AUTUMN MID SEMESTER EXAMINATION-2022

School of Computer Engineering

Kalinga Institute of Industrial Technology, Deemed to be University

Object Oriented Programming

IT-2005

Time: 1 1/2 Hours   **Full Mark: 20**

Answer any four Questions including Q.No.1 which is Compulsory.

The figures in the margin indicate full marks. Candidates are required to give their answers in their own words as far as practicable and all parts of a question should be answered at one place only.

[1 x 5]

1. Answer all the questions.

    a) Provide the output and justification for the following C++ program.   – 0.5

```cpp
#include <iostream>
using namespace std;
class Test
{
    int *p;
    public:
    Test()
    {
        p = new int(1);
    }
    Test(int *k)
    {
        p = new int(*k);
    }
    void Show()
    {
        cout<<*p;
    }
};

int main()
{
    static int i;
    Test t1, t2(&i);
    t1.Show();
    t2.Show();
    return 0;
}
```

    b) Justify whether it is mandatory to write a zero argument constructor?

    c) Justify why the copy constructor takes the argument to its own class type by reference.

    d) Write a program in C++ to demonstrate call by address for swapping two numbers.   — 1

    e) How is a friend function different from an inline function?

2.   a.   [2.5 Marks]

Write a program in C++ to find the volume of a sphere, cylinder and cube using function overloading concepts along with default arguments in every function? Write a main function to validate each function with/without default arguments.

b.

[2.5 Marks]

The effect of the default argument can be alternatively achieved by overloading. Discuss with suitable examples.

a.

[2.5 Marks]

Write a program in C++ to create a class named Distance with two data members named feet and inches. It includes the member functions for accepting values of the data members and compare function that takes only one argument as an object of the same class (i.e., Distance) which compares between two distances and returns the larger one.
[Note: A duplicate copy of the argument object should not be created and there must be a restriction on the modification of the argument object]

b.

[2.5 Marks]

Imagine a tollbooth on a bridge. Cars passing by the booth are expected to pay a 50-cent toll. Mostly they do, but sometimes a car goes by without paying. The tollbooth keeps track of the number of cars that have gone by, and of the total amount of money collected. Write a program in C++ to model this tollbooth with a class called TollBooth. The two data items are a type unsigned int to hold the total number of cars, and a type double to hold the total amount of money collected. A constructor initializes both of these to 0. A member function called PayingCar() increments the car total and adds 0.50 to the cash total. Another function, called NoPayCar(), increments the car total but adds nothing to the cash total. Finally, a member function called Display() to present the two totals (i.e., total number of cars and total amount of money collected).

a.

[2.5 Marks]

Write a program in C++ to create a base class named Coordinate having two int-type data members named x and y. Derive two specific classes, Rect_C (i.e., rectangle coordinate) and Polar_C (i.e., polar coordinate) from Coordinate. In the rectangle coordinate, the distance of a point(x,y) from the orgin (0,0) is the square root of x^2+y^2. Similarly, in polar coordinate, the distance of a point(r, a) from origin(0,0) is the square root of $[r\times\cos(a)]^2 + [r\times\sin(a)]^2$. In the base class, include getData() function to initialize the data members, and in the derived class include displayDistance function to compute and display the distance.

b.

[2.5 Marks]

Write a program in C++ to create a Student class which stores the name, roll and branch of a student. Derive three classes named InternalExam, MidSemesterExam and EndSemesterExam from it. InternalExam stores internal marks for five different subjects (out of 30), MidSemesterExam stores the mid semester exam marks for five different subjects (out of 20) and EndSemesterExam stores the end semester exam marks for five different subjects (out of 50). Derive a class Result from InternalExam, MidSemesterExam and EndSemesterExam to compute and display the total marks and percentage of a student.

a.

[2.5 Marks]

A singleton principle is used to restrict the instantiation of a class to one object. This is useful when exactly one object is needed and created to coordinate actions across the system or application. This also ensures that only one object of its kind exists and provides a single point of access to it for any other code. Write a program in C++ to demonstrate the singleton class.

b.

[2.5 Marks]

Write a program in C++ to keep track of and display the number of objects created, the number of objects destroyed, and number of active objects for a class named ObjectManager.