Ex/IT/T/211/2018(S)

B. E. (INFO. TECH) SUPPLEMENTARY EXAMINATION, 2018

(2^{nd} year 1^{st} Semester)

OBJECT ORIENTED PROGRAMMING

Time: Three hours Full Marks : 100

Attempt **any FIVE** questions

1. Suppose that a class ***Fraction*** contains two integer data members. One data member stores the numerator and the other stores the denominator so that the numerator and the denominator are prime to each other. That is, the numerator and the denominator do not have a common factor. Write methods or functions for the following.
   (i) constructor that takes two integers
   (ii) Overloading of the operator "-".
   (iii) Overloading of the operator "*"
   (iv) Overloading of the operator "<<" so that a fraction is displayed as (n/f) if its numerator and denominator values are "n" and "f" respectively.

   5x4

1. Consider a class "Employee". Each object of class "Employee" must have the following attributes: (i) name, and (ii) age. It should be possible to print the name of an employee object. Consider another class "manager" which is a specialization of the class "Employee". Each manager object contains a list of employees that the manager supervises. Printing a manager object involves printing his/her name, age and the details of the employees that he/she is managing. Each employee object must also have a pointer to his/her manager. An employee may be queried about his/her manager. Implement the classes "Employee" and "Manager".

   15

   Which methods are not overridden?

   3

   Explain late binding.

   2

2. Write a class "Point". A "Point" class has two members to store its x and y coordinates and an appropriate constructor. A "Point" class has a method "getDistanceFrom" that accepts a "Point" object and returns the distance of the given point from "this" point.
   Write a "SimplePolygon" class in that has an array of "Point" objects. The constructor of this class is passed an array of points. The "SimplePolygon" class has a method called "getPerimeter" that calculates the perimeter of the polygon by calling repeatedly "getDistanceFrom" methods of its point objects..

   10+10

3. Consider the following C++ template. Introduce a copy constructor and a method for overloading assignment operator in the template.

```
template <typename T>.
class Point
{
public:
   T x;
   T y;

   Point() : x(0), y(0) {}

   Point(T _x, T _y) : x(_x), y(_y) {}
};
```

5+5

What is the problem of multiple occurrence of the same base class in the context of multiple inheritance in C++? How is it solved?

3+3

Suppose a class *X* is a friend of another class *Y* in C++. What does that signify? Is class *Y* a friend of *X*? If a class *Z* is a friend of *Y* then are *X* and *Z* are friends? Mention one use of friend class or friend function.

2+1+1

4. Suppose that a text file is to be read and a table is to be constructed such that each row in that table contains a letter in the English Alphabet (a-z, A-Z) and the number of times the letter occurs in the text file. This table is then written onto a file. Write a C++ program for this purpose. Define the necessary classes and their member functions and a *main* function.

20

5. Answer the following questions.
   (a) State the condition when an inline C++ function is not textually replaced??
   (b) Mention three operators, which cannot be overloaded.
   (c) Mention two operators, which cannot be overloaded as friend functions and why?
   (d) Why is it not good to overload "&&" and "||" operators in C++?
   (e) What is the prototype of a copy constructor for a class X? When is the copy constructor called?
   (f) Why call by reference is preferred over call by value for passing objects?
   (g) What is multiple inheritance? What is its syntax?

6x3+2

6. Write short notes on the following:
   a) Private Inheritance and its use
   b) Inline functions vs Macro Definitions
   c) dynamic_cast, type_id operators
   d) *try-catch* block and exception handling

5x4