Name:		Index Number:		Class:	

DUNMAN HIGH SCHOOL
Preliminary Examination
Year 6

COMPUTING (Higher 2)

9569/01

Paper 1 Written

18 September 2024

3 hours

READ THESE INSTRUCTIONS FIRST

Write your name, index number and class on the work you hand in.
Write in dark blue or black pen on both sides of the paper.
You may use an HB pencil for any diagrams or graphs.
Do not use staples, paper clips, glue or correction fluid.

Answer **all** the questions.

Approved calculators are allowed.

You are reminded of the need for good English and clear presentation in your answers.
Please ask the invigilator if you require additional paper.

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 100.

1. The rules that are used when deciding whether to offer insurance to customers and whether to offer discounts are as follows:

- If the customer has been refused insurance by another company and their car is over 10 years old then insurance is refused.
- If the customer has been refused insurance by another company and their car is not more than 10 years old then insurance without any discount is available.
- If the customer has not been refused insurance by another company and their car is over 10 years old then insurance without any discount is available.
- If the customer has not been refused insurance by another company and their car is less than 10 years old and they have made not more than three claims previously then insurance with a discount is available.

(a) Copy and complete the decision table showing all the possible outcomes and results.[4]

Condition	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
Has customer been refused insurance by another company?								
Is car over 10 years old?								
Has customer make more than 3 claims previously?								
Action								

(b) Simplify your decision table by removing redundancies. [2]

2. Guests stay at holiday homes in the Changi Holiday Park for a week at a time. When a guest wants to book an activity (swimming, dining, etc), a computer-based activity booking system will be used. It will contain all the information described below. It will allow guests to book their activities on the Changi Holiday Park 's intranet.

When a booking is made, the following details are always required:

- hNo: holiday home number, e.g., 02-14: room 14 of level 2
- aCode: code of activity, e.g., D1800

The following are also required:

- sGuest: Status of guest. (M) Member, (N) Non-member
- nVisits: Number of visits for member
- nmVoucher: a e-voucher worth $2 will be given to non-member for each activity

Member will be given 10% discount if number of visits is more than 5 times.

(a) Draw a diagram that shows suitable classes and their relationships for a solution to different **payment** type for guests of different activity that uses OOP techniques. Include appropriate attributes and methods in each class. [6]

Discuss the following with the class diagram from **(a)** and the appropriate attributes and methods in each class.

(b) What are the benefits of using OOP? [2]

(c) The three key features of the object-oriented approach are often quoted as: [6]

(i) Encapsulation

(ii) Inheritance

(iii) Polymorphism

What do these three features mean?

3. Decomposition and modularity are important concepts in software development. Explain what they mean and how do they benefit in software development. [4]

4. The following questions are not related to each other.

(a) State the meaning of **privacy of data**. [1]

(b) State the meaning of **integrity of data**. [1]

(c) What is the difference between back up and archive? [1]

(d) What is the advantage of version control in software development? [2]

5. A bank has a number of offices all over the world. Each office has a local area network (LAN). The LANs are connected together to create a wide area network (WAN) for use by its staff.

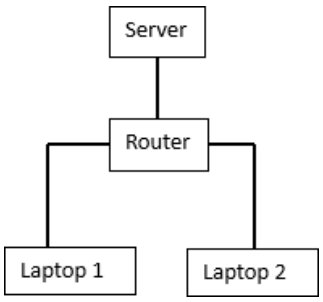
A Local Area Network (LAN) contains a number of devices:

- a router
- twenty laptop computers
- a server.

(a) The server has the IP address 192.168.3.2

Explain why this is **not** an IPv6 address. [2]

(b) The LAN is set up as a star topology as follow:



Describe the function of a router in the network. [2]

(c) Explain how data is transmitted between the two laptops in the LAN. [2]

(d) What does protocol define in computer networks? [2]

(e) Explain the importance of protocol in computer network. [2]

(f) Explain the TCP/IP model and the function of each layer with examples. [4]

(g) A new online (web) form is to be designed to gather data from customers.

Describe the features that must be considered when designing a new form. [3]

(h) Explain with any two techniques how the bank could use encryption techniques to attempt to prevent its data from being read by unauthorised people. [2]

(i) Identity theft means one of the following:

- Unauthorised use of personal information so that perpetrator can pretend to be another person/use their identity
- Using the information (in an unauthorised manner) for personal gain
- Using the information to cause harm/loss/disadvantage to victim
- Combining valid identity data with false/fabricated data to create a new/synthetic identity.

Describe **two** impacts of identity theft on individuals. [2]

6. (a) Describe, with the **aid of a diagram**, the data structure called a linked list. [4]

(b) Describe, with the **aid of diagrams**, an algorithm to add a new data item into the linked list, so that this new data item occupies position **n**. You may assume that the linked list contains at least **n - 1** items before the addition. [6]

(c) An alternative type of list structure is one whose data items are always held in a contiguous area of store (an array). Give **one** advantage and **one** disadvantage that this has over the linked list organisation. [2]

7. A stack Abstract Data Type (ADT) is to be implemented using pseudocode, with procedures to initialise it, to push new items onto the stack and pop an item from stack.

A 1D array Stack stores the decimal numbers of the stack.

```
CONSTANT MaxSize = 40
DECLARE BasePointer : INTEGER // Points to the bottom of the stack
DECLARE TopPointer : INTEGER  // Points to the top of the stack
DECLARE Stack : ARRAY[1:40] OF REAL

// initialisation of stack
PROCEDURE Initialise()
   BasePointer ← 1
   TopPointer ← 0
ENDPROCEDURE
```

(a) Copy and complete the pseudocode procedure `Push()` to push an item into `Stack`. [3]

```
// adding an item onto the stack
PROCEDURE Push(NewItem : REAL)
:
:
ENDPROCEDURE
```

(b) Copy and complete the pseudocode function `Pop()` to pop an item from `Stack`. [5]

```
// popping an item from the stack
FUNCTION Pop()
:
:
ENDFUNCTION
```

(c) Justify the use of a linked list instead of an array to implement a stack. [2]

(d) Explain how to make use of a stack when translating recursive programming code. [3]

(e) Compare and contrast the queue and stack Abstract Data Types (ADT). [3]

8. The location of a record in a random file is determined using a hashing algorithm.

A collision may occur during the process of adding a record.

(a) Outline what is meant by the term **collision** in this context. [2]

(b) Explain how a collision can be dealt with when writing records to a random file. [3]

9. A Computing Competition has a Preliminary Round and a Final Round. There is no limit on the number of participants from each school for the Preliminary Round. There are 5 questions to be solved in the Preliminary Round, each with different number of marks (E.g. Question 1 is worth 10 marks and Question 5 is worth 30 marks). A student's score for the Preliminary Round will be the total marks scored for all 5 questions. The **top 3 students from each school** will progress to the Final Round.

A database is to be used to store the data about the schools, students, questions and marks scored by each student for the Preliminary Round.

Each school has a unique 4-digit school ID (E.g. 2222). The school's name is also stored in the database.

Each student has a unique student ID, which is their NRIC (E.g. T0675069D). The student's name and the school he/she is from is also stored in the database.

Each question has a unique question number. The maximum number of marks for each question is also stored in the database.

At the end of the Preliminary Round, the **number of marks scored by each student for each question** is stored in the database.

Four entities (School, Student, Question, Marks) are to be used to define the data needs of the competition's Preliminary Round. All the tables in the database are normalised to the third normal form (3NF).

(a) Create an entity-relationship (ER) diagram for the four-table database. [3]

(b) Write table definitions, indicating the primary key with underline and foreign key with *, for each of the tables. [4]
Use the format: `TableName(Attribute1, Attribute2, Attribute3*, etc.)`

(c) At the end of the Preliminary Round, the organiser will generate a report for each school to show their top 3 students' details and their individual total score.

Write an SQL query that will output the top 3 students' details and their individual total score for the school "Dunman High School". [7]

(d) Normalisation is the process of organising the tables in a database to reduce data redundancy and prevent inconsistent data. Explain why the above tables are considered to be in the third normal form (3NF). [3]

End of Paper