

**HWA CHONG INSTITUTION  
C2 BLOCK TEST 2022**

**COMPUTING  
Higher 2**

**29 June 2022**

**Paper 1 (9569 / 01)**

**1400 -- 1515 hrs**

**READ THESE INSTRUCTIONS FIRST**

An answer booklet will be provided with this question paper. You should follow the instructions on the front cover of the answer booklet. If you need additional answer paper ask the invigilator for a continuation booklet.

Answer ***ALL*** questions.

Approved calculators are allowed.

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

The total number of marks for this paper is **40**.

- 1
  - (a) Explain the term Domain Name Server (DNS) and how it works. [3]
  - (b) Describe **one** advantage and **one** disadvantage of client-server network compared to peer-to-peer network. [2]
  
- 2 A gaming magazine pays freelance reviewers to write game reviews for new releases. Each reviewer specialized in reviewing game in some platforms.

The following table REVIEWER was a first attempt at the database design.

Table: REVIEWER

Reviwer ID	Reviewer	Platform ID	Platform	Review ID	Title	Review Date
151	Tim	16	Xbox	181	Halo Infinite	2021-12
				188	Elden Ring	2021-11
151	Tim	20	iOS	170	Angry Birds Journey	2022-01
170	Ace	18	PlayStation	192	A Short Hike	2021-10
				179	It Takes Two	2021-09
165	Leo	24	Nintendo	165	Puzzle Frenzy	2021-08
				176	Pokemon Legends	2021-12

- (a) State why the table is not in first normal form (1NF). [2]
- (b) Explain the reasons for reducing data redundancy in this database design. [2]

The following is an attempt to reduce data redundancy:

Table: REVIEWER

ReviewerID	Reviewer
151	Tim
165	Leo
170	Ace

Table: REVIEW

Review ID	Title	Platform ID	Platform	ReviewDate	ReviewerID
181	Halo Infinite	16	Xbox	2021-12	151
192	A Short Hike	18	PlayStation	2021-10	170
188	Elden Ring	16	Xbox	2021-11	151
165	Puzzle Frenzy	24	Nintendo	2021-08	165
170	Angry Birds Journey	20	iOS	2022-01	151
176	Pokemon Legends	24	Nintendo	2021-12	165
179	It Takes Two	18	PlayStation	2021-09	170

(c) Explain why table REVIEW is not in third normal form (3NF). [2]

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.

(d) Write table descriptions for the required tables in the databases so they are in third normal form (3NF). [4]

The gaming magazine decides to use object-oriented programming to manage the articles written about games. For every article, the following items of data are recorded:

- article title
- article writer
- content
- the date and time published

For news, the tag and comments of article is recorded.

For review, the game information, release date and rating is recorded.

- (e) Draw a class diagram that shows the following for the situation described above:
- the superclass
  - any subclass
  - inheritance
  - properties
  - appropriate methods
- [4]
- (f) Explain inheritance using the examples from this situation. [2]
- (g) Explain the purpose of encapsulation using the example from this situation. [2]

The company decides to include the game information for news and comments for review.

- (h) Suggest the changes to the class diagram to enable the changes mentioned above. [2]
- 3 (a) Explain the purpose of using asymmetric encryption and describe how it works. [3]
- (b) Describe how DOS attack can compromise computer system. Name one protection scheme for such attack. [2]

- 4 A movie theatre wants to create a system to seat their customers more efficiently in the theatre. The IT manager wants to create a data structure to implement the new system.

The superclass, `Customer`, will store the following data:

- a linked list of elements that have two parts: the customer data and a pointer to the next element in the linked list
- `head` pointer, pointing to the first element in the linked list
- `tail` pointer, pointing to the last element in the linked list

This class has the following methods:

- `create()` method which creates an empty linked list
  - `display()` method which should display the current contents in the order they are stored, or the message `No customers` if the linked list is empty
- (i) Write the **Python** code for the `create()` and `display()` methods. [2]

The subclass `Queue` has the following methods:

- `enqueue (value)` which appends the next customer to be seated
- `dequeue ()` which returns and removes the first customer in the linked list

(ii) Write the **Python** code for the subclass `Queue`. [5]

Upon visiting the cinema and noticing the narrow footpath along the seats, the IT manager realises that this `Queue` class is not a suitable data structure for the purpose of emergency evacuation.

(iii) Explain why the data structure used may not be suitable and suggest an alternative solution. Write the **Python** code for this new class, `BetterQueue`, which has the same methods as `Queue`. [3]