

Candidate Name: _____

CT Group: _____

Index no. _____



**PIONEER JUNIOR COLLEGE
JC 2 PRELIMINARY EXAMINATION**

H2 COMPUTING

9597/02

Paper 2

Wednesday

25 SEPTEMBER 2013

3 hours

TIME 0800 - 1100

INSTRUCTIONS TO CANDIDATES

Do not open this booklet until you are told to do so.

Write your name, CT Group, and Index No. in the spaces provided on this cover page and on your answer scripts.

Write your answers on the writing paper provided and **NOT** on the question paper.

Answer **all** questions.

INFORMATION FOR CANDIDATES

This question paper consists of **6** printed pages (inclusive of this page).

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.

The Friendly Mail Order Company receives between 50 and 200 orders by telephone, and post from its customers each day. At present the orders are written, in the Sales Department, onto an internal 3-part order form. One copy is retained by Sales, one copy is sent to the warehouse where the orders are made up and despatched to the customers, and the third copy is sent to Accounts.

A copy of a despatch note is sent from the warehouse to both the customer and to the Accounts Department. The Accounts Department then invoice the customer.

There are about 2000 items in the Company's catalogue. The warehouse places orders with suppliers. The suppliers then send a delivery note with the goods to the warehouse; the delivery note is passed to Accounts after checking the goods delivered. A supplier invoice for these goods is sent by the suppliers to Accounts.

There is no computer system at present and the Sales Department do not know what is in stock or on order; neither do they know any delivery dates of items from suppliers.

The company wishes to replace this manual system with a computerised system.
The new system will replace orders by telephone by emails.

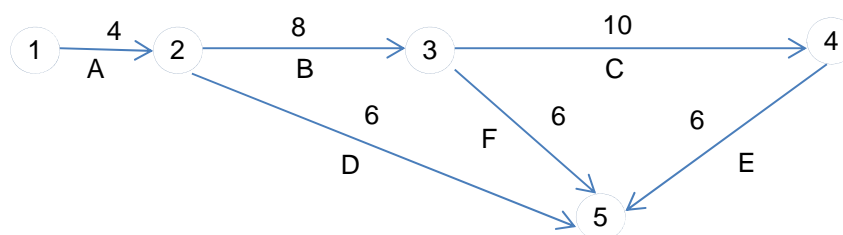
The new computer system, including hardware, software and files would be suitable for handling both customers' orders on arrival and stock control in the warehouse. It should also be capable of handling customer queries about the availability of items and delivery dates.

A system developer is employed to carry out the task. The first task assigned to the system developer is to write a project proposal.

1. One section of the project proposal is the Problem Statement which lists the problems in the current system. Write the Problem Statement. [6]

2. A system developer produces the following Program Evaluation and Review Technique (PERT) chart:

A – analysis of the solution
B – design of the solution
C – development of the solution
D – documentation of the solution
E – implementation of the solution
F – testing of the solution
Time is measured in weeks.



- (a) State the critical path. [1]
(b) State the minimum time in which the project could be completed. [1]

3. A decision is made that the PERT chart should show more details with regard to testing. It is proposed that stage F (testing) should be removed from the chart and two new stages added: [4]

G – black box testing – 4 weeks

H – white box testing – 2 week

Redraw the PERT chart to show the effect of these changes.

4. Draw GANTT chart for these tasks. [4]

5. (a) Use a diagram to show the data flows (DFD), processes, data stores and external links in the system. [6]

- (b) By using examples from your DFD explain how the diagram helps to specify **three** important components of the current system. [3]

6. The design for the new system includes the provision of a network of computers in the office with a central file server. Each office staff will have access to a computer to retrieve and update sold-item data held on the central file server. Some support staff are allowed to access the data but not change it. In addition the system has an Internet link which allows staff to access the system from outside the office. [6]

Describe **three** ways in which the security of this system can be implemented.

7. The sales representative enters information provided by new customers into the computer system using a graphical user interface. Some of the information required includes: [3]

- customer's salutation (e.g. Dr., Mr., Ms, Mrs, Mdm...)
- customer name and address
- customer gender (e.g. F or M)
- mobile number

For this application design a simple screen layout which makes use of appropriate graphical user interface controls.

8. Top-down design is a technique used to produce solutions to computer system. [3]
- (a) Explain the term top-down design. [3]
- (b) Explain **three** advantages of using top-down design to solve complex problems. [3]
- (c) Explain **three** techniques that can be used to ensure that program code is understandable and can be easily maintained. [3]

9. The following pseudo-code algorithm describes one method of finding an arbitrary customer name in an alphabetically ordered array of N unique names.

```
set first to 1
set last to N
repeat
    set mid to the integer part of (first + last) / 2
    if the mid name precedes the wanted name then set
        first to mid + 1
    else
        set last to mid - 1
    endif
until first > last or mid name is the wanted name
```

- (a) If 142 names are stored in the array, and HAMMOND is the 44th name, state the elements of the array that are examined when searching for HAMMOND. [4]
- (b) If a search is made for a name that is not in the array, what is the largest number of elements that might need to be examined before one could say that the name is not present? Explain how you arrive at your answer. [3]
10. A programmer is going to write the computer system, using an object-oriented programming language, which will store details of received orders by email and post. The orders received by post will have to pay postage charge while orders received by email will have a discount of 0.5%.
- Properties identifying the orders include:
- Order number
 - Number of items
 - Postage charge
 - Discount rate
 - Type of order (email or post)
- (a) Draw a diagram that shows how the properties could be distributed amongst a number of classes. Include in your diagram any inheritance between classes. Also indicate some of the methods that would be required. One method should demonstrate polymorphism. [6]
- (b) In the context of object-oriented programming explain what is meant by:
- (i) encapsulation; [2]
 - (ii) object; [2]
 - (iii) inheritance; [2]
 - (iv) polymorphism. [2]
- (c) Give **two** advantages of object-oriented programming. [2]

11. Describe how the system developer will test the new computer application in development phase. [6]
12. An email package received by the company consists of 128 bytes. The first 126 bytes contains both control data and also a part of the email message. Byte 127 in the packet is a checksum. Byte 128 is currently not used. Odd parity is used in each byte.
- (a) If the first seven bits of a byte are 0 0 1 1 0 1 0, state the value of the parity bit. [1]
 - (b) Describe how the checksum byte is produced by the sender computer. [3]
 - (c) It is decided to use the unused byte as a parity byte. Explain, using an example, how this byte could be used to detect and correct a single bit error in the packet. [3]
13. The system developer is recommending cloud computing for the company.
- (a) What is cloud computing? [2]
 - (b) Explain the **three** kinds of cloud with examples. [6]
14. Consider the following data, which shows some data that has to be stored in a college with regard to students, courses, modules, lecturers, etc.

| Student no | Student Name | Programme | Programme Duration (years) | Module No | Module name | Lecturer |
|------------|--------------|-----------|----------------------------|-------------------------|--|------------------------|
| 9125 | Alvin Chan | P303 | 2 | MC105 MC111 | Visual Arts Networking | Pong Smith |
| 7927 | Kenny Fish | P304 | 2 | MC111 MC120 | Networking Database | Smith Mann |
| 6872 | Ben Rogers | P501 | 3 | MC192 MC107 MC120 | Music Intro to Accounts Database | Sunny Bloom Mann |
| 2553 | Yong Foo | P706 | 4 | MC111 MC120 | Networking Database | Smith Mann |

In general, a student is enrolled onto a programme and may take several modules as part of this programme. A module is only delivered by one lecturer.

- (a) These data are in its un-normalised form. Explain the problems associated with it. [3]
- (b) Write the table (in standard notation) as **two** separate relations in first normal form. [2]
- (c) Normalise the data and write them in **four** tables. [8]
- (d) Draw an ER diagram that shows the relationships between these four tables. [3]

15. The complete set of characters that a computer uses is known as its character set.
- (a) Explain how characters are stored in a computer. [3]
 - (b) Describe ASCII and Unicode characters. [4]
 - (c) A number is stored as a one byte binary integer. How would the number 99 be represented as a one byte binary? [2]
 - (d) Convert the number 99 into hexadecimal. [2]
16. Records of employees for a company are stored in a linked list in alphabetical order of surname. [6]
- (a) Using a diagram, show the list for the employees **Yang, Lin, Sim, Hong** and a free list.
 - (b) Show and explain how an employee **Tan** would be added to the list.

END OF PAPER