

Candidate Name: _____

CT Group: _____

Index no. _____



**PIONEER JUNIOR COLLEGE
JC 2 PRELIMINARY EXAMINATION**

H2 COMPUTING

9597/02

Paper 2

Monday

19 SEP 2016

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 **7** 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.

1. The PJC clinic has several doctors. When a patient wants to book an appointment with a doctor, the patient rings the doctors' receptionist. The receptionist asks for the following details:

- patient name
- first line of address
- doctor requested

The receptionist checks the files to ensure that the patient is registered with the clinic. The receptionist looks to find the requested doctor's free appointments in the appointments book. The receptionist offers the patient a day and a time for the appointment. If this is agreed then the patient's name is written in the space in the appointment book for that day and time.

At the beginning of every day, the receptionist types an appointment list for each of the doctors for that day. The list contains the appointment times and patients' names.

When the patient arrives at the doctors' clinic for their appointment, they give their name to the receptionist. The receptionist informs each doctor as their patients arrive.

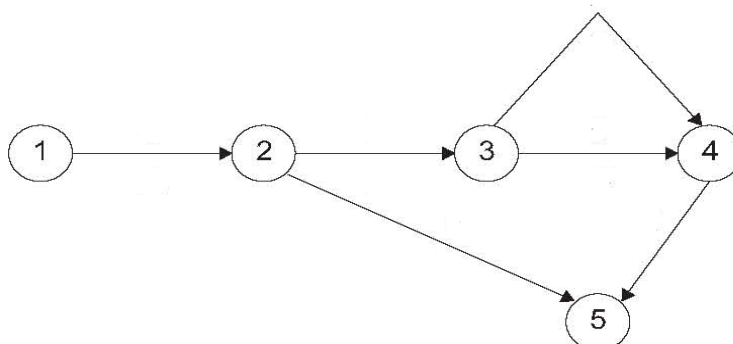
The clinic has decided to replace this manual system with an on-line computerised system.

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

- (a) One section of the project proposal is the Problem Statement which lists the problems in the current system. Write the **Problem Statement**. [4]
- (b) The system developer has drawn up an initial plan of the work involved:

Stage	Activity	Weeks
A	identify requirements	3
B	produce design	5
C	write code	9
D	black box testing	2
E	acceptance testing	3
F	prepare documentation	6

From this data, a Program Evaluation Review Technique (PERT) chart is constructed. The stage is between the nodes in circles.



- (b) (i) Complete the PERT chart by writing the stage (A, B, ...) and duration between the nodes. [4]
- (ii) State the critical path. [1]
- (iii) State the minimum time in which the project could be completed. [1]
- (iv) For activity D:
- (iv.1) state the earliest start time. [1]
- (iv.2) state the latest finish time. [1]
- (v) Two stages start and end at the same nodes. Re-draw the PERT chart by using an extra dummy stage separating them. Explain the nature and purpose of a dummy stage. [2]
- (vi) Explain dependent stages and concurrent stages. For each type of stage give an example from this chart. [4]
- (vii) Draw a Gantt chart showing all stages and their dependencies. [4]
- (c) Describe any **three** key stages (System analysis, System design, System development, Testing, Implementation of computer system, Documentation, Maintenance) of the software development life cycle. [6]
- (d) Explain why the problem must be defined accurately before the analyst starts work. [2]
- (e) Name **two** methods the analyst could use to gather information about the existing manual system. Explain how each method would be used to gather information about this manual system. [4]
- (f) When the receptionist types an appointment for a patient, explain why the patient name and first line of address need to be entered. [2]
- (g) The following pseudocode algorithm describes one method of finding an arbitrary patient 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

```
- (i) If 142 patients' names are stored in the array, and Natasha is the 44th name, state the elements of the array that are examined when searching for Natasha. [2]
- (ii) 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. [2]

**(h)** Before releasing the software, it is tested using a variety of strategies. Describe the following test strategies:

- (i)** White box testing [2]
- (ii)** Black box testing [2]

**2.** You are the assistant of the system developer. You have been asked to draw up a plan to provide security within the system you are developing.

Describe measures you can take to ensure

- (a)** The reliability and integrity of your data [2]
- (b)** Physical security [2]
- (c)** Errors may occur during data transmission. Two methods of checking for these errors are check sums and parity checks
  - (i)** Explain how a check sum is used to check transmitted data for errors. [2]
  - (ii)** Parity bits can be used to check for errors in transmission and may also be used to check and self-correct data in blocks. [2]

Explain how parity checks of data blocks can sometimes be used to correct transmission errors automatically.
- (d)** Explain the differences between using packet switching and circuit switching to transmit a message. [3]

**3.** A programmer is going to write part of the new system, using an object-oriented programming language, which will store details of patients.

All patients will be identified by their PATIENT\_ID.

Normal patients will pay cash for their visit but corporate patients will charge into their company account.

Properties identified type of payments is:

- Payment\_type

- (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. [4]
- (b)** In the context of object-oriented programming explain what is meant by: [3]
  - (i)** encapsulation;
  - (ii)** inheritance;
  - (iii)** polymorphism

4. An alternative solution for this project is to use cloud computing. [6]

Discuss briefly the **three** services that could be used for the new project.

5. (a) The following is a byte stored in a file which contains binary code:

10011010

- (i) What is the corresponding denary number? [2]

- (ii) What is the corresponding hexadecimal number? [2]

- (b) An operating system provides a user interface to a computer system. [4]

Describe **two** different types of interface that an operating system provides.

- (c) Many modern operating systems support Unicode.

- (i) What is Unicode? [2]

- (ii) What are the advantages of Unicode over ASCII? [3]

6. The following shows some data that are stored in a college.

| Student no | Student Name | Programme | Programme Duration (years) | Module No            | Module Name                     | Lecturer               |
|------------|--------------|-----------|----------------------------|----------------------|---------------------------------|------------------------|
| 13828      | Elvin Gan    | P302      | 2                          | M165<br>M121         | Visual Arts<br>Networking       | Fang<br>Jason          |
| 13253      | Goh Seng Lee | P305      | 2                          | M121<br>M110         | Networking<br>Database          | Jason<br>Kabu          |
| 13423      | Yong Kee Le  | P502      | 3                          | M181<br>M107<br>M110 | Music<br>Accounting<br>Database | Sunny<br>Honto<br>Kabu |
| 13098      | Mahesh Babu  | P306      | 4                          | M121<br>M110         | Networking<br>Database          | Jason<br>Kabu          |

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. [2]

- (b) Normalise the data and write them in **four** tables. [6]

- (c) Draw an ER diagram that shows the relationships between these four tables. [2]

7. An online order company charges \$8 for delivery of packages. If the order value is over \$60, the package is small and the customer has a promotion code, the delivery is free. If the order value is over \$60 and the package is small, the delivery charge is \$2. If the order value is over \$60 and the customer has a promotion code, the delivery charge is \$2.
- (a) Draw a decision table showing all the possible conditions and actions. [4]
- (b) Simplify your decision table by removing redundancies. [2]
8. Consider the following program in pseudocode, which includes a recursive function that calculates the power of an integer.

```

010 PROGRAM
020
030 FUNCTION Power(Base: INTEGER, Exponent: INTEGER) RETURN
040 INTEGER
050 IF Exponent = 0
060 THEN
070 Result ← 1
080 ELSE
090 Result ← Base * Power(Base, Exponent - 1)
100 ENDIF
110 RETURN Result
120 ENDFUNCTION
130
140 // main program
150 DECLARE Answer: INTEGER, Base: INTEGER, Exponent: INTEGER
160 INPUT Base
170 INPUT Exponent
180 Answer ← Power(Base, Exponent)
 OUTPUT Answer

```

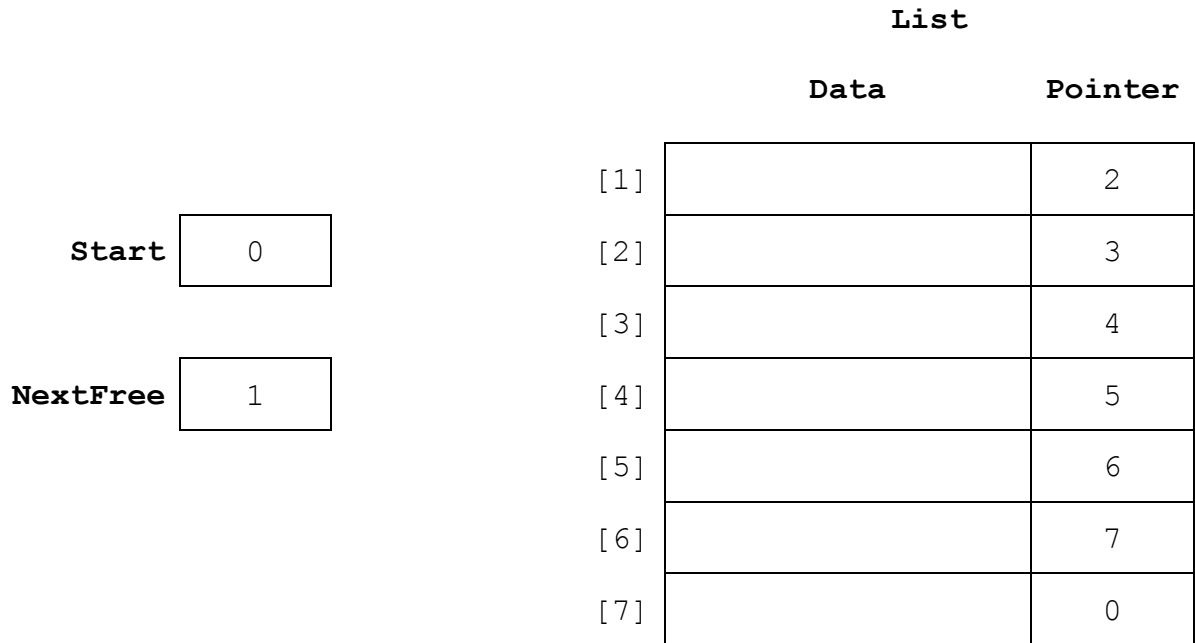
- (a) Trace the execution of the function call `Power(2, 3)`, showing for each re-entry into the `Power` function, the values passed to the function and the results returned. [3]

The program is executed, starting from line 140.

- (b) Explain how the stack content changes during the execution of the program, with input of 2 for `Base` (line 150), and 3 for `Exponent` (line 160). [4]
- (c) Write a pseudocode for a non-recursive version of the `Power` function. [3]
- (d) State **one** reason why a non-recursive `Power` function may be preferred to a recursive one. [1]

9. A linked list is stored in an array of records. One record represents a node and consists of the data and a pointer.

The diagram shows an implementation of an **ordered linked list** before any data is inserted into it. NULL is represented by a value of 0.



- (a) Show the state of the **ordered linked list** after **three** data items have been added to it in the given order: *Paris, Tokyo, Santiago*. [2]
- (b) Write the algorithm for the procedure to insert a new node into an ordered linked list. Use the identifiers above and include suitable annotations. [7]
- (c) Describe how a stack can be implemented as a linked list. [3]

~~~ END OF PAPER ~~~