



Sri Lanka Institute of Information Technology

B.Sc. Honours Degree in Information Technology

Specialized in Information Technology

Final Examination
Year 1, Semester 2 (2023)

IT1050–Object Oriented Concepts

Duration: 2 Hours

November 2023

Instructions to Candidates:

- ◆ This paper has 4 questions.
- ◆ Answer all other questions in the booklet given.
- ◆ The total marks for the paper is 100.
- ◆ This paper contains 7 pages, including the cover page.
- ◆ Electronic devices capable of storing and retrieving text, including calculators and mobile phones are not allowed.
- ◆ This paper is preceded by 10 minutes reading period. The supervisor will indicate when answering may commence.

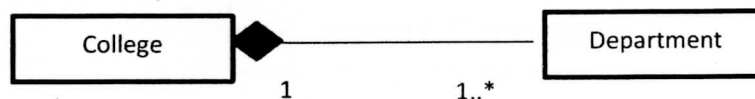
Question 01**(40 Marks)**

Write the answers to the following questions.

- a) Give 3 benefits of developing a program using Object Oriented Programming Concepts. (3 marks)
- b) Write the 5 features of Object-Oriented Programming. (5 marks)
- c) Briefly explain "Function Over riding" using an example. (4 marks)
- d) Identify and list the classes and objects in the following scenario. (5 marks)

Mr. Perera the owner of a Distributing Centre called "StarPlus" which distributes Milk products such as Milk Power, Liquid Milk, Yogurt and Butter. A sales tracking system is used to maintain records of daily sales at the Centre. The operator, Mr. Silva uses these records to find out the items with low quantities to makes new orders from the buyers of the products they sell. At the end of each day owner can generate reports on items sold during the day and about the new purchases done."

- e) Consider the following UML diagram and answer the questions.



- i) What is the relationship between class "College" and class "Department" according to the UML notation above? (1 marks)
- ii) Write the C++ coding with necessary attributes and methods only to show the relationship between the two classes. (5 marks)

f) Consider the code below and answer the questions.

```
class Address
{
    private:
        int HouseNo;
        char street[30];
        char city[20];
    public:
        Address(int no, char s[], char c[])
        {
            HouseNo = no;
            strcpy(street, s);
            strcpy(city, c);
        }
};

class Person
{
    private:
        char name[20];
        Address *add;
    public:
        Person(char pName[], Address *address)
        {
            strcpy(name, pName);
            add = address;
        }
};

int main()
{
    Address *add1 = new Address(25, "New Kandy Rd", "Malabe");
    Person *p1 = new Person("Perera", add1);

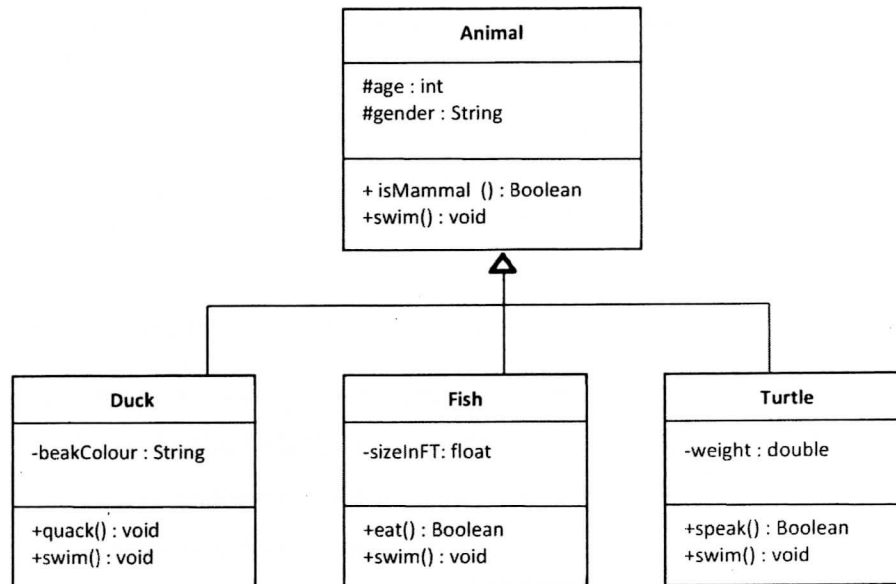
    return 0;
}
```

- i) What is/are the relationship/s shown in the code above? (2 marks)
- ii) Draw the UML notation to show the relationship shown in the code. (4 marks)

g) Explain the following terms briefly

- i) Entity Class
- ii) Polymorphism (4 marks)

h) Consider the following class diagram and answer questions.



- i) Write the statement to create an object of the “Duck” class using dynamic memory allocation. Consider that there is a overloaded constructor which take the age, gender and the beak colour as parameters, in the Duck class. (2 marks)
- ii) Write the coding of the “Fish” class. (You are not required to implement the methods). Add a suitable constructor. (3 marks)
- iii) What would you do to make “Animal” class an Abstract class.
Write the relevant statement. (2 marks)

Question 02

(20 marks)

Given below is a set of requirements for a bank. Analyse the given requirements and answer the questions.

In the dynamic world of scientific research, the need for efficient management of experiments, data analysis, and seamless collaboration among researchers is paramount. To address this challenge, a comprehensive software solution has been conceptualized, known as the Research Management Software (RMS).

Features of Research Management Software:

The RMS allows researchers to catalogue and manage experiments effortlessly. Researchers can create, edit, and archive experiments, including detailed descriptions, objectives, and timelines. The software ensures that each experiment is easily accessible for team members.

A key feature of RMS is its robust data analysis toolkit. Researchers can import, organize, and analyse data from various experiments in a secure and user-friendly environment. The toolkit supports a wide range of data types, from text and numerical data to images and videos.

The software fosters seamless collaboration among researchers. It provides a central hub where team members can communicate, share findings, and contribute to ongoing projects. Integrated messaging, document sharing, and version control facilitate a cohesive research environment.

Security and confidentiality are paramount in research. RMS implements role-based access control to ensure that researchers have appropriate access levels. Administrators, project leads, and team members can access data and features according to their roles.

Researchers can stay updated with real-time notifications on project progress, data analysis results, and collaborative activities. These notifications are customizable, allowing researchers to focus on critical updates.

To streamline experiments, RMS can integrate with laboratory equipment, enabling automated data collection and real-time data synchronization. This feature minimizes manual data entry errors.

RMS offers a suite of reporting and visualization tools. Researchers can generate comprehensive reports and visual representations of their data, making it easier to interpret results and draw conclusions.

- a) Write the five rejecting rules in the column heading of the following table and write all the nouns in the above description that will be eliminated under each rule. (5 marks)

Heading 1	Heading 2	Heading 3	Heading 4	Heading 5

- b) Identify and list the candidate classes in the above scenario. (5 marks)
- c) Draw the CRC cards for any 5 classes you have identified in part b). (10 marks)

Question 03**(20 marks)**

Consider the following description and draw the class diagram. Clearly show the classes, relationships and multiplicity using UML notations.

ABC elementary school requires a system to handle data and functions of the children enrolled in their school. Once a child is enrolled to the school, each child is given a unique ID number. It is necessary for the system to record ID number, name, age, address and type of each enrolled child. Type of a child can be fulltime or parttime.

There are two levels in ABC elementary school. Children with age under 5 are categorized as Kindergarteners and children with age 5 or more are categorized as Preschoolers. For each kindergartener in the school, system must record age and weight. For each preschooler in the school, system must record the vaccination status. The value of vaccination status has to be true if the preschooler is vaccinated and false if the preschooler is not vaccinated.

All children in the school are allocated to a class. A class has a class name, level (kindergarten or preschool) total children count and building. A class has 2 teachers. The system must record the name, age, contact number and address of each teacher in the school.

Each child in the school has guardian. The system must record the name, contact number, address and profession of the guardian of each child.

A monthly payment has to be made for each in the elementary school. Monthly payment amount for a parttime child is Rs. 5000 and fulltime child is Rs.7500. When there is a payment is done for a child, the system must record a payment ID, date and amount.

Question 04**(20 marks)**

Consider the following class diagram and write the C++ code for the classes shown in the diagram. (Add methods with implementations ONLY when you need to show the relationships)

