. [4]  Discuss two security threats faced by the company’s LAN and measures that can be put in place to reduce these threats. [6]  The company is thinking of allowing all its sales personnel access to this inventory. It can store this data on an intranet or cloud storage. Discuss the relative merits and demerits of these two options. [6] | | | |
| **4** A company has decided to offer an in-house credit system by issuing privileged customers an in-house credit-card which allows customers to charge their purchases from the stores to the card, up to the customers’ credit limits.   1. During a sales promotion, the store offers a discount of 15% if a customer’s total purchase is greater or equal to $200 but less than $500. A discount of 20% is given if the customer’s total purchase is greater or equal to $500. For customers who had exceeded their credit limits, the supervisor’s approval is required. Create a decision table or tree to represent the above conditions and actions. [5]      1. In order to protect the privacy of data, many countries have passed legislation to address this issue. Describe any 3 features of the Personal Data Protection Act in Singapore that aims to do this. [6] | | | | |
| **5** When a customer orders goods over the phone, the cashier will record the order in an order form containing the items ordered and quantity, customer address, delivery date and time and the amount payable. A copy of this form will be given to the storeman who will pick the goods and generate a delivery order (DO). The DO will be given to the delivery man who will deliver the goods. The customer on collecting the goods will sign on the DO and return a signed copy to the delivery man. On his return, the delivery man will give the DO to the accounts department who will generate an invoice. Invoices are kept in a file until the next day where they will be mailed to the customers. | | | | |
|  | **(a)** | | Draw a data flow diagram of the above processes. [8] | |
|  | **(b)** | | Goods in the warehouse are divided into 2 main categories – Kitchen appliances (e.g. kettle, toasters and ovens) and Entertainment products (e.g. LCD television, mp3 players and gaming consoles). Each item has an item name, description, unit price and quantity on hand. Kitchen appliances have an item weight, packing volume and colour. Entertainment products have a serial number, country of manufacture and recommended retail price.  **(i)** Draw a class diagram of the above showing inheritance, their private attributes and public methods. [6]  **(ii)** What is the purpose of a public method? [1]  **(iii)** What is the difference between a class and an object? [2] | |
|  | **(c)** | | In relation to the diagram in part (b), explain the terms:   1. Encapsulation; [2] 2. Inheritance; [2] 3. Data hiding; [2] 4. Polymorphism. [2] | |
| **6** A linked list ADT with the following incomplete specification is given as follows:   |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | | |  | | --- | | LList | | head : Node | | constructor()  addNode(s : Node)  findmiddle(l : LList) -> INTEGER | | |  | | --- | | Node | | data : INTEGER  nextPtr : Node | | constructor()  setData(s : INTEGER)  setnextPtr(x : Node)  getData(): INTEGER | | | | | | | |
|  | **(a)** | | | Explain the main difference between an array and a linked list data structure. [2] | |
|  | **(b)**  **(c)**  **(d)** | | | Using pseudo code, write an algorithm to implement findmiddle that will return the data in the middle of the linked list in **one pass**. [7]  State two applications of a linked list. [2]  State two other common methods (including parameters) that should be included in the LList specification. [2] | |