Sri Lanka Institute of Information Technology

B.Sc. Honours Degree in Information Technology

Specialized in Information Technology

Final Examination
Year 1, Semester 2 (2019)

IT1050 – Object Oriented Concepts

Duration: 2 Hours

June 2019

Instructions to Candidates:

- This paper is preceded by 10 minutes reading period. The supervisor will indicate when answering may commence.
- This paper has 4 questions.
- Answer all questions in the booklet given.
- The total marks for the paper is 100.
- This paper contains 6 pages, including the cover page.
- Electronic devices capable of storing and retrieving text, including calculators and mobile phones are not allowed.

Question 01 (30 marks)

a) Write 2 advantages of using "Object Oriented Programming" to develop large programs. (2 marks)

b) Explain the terms "Class" and "Object" using examples. (3 marks)

c) Write the steps that you should follow to build an Object Oriented Program. (5 marks)

d) List the five main features of Object Oriented Concepts. (5 marks)

e) Briefly explain the following terms using examples. (6 marks)
   a. Super Class
   b. Constructor
   c. Function Overloading

f) Consider the following description and identify the classes, objects and attributes and write them separately in the table shown below. (9 marks)

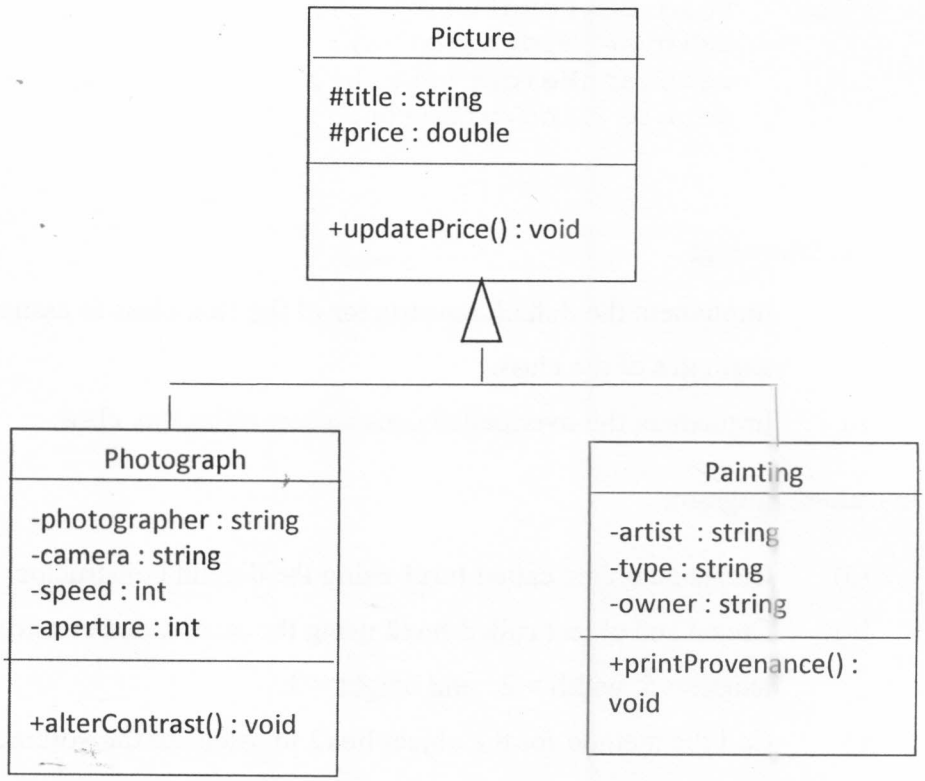
An online purchasing system is needed to be implemented at "Book Worm" book shop. Customers can register themselves by entering their name, address and contact number. They purchase items such as books, magazines, CDs and newspapers by ordering online. Each Item should have a price and a description. Each purchase has a date, one or more items and the amount which is equal to the sum of the items purchased. Customer "Smith" purchases copies of "C++: How to Program" and the magazine "Business Today".

Classes	Objects	Attributes

Question 02 (30 marks)

a) Write the five relationships that can exist among classes according to their strength from strongest to the weakest. Draw the UML notation used to show each relationship. (6 marks)

b) Consider the diagram below.



i) What is the relationship shown in the UML diagram and explain it.(2 marks)

ii) Write the coding for the three classes shown above. Do not implement the methods. (8 marks)

c) Consider the following class.

```
class Box
{
   private:
        double length;
        double width;
        double height;

   public:
        Box();
        Box(int l, int w, int h);
        void setLength(int l);
        void setWidth(int w);
        void setHeight(int h);
        double findVolume();
};
```

Do the following;

i) Implement the default constructor of the Box class to assign **0** for all three attributes of the class. (2 marks)

ii) Implement the overloaded constructor of the Box class. (2 marks)

In a client program;

iii) Create an object called **box1** using the default constructor (1 mark)

iv) Create and object called **box2** using the overloaded constructor. Use length = 5, width = 2 and height = 3. (2 marks)

v) Call the method for the object **box2** to calculate the volume and print the volume. (2 marks)

vi) Create a dynamic Object called **box3** using the default constructor. (2 marks)

vii) For object **box3**, set the length, width and height to 10, 7, and 3 using the set methods available in the Box class. (3 marks)

Question 03 (20 marks)

a) Write the five eliminating rules for nouns in Noun Verb analysis. (5 marks)

b) Consider the following scenario and answer the questions given below.

The "Rent-o-Bike" is a renting company which rents bikes for cyclists who want bikes for daily exercises or practicing for races. The company wants to automate the renting system and expects the new system to do the following tasks.

- Keep a list of all bikes and their details including bike number, type, size, make, model, daily charge rate, and deposit.
- Keep a record of all customers and their past rent transactions.
- Work out automatically how much it will cost to rent a given bike for a given number of days.
- Record the details of a rent transaction including the start date, estimated duration, customer and bike, in such a way that it is easy to find the relevant transaction details when a bike is returned.
- Keep track of how many bikes a customer is renting so that the customer gets one unified receipt not a separate one for each bike. (single payment)
- Cope with a customer who rents more than one bike, each for different amounts of time.
- Work out automatically, on the return of a bike, how long it was rented for, how many days were originally paid for, how much extra is due.
- Record the total amount due and how much has been paid.
- Print a receipt for each customer.
- Keep track of the state of each bike, e.g. whether it is in stock, rented out or being repaired.

i) Do the Noun Verb analysis to identify the classes of the given description. Clearly show how the nouns are rejected using the eliminating rules and finally write the identified classes. (7 marks)

ii) Draw the CRC cards for the classes identified above. (8 marks)

Question 04 **(20 marks)**

Read the following description and identify the classes, attributes, methods, relationships between classes, and multiplicity specification. Draw a UML class diagram for the following scenario using the above features.

In a project module at a university, the students are members of project groups. Each group consists of four or five members. One student can be a member of one project group only. A student can be a regular student or a pro-rata student. Each project may or may not be assigned a client. Each project group has at least one supervisor. The Supervisor can be a faculty member or an external supervisor. All the supervisors are entitled to a payment for the projects they supervise. Regular students need to take one or more online exams where the pro-rata students carry forward their previous online exam marks.

Hint : Your solution should have at least ten classes. Clearly show the classes and the class relationships with multiplications.

----------End of Question Paper----------