



Student Name: -

ID: -

Question 1: Chose the correct answer of the followings: 20 points

- 1- Regarding members of a class specified as Protected.
 - a) They can only be accessed by member functions of the class.
 - b) They can only be accessed by the member functions of class and friend functions.
 - c) They can only be accessed by member functions, friend functions and derived classes
 - d) All the previous answers are incorrect

- 2- If you have an object of class, which operator is used to access the object's members?
 - a) "."
 - b) "->"
 - c) "&"
 - d) none of the answers

- 3- Which operator used to get the address of an object ?
 - a) \$
 - b) =0
 - c) &
 - d) !

4. Which of the following is not a member of class?
 - A. Static method
 - B. Friend methods
 - C. const method
 - D. Virtual methods

5. How many instances of an abstract class can be created?
 - A. 0
 - B. 1
 - C. unlimited
 - D. non of the choices

6. Which of the following concepts provides facility of using a reference of an object inside another object?
 - A.Encapsulation
 - B.Abstraction
 - C.Aggregation
 - D.Inheritance

7. Which one of the following is the correct way to declare a pure virtual function?
 - A. virtual void Display(void){0};
 - B. virtual void Display = 0;
 - C. virtual void Display(void) = 0;
 - D. void Display(void) = 0;

8. Which of the following statement is correct?
 - A. Class is an instance of object.
 - B. Object is an instance of a class.
 - C. Class is an instance of data type.
 - D. Object is an instance of data type.

- 9 . an abstract class is a class that:
 - A. has at least one pure virtual method
 - B. all it methods are pure virtual methods.
 - C. have no data members.
 - D. have no method members.

- 10- Which statement is used to catch all types of exceptions?
 - a) catch()
 - b) catch(Test t)
 - c) catch(...)
 - d) none of the choices

Question 2: Given the following class that represent a vector in two dimension space **16 points**

```
class Vector
{
private:
    double X;
    double Y;
public:
    Vector(){X=Y=0.0;}
    Vector(double a,double b){X=a; Y=b;}
};
```

1. Define an << operator for output operation where the output should be in the form $Xi+Yj$
2. Define * operatrion that represent dot product where the result is $C=AB$ where $Cx=Ax*Bx$ and $Cy=Ay*By$
3. Define ++ operator that increment X and Y by 1 unit (pre and post increment)
4. Define > operator where $A>B$ if $\sqrt{(Ax)^2 + (Ay)^2} > \sqrt{(Bx)^2 + (By)^2}$

Question 3: A students data are stored in a sequential access file where the first record represent the number of students. And the remaining recorec represent the information of students as the following ID FName LName GPA separated by white spaces as shown in the example bellow **16 points**

2	Number of records
1001 Ahmad Hani 90.5	Record 1
1002 Sami Sameer 80.3	Record 2

Write a C++ program that perform the followings:

- 1- define a structure to store one student information.
- 2- Open the file above and read the first record.
- 3- Create a dynamicly allocated array of student structue.
- 4- Read the data from the file to Array created in previous section.

Question 4: Given the following program:

16 points

```
struct Date
{
    int Day;
    int Month;
    int Year;
};

void Set_Date(Date& Dt,int D,int M,int Y)
{
    Dt.Day=D;
    Dt.Month=M;
    Dt.Year=Y;
}

int main()
{
    Date Dt;
    int D,M,Y;
    cout<<"Day: ";    cin>>D;
    cout<<"Month: ";  cin>>M;
    cout<<"Year: ";   cin>>Y;

    Set_Date(Dt,D,M,Y);

    return 0;
}
```

The value of the year should not be negative.

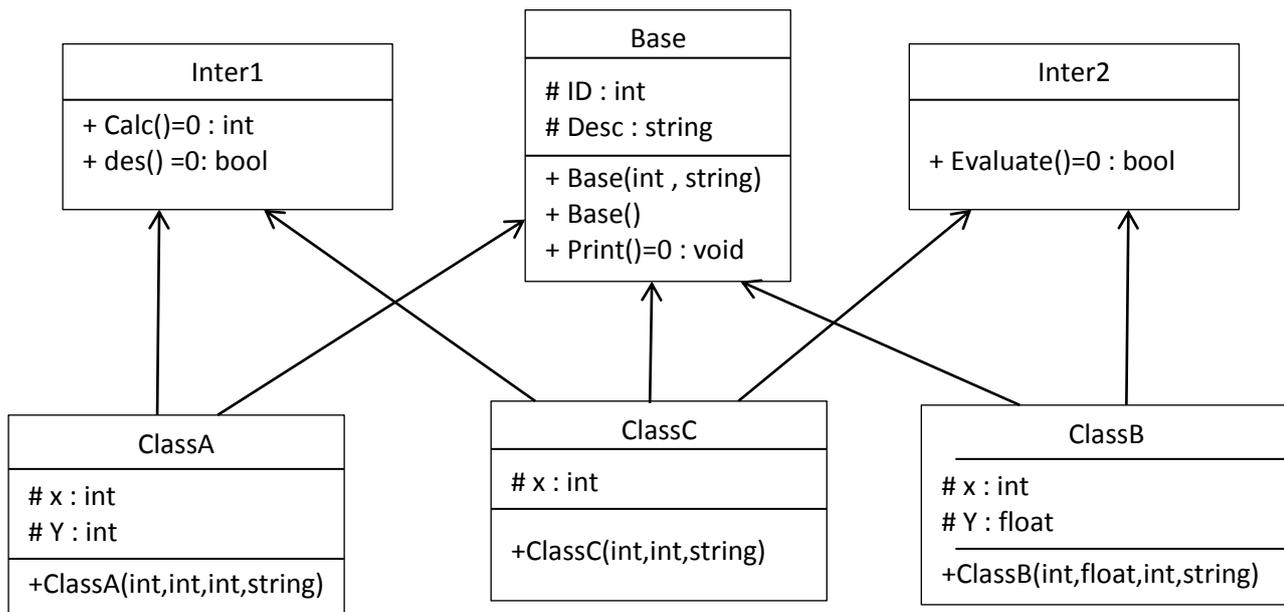
The value of the month should be between 1 and 12.

The value of the Day should be greater than 0 and the upper bound depends on the month and year.

- 1- Define an exception handling class that is thrown in function Set_Date with the appropriate message if one of the above conditions is violated.
- 2- The function Set_Date should rethrow the exception to the caller function.
- 3- Define a try catch block in main that catches the exception if it occurs.

Question 5: Given the following UML diagram, Construct the class hierarchy shown bellow.

20 points



Question 6: Define a class that have the following properties: **12 points**

- 1- allow only 3 object to be allocated at the same time.
- 2- If there is 3 object in memory it will deny creating new object.
- 3- If an object in memory was deleted then an new object can be created.