



HWA CHONG INSTITUTION

C1 Promotional Examination

Higher 2

Computing

Paper 1

9569/01

01 OCT 2025

3 Hours

Candidate	
Name	

Civics	
Group	

READ THESE INSTRUCTIONS

Write in dark blue or black pen. Pencil may be used for graphs and diagrams only.

Answer **ALL** questions.

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

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

Arrange in the correct order of the questions.

Total marks for this paper is **100** marks.

This document has **6** printed pages.

For Examiner's use only	
Question Number	Mark
1	
2	
3	
4	
5	
6	
7	
8	
Total	

- 1 A company is developing a Gym Tracker application that helps users monitor their workouts and performance. The application supports two types of workouts: Cardio Workouts and Strength Workouts.

For all workouts, the data that will be stored include:

- date of workout
- weight of user
- the length of workout session
- estimated calories burned

For Cardio Workouts, the additional data stored:

- type of cardio
- distance covered in kilometers
- average heart rate during exercise
- maximum heart rate achieved

For Strength Workouts, the additional data stored:

- muscle group targeted
- number of sets performed
- number of repetitions per set
- weight lifted per repetition

Estimated calories burned for all workouts are computed periodically by using weight of user and the length of workout session.

For cardio workouts, the estimated calories burned are computed by using the length of workout session, average heart rate during exercise and distance covered in kilometers.

For strength workouts, the estimated calories burned are computed by using the length of workout session, number of sets performed, number of repetitions per set and weight lifted per repetition.

(a) Draw a class diagram for Gym Tracker application showing

- any derived classes and inheritance from the base class
- the properties needed in the base and derived classes
- suitable methods, in each class, to support the system. [7]

(b) Explain polymorphism using the example in Gym Tracker application. [2]

(c) Explain inheritance using the example in Gym Tracker application. [2]

- 2 (a) State **one** advantage and **one** disadvantage of using a network. [2]
- (b) Describe **three** benefits of designing the TCP/IP protocol suite in layers. [3]
- (c) Describe the steps involved in TCP's three-way handshake. [5]
- (d) Describe **two** mechanisms used by TCP to ensure reliable data transmission. [2]
- (e) Given the IPv4 address 196.168.10.23/22
- (i) How many usable host IP addresses are available in this subnet? [1]
- (ii) Convert the IP address to a 32-bit binary number. [2]
- (iii) What is the network address? [2]
- (iv) What is the broadcast address? [2]
- 3 (a) A company's IT administrator has implemented a network monitoring measure. The administrator tracks all employees' internet activities, including websites visited, time spent online and files downloaded, without informing the employees and obtaining their consent. Discuss whether the IT administrator's actions align with the code of ethics for computer professionals. [2]
- (b) Explain the need to use ASCII or Unicode in modern computing. Describe **one** advantage of Unicode over ASCII. [2]
- 4 A staff ID consists of five digits and a check digit. The check digit is calculated from the five digits using the modulus 11 system below, it can be digits 0 – 9 or character 'X'.
- Each of the five digit is assigned with a weight. The rightmost digit is given a weight of two, the next digit to the left is three, and so on.
 - Each digit is multiplied by its weight and the products are added together.
 - The sum of the product is divided by 11 and the remainder is subtracted from 11 to give the check digit.
 - As the check digit is a single digit, we have two special cases.
If the remainder is 0, the check digit 11 is converted to 0.
If the remainder is 1, the check digit 10 is replaced by X.
- (a) Describe **two** types of error that this check digit can detect. [2]
- (b) Explain why the data type of the staff ID should be a string rather than an integer. [1]
- (c) Write, in **Python**, an algorithm to ask the user to enter the staff ID and output appropriate messages when the staff ID is valid, invalid with wrong format or invalid with wrong check digit. [6]

5 A school canteen ordering app uses a relational database to store customers' order of bento.

- The app displays each bento's name, price and description.
- Each customer registers name and handphone number on the app.
- Each customer can order many times each day.
- Each time a customer places an order, the system records the timestamp, the bento and the collection date

(a) Describe the requirement for a table to be in the first normal form. [1]

(b) A database needs a number of tables to store the data.

Draw an entity-relationship (ER) diagram to show the tables in third normal form (3NF) and the relationship(s) between them. [4]

(c) A table description can be expressed as:

TableName (Attribute1, Attribute2, Attribute3, ...)

The primary key is indicated by underlining one or more attributes. Foreign keys are indicated by using a dashed underline.

Write table descriptions for the tables you identify in part (b), using the information given. [4]

(d) The app manager wants to know the popularity of bento. Write an SQL query to output the name of bento and the corresponding number of orders, in descending order of the number of orders. [4]

(e) Describe **two** data validation techniques that the app may use on the customer's handphone number. [2]

(f) Describe **two** actions the app company must take regarding the collection, disclosure and use of this data under the Personal Data Protection Act. [2]

- 6 The restaurant Laksada sells laksa. To manage customer orders, a queue is to be implemented using linked list. Two pointers are maintained:

- `Front`: reference to the first node in the queue
- `Rear`: reference to the last node in the queue

The `Node` class contains two attributes:

- `Data`: table number making the order
- `Next`: pointer to the next node

A constructor method that sets the attributes `Data` and `Next` to `Null`.

- (a) Explain why a stack would not be suitable for managing the customer orders in Laksada. [2]
- (b) State **two** disadvantages of using a linked list instead of a fixed-size array for implementing the queue. [2]
- (c) Write, in **pseudocode**, the function `enqueue (table_num)` which enqueues a new node with `Data` set to `table_num`. [4]
- (d) Write, in **pseudocode**, the function `dequeue ()` which dequeues the node and returns the `Data` of the dequeued node. [4]

The following sequence of operations is carried out on an initially empty queue:

```
enqueue ("Table4") , enqueue ("Table5") , enqueue ("Table2") ,  
dequeue () , enqueue ("Table1")
```

- (e) Draw a diagram of the linked list after these operations, clearly indicating the contents of each node and the `Front` and `Rear` references. [3]

- 7 It is given that a sequence is such that the first term has the value 3, and each subsequent term is 1 less than double the previous term. The following code is provided.

```
FUNCTION recur (n)
    IF n = 1
        RETURN 3
    ELSE
        RETURN 2 × recur (n - 1) - 1
    ENDIF
ENDFUNCTION
```

- (a) Identify **two** key characteristics of recursion illustrated by the function `recur()`. [2]
- (b) Draw a trace diagram for the recursive function call `recur(4)` and give the final result returned. [5]
- (c) Explain how a stack is used when a recursive call is made. [4]
- (d) Explain why the depth of the call stack can become a problem when recursion is used with very large input sizes. [2]
- (e) Write, in **pseudocode**, the iterative function `func(n)` which returns the value of the n th term in the sequence. [2]
- 8 A perfect number is a positive integer that is equal to the sum of all its positive factors (excluding itself). For example, $28 = 1 + 2 + 4 + 7 + 14$.

Write, in **Python**:

- (a) a function `factors(n)` that returns a list of all the positive factors of the integer n , [4]
- (b) a function `is_perfect(n)` that uses your function from part (a) to return a Boolean indicating whether n is a perfect number, [3]
- (c) a function `perfect(k)` which returns the first k perfect numbers. (note: 1 is not perfect as it does not have factors excluding itself) [3]