

Candidate Name: _____

CT Group: _____

Index no. _____



**PIONEER JUNIOR COLLEGE
JC 2 PRELIMINARY EXAMINATION**

H2 COMPUTING

9597/2

Paper 2

Wednesday

19 SEP 2018

3 hours

TIME 1400 - 1700

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 **9** 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.

A Foreign Government Agency is looking for a Tourist Information Management System. The system should be able to cater for the following two requirements:

a) Capture and provision of information for migration control propose and other aspects of citizen identification

This is to facilitate the processing of Disembarkation/ Embarkation (D/E) cards collected from visitors at the checkpoints. It also captures visitors' arrival data e.g., the number of arrivals by countries of residence, their modes of arrival and demographics (e.g., age and gender).

b) Data Warehouse for analysis

The Data Warehouse has to receive data and code information on Disembarkation/Embarkation cards (D/E cards). Information gathered in this manner is to analyse visitor arrival trends and serve as input to the computation of key performance indicators (Tourism Receipts, Tourism-Sector Value, etc.)

The Agency wishes to replace this manual system with a computerised system.

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 [6] the current system. Write the Problem Statement.

2. The system developer has drawn up a list of activities and their likely duration.

Activity	Description	Weeks to complete
A	Write requirement specification	1
B	Produce program design	1
C	Write module code	7
D	Module testing	2
E	Integration testing	2
F	Alpha testing	2
G	Install software and carry out acceptance testing	2
H	Research and order hardware	1
J	Install delivered hardware	3
K	Write technical documentation	4
L	Write user training guide	2
M	Train users on installed hardware and software	1
N	Sign off final system	1

- [2]**

[illegible]

Copy and complete the GANTT chart by adding activities M and N.

- [1]

- [9]**

- Activity E showed that the code contained major errors. The senior programmer now estimates that:
- further module coding will require another 2 weeks
- further module testing will require another 2 weeks
- further integration testing will require another 2 weeks
- The hardware delivery is delayed by 16 weeks

A revised GANTT chart is now required

Copy and complete the chart in the grid below

Activity	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27
A																											
B																											
C																											
D																											
E																											
F																											
G																											
H																											
J																											
K																											
L																											
M																											
N																											
Week number	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27

(d) State the new estimated completion date in terms of week number. [1]

A team was formed for the designing of this project.

(e) Why the team work and the roles of team members working on a computer project are important? [2]

3. 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 visitors' 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.

Describe **three** ways in which the security of this system can be implemented. [3]

4. The office staff enters information provided by visitor into the computer system using a graphical user interface. Some of the information required includes:

- Passport number
- visitor's salutation (e.g. Dr., Mr., Ms, Mrs, Mdm...)
- visitor name and address
- visitor 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. [3]

5. Top-down design is a technique used to produce solutions to computer system.

(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]

6. The following pseudo-code algorithm describes one method of finding an arbitrary visitor 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 JOSEPH is the 44th name, state the elements of the array that are examined when searching for JOSEPH. **[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]**
7. Visitors can claim the GST (Goods and Services Tax) before they leave the country. A programmer is going to write part of the computer system using an object-oriented programming (OOP) language, which will store details of claims by visitor either pay by cash or hand phone transfer. The claim receive by hand phone transfer will have a rebate of 0.2%. while claim receive by cash will have to pay 0.5% of service charge and recording the currency exchange rate.

Properties identified the claims included:

- Passport number
- Receipt number

Type of claims (cash or hand phone transfer)

- (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 appropriate methods (including one pair of 'get' and 'set' methods for one of the properties) 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 and how classes support information hiding and implementation independence. [3]
 - (ii) Inheritance and how it promotes software reuse. [2]
 - (iii) Polymorphism and how it enables code generalisation. [2]
 - (iv) Computational thinking and why it is important? [5]
- (c) Give **two** advantages of object-oriented programming. [2]
8. The system developer recommending cloud computing for the Agency.
- (a) What are the **three** different layers of cloud computing? [3]
 - (b) Discuss the benefits and drawbacks of using the cloud for storing data rather than other methods. [4]

9. PJ Mall plans to create a database to store data on its shops. It rents out shops to tenants who run their business.

- Each *tenant* is to provide information on its *company name*, *director of company*, *company address*, *contact number*, and *retail type*.
- There is a *start* and *end date* for every rental.
- Each *shop* rented by the tenant consists of one or more unit spaces.
- Each unit space is located at a particular *level* and has a *unit number*.
- There are 3 categories of unit space. Each *category* has its own *size* and *rental rate*.

Category	Size (square feet)	Rental rate (\$ per square feet)
A	Less than 200	40
B	200 – 2000	30
C	More than 2000	20

Here are some tenants who run their business in PJ mall:

Company Name	Level	Unit Number	Retail Type
Bata	2	03 – 04	Footwear
Challenger	2	06 – 08	Technology
Coldwear	3	08	Fashion
Esprit	3	09 – 10	Fashion
Giant	1	01 – 12	Supermarket
Hi Tea	1	14	Food & Beverage
PappaRich	2	11 – 13	Food & Beverage
...

(a) A solution is to create a relational database which requires a number of tables to store data for this application.

(i) Draw the E-R diagram showing the tables and the relationships between them. [5]

(ii) A table description can be described as [6]

TableName (Attrbutel, Attribute2, Attribute3,)

The primary key is indicated by underlining one or more attributes.

Write table descriptions for the tables in part (i).

(b) Describe **two** advantages of using a relational database for storing data on its shops rather than a customised software. [4]

10. A dataset of fruit names is to be stored in a binary search tree.

The names of the fruits are inserted into the tree in the order shown:

Papaya, Mango, Durian, Strawberry, Orange, Rambutan, Watermelon

- (a) Draw the binary search tree. [3]

The binary tree is implemented using these identifiers.

Variable	Data Type	Description
RootPtr	INTEGER	Array subscript of the root of tree
Fruit	ARRAY [1..100] of STRING	Array of fruit names
LeftPtr	ARRAY [1..100] of INTEGER	Array of left pointer values
RightPtr	ARRAY [1..100] of INTEGER	Array of right pointer values

- (b) Draw a diagram to show the contents of the binary tree in array form and the root pointer variable for the fruits inserted in (a) above. [3]

- (c) The pseudocode shows an algorithm to search for a particular fruit in the binary tree. Additional variables SearchFruit, IsFound, and Current are used.

```
INPUT SearchFruit
IsFound ← False
Current ← RootPtr
REPEAT
    ... ..
    ... ..
    ... ..
UNTIL Current = 0 OR IsFound = TRUE
IF IsFound = False THEN
    OUTPUT SearchFruit "Not found"
ENDIF
```

- Complete the algorithm in the REPEAT-UNTIL loop by writing the missing lines. [6]

11. The ASCII encoding system can be used to represent characters on computers.
- (a) The ASCII code in decimal for the numeric character '1' is 49. Using 8 bits, what is the ASCII code for the character '4' in binary? [2]
- (b) The ASCII codes for uppercase letters are from 01000001 for 'A' to 01011010 for 'Z'. What is the ASCII code for 'W' in binary? [2]
- (c) An alternative encoding system is Unicode. State **one** advantage and **one** disadvantage of using ASCII rather than Unicode. [2]
12. A fashion shop gives customers a discount on purchases totalling more than \$30:
- Discount of 5% with a member card
 - Discount of 5% for purchases totalling more than \$200
 - Discount of 10% with a member card and for purchases totalling more than \$200
- Draw a decision table and simplify it by removing redundancies. [8]
13. The following list of numbers is to be sorted in ascending order.
- 98, 12, 23, 8, 74, 30, 62
- (a) Show the list of numbers **after each pass** by performing
- (i) a bubble sort, [3]
- (ii) an insertion sort. [3]
- (b) By comparing how the bubble and insertion sort work, explain which one is a faster sort. [3]

END OF PAPER