Sri Lanka Institute of Information Technology

B.Sc. Honours Degree in Information Technology

Specialized in Information Technology

Final Examination

Year 1, Semester 2 (2018)

IT1050 – Object Oriented Concepts

Duration: 2 Hours

October 2018

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 **(40 marks)**

a) Explain the difference between a "Structure" and a "Class" in C++ by giving examples ?
(3 marks)

b) Briefly explain the steps of building an object oriented program. (2 marks)

c) Read the description given below and answer the questions

A university issues ID cards (Identity Cards) for its staff and visitors to provide access to University facilities. Every staff ID will be valid for a year from the date of issue. It has to be updated every year. However, the visitors' cards are issued on daily basis.

Kamal is an undergraduate student following Bachelor of Information Technology in the Faculty of Computing. Mr. Perera was the first visitor (ID == 001) who came to the university premises on the 20th March 2017. He came to the university for a meeting with Dr. Ajith Pieris (ID: 312353), the Head of the Software Engineering Department. Dr. Ajith Pieris joined the facility as a Senior Lecturer on 30th September 2015. Dr. Amal Perera is a Senior Lecturer attached to the Engineering Faculty and his ID number is 234567. He joined the university on 1st of January 2018.

i) Identify the classes, objects and the attributes in the scenario above, and write in a table as shown below. (6 marks)

Classes	Objects	Attributes

ii) Briefly explain the terms below by taking examples from the scenario given above.
(6 marks)

1. Abstraction
2. Encapsulation
3. Information Hiding

d) Consider the UML diagram of a class shown below;

Item
- itemID : int - name : char [] - price : double
+ Item() + Item(pid : int, pname : char[]) + setPrice(pprice : double) : void + getPrice( ) : double + display () : void

i) Write the coding in C++ for the class **Item** represented above (3 marks)

ii) Write the overloaded constructor of the class **Item**. (2 marks)

iii) Implement the **setPrice()** method and the **getPrice()** method (2 marks)

e) Consider the following classes.

```
class A
{
     private :
         int num1;
     public :
         void setNum(int n1 );
         void add ( B b);
         void display();
};
```

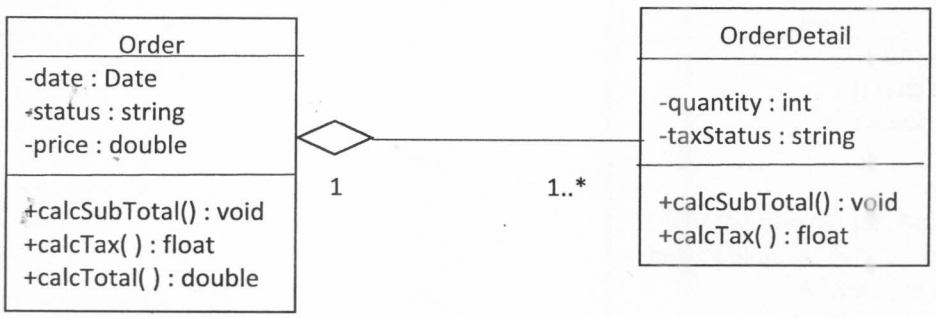
```
class B
{
     private :
         int num2;
     public :
         void setNum(int n2 );
         int getNum();

};
```

i) Write the method add() of class A where an object of class B is sent as a parameter to the method. This method will add the value of num2 to num1 in class A. (2 marks)

ii) Write a client program to create a static object of class A and call the methods add() and display() of class A.
(3.5 marks)

iii) Create another object of class A using dynamic Memory allocation and display the details appropriately. (You can set num1 to 10 and num2 to 20) (3.5 marks)

f) Consider the UML diagram given below.



i) What is the relationship that exits between these two classes (2 marks)

ii) Write the necessary C++ coding of the two classes. (5 marks)
(You are not required to implement the methods)

Question 02 **(15 marks)**

a) Consider the following scenario. Do the Noun Verb analysis to identify the classes in the description. Show clearly how the nouns were rejected using the above rules. (5 marks)

A program is needed to be implemented to handle the rentals paid by the tenants (the person who occupies the room) in a small apartment building. The landlord (owner of the building) should be able to input the rents paid by individual tenants and also the expenses incurred in operating the building. The expenses could be for electricity, water and any repairs done to the building. The program should be able to display a rent record, which sows the rents paid by each tenant for each month, and an expense record, which for each expense records the date, payee, amount and budget category. The program should also be able to display an annual summary, which shows total rents paid for the year and total expenses paid in each budget category.

In addition to the above requirements, the landlord wants to keep track of the basic information of the tenants such as the name, NIC no, contact details, and details about the rental contract such as the room number, the joined date and the expected period of stay. The user should be able to search for details by entering the name or the NIC number of the tenant.

b) Consider the classes identified above and draw the CRC cards for 5 selected classes.

(10 marks)

Question 03 **(20 marks)**

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

Five doctors with three trainee nurses run the "Health First" Medical Center. When a patient calls for an appointment, he or she usually sees the same doctor, but at busy times, patients may see any of the doctors or nurses. Once a patient has been seen by the doctor or nurse, the medical records are updated and the doctor may also write or a prescription for the patient. Sometimes the doctor considers that the patient needs further tests. These may be routine or intensive. They are carried out at one of the local hospitals.

The Medical also has an emergency unit with four beds that can be used by patients with emergency cases or minor injuries. One doctor is in charge of the emergency unit with the support of a nurse. A patient can be referred to the local hospital in case of further treatment or for consultation of a surgeon.

Question 04 **(25 marks)**

Consider the following class diagram and write the coding for the classes shown in the diagram considering the relationship among them. You are not required to write any methods for the classes.