

for University, con., univer.

Paper Code: MCA-111

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MCA

(SEM I) ODD SEMESTER

MINOR TEST (EXAMINATION) 2022-2023

Object-Oriented Programming with C++

whil (contd)

{ - -

statement  
++;

**Time: 2 Hours**

**Max. Marks: 30**

**Note: Answer all questions**

int c = fib(q);

**Q.1 Attempt any Three parts of the following.Q.1 (a) is compulsory.**

- (a) Explain basic concepts, benefits and applications of OOPs in detail? 4
- (b) What is typecasting? What are explicit & implicit type conversions with example. 3
- (c) Compare and contrast for, while & do-while looping statements on the basis of syntax? 3
- (d) Differentiate between nested if-else & switch statement. Write a C++ program that checks whether a number is palindrome or not. 3

**Q.2 Attempt any Two parts of the following.Q.2 (a) is compulsory.**

- (a) What is the need of constructor and destructor? Explain types of constructors with example. 4
- (b) What do you mean by inline function? Discuss about array of objects with example 3
- (c) Explain friend function. Write a program to demonstrate friend function in C++. 3
- (d) What is constructor overloading? Write a C++ program to demonstrate constructor overloading. 3

**Q.3 Attempt any Two parts of the following.Q.3 (a) is compulsory.**

- (a) What is function? What are its advantages? Explain the difference b/w call by value & call by reference. Write a program in C++ to generate Fibonacci series using recursion function. 4
- (b) Discuss the use of public, private & protected access specifier & their visibility in the class. What is the default access modifier in a class? 3

(c) What do you mean by operator precedence? Differentiate between Procedural Oriented Programming & Object-Oriented Programming. 3

(d) What is a class? What is the relation b/w an object & a class? Write a program which shows how to define a class, how to access member functions & how to create & access objects in C++. 3

switch (7 marks)

```
{  
    case 1 :  
    {  
        --  
        break;  
    }  
    case 2 :  
    {  
        --  
        break;  
    }  
    default :  
    {  
        --  
        inside body  
    }  
}
```

MCA  
 ODD SEMESTER  
 MINOR TEST -2021-2022

## OBJECT ORIENTED PROGRAMMING WITH C++

Time-2Hrs

Marks-20

Note-Answer all questions

Q1 Attempt any three parts of the following. Q1(a) is compulsory.

- (a) What is the primary data type in C++, their size, range, and format? I 4
- (b) Explain the difference between Do While and While statement with an example. I 2
- (c) What are Destructors. Explain with an example. I 2
- (d) What is Constructor. Define different types of constructors. I 2

Q2 Attempt any two parts of the following. Q2(a) is compulsory.

- (a) What are derived and user-defined data types in C++. I 4
- (b) Write a program to print prime numbers up to a given number. I 2
- (c) What are the differences between the object-oriented programming and procedure-oriented programming? I 2

Q3 Attempt any two parts of the following. Q3(a) is compulsory.

- (a) What is friend function? Write a program to swap two numbers using pass by addresses with help of friend function. I 4
- (b) Describe the concept static data member and static member functions with suitable example. I 2
- (c) What is inline function? Write down the necessity and limitation of inline function. I 2

```

while (cond)
{
    body;
}
do
{
    body;
} while (cond);

```

- ✓ In line function
- ✓ friend function
- ✓ Static Destructor
- ✓ Static members
- POD & OOPS

- ✓ Constructor
- ✓ Destruct

- Primes
- factorial
- fibonacci
- Armstrong
- pallindrome

**M.C.A.**  
**SUMMER TERM**  
**MINOR TEST 2018 - 2019**

Subject Name: Object Oriented Programming using C++

Time: 2 Hrs.

Max. Marks: 20

Note: Answer all questions.

**Q.1 Attempt any Three parts of the following. Q. 1(a) is compulsory.**

- (a). Write a program in C++ that prints following pattern- 4

|                             |           |
|-----------------------------|-----------|
| 1                           | 1         |
| 2 2 2                       | 2 2 2     |
| 3 3 3 3 3                   | 3 3 3 3 3 |
| 4 4 4 4 4 4 4 4 4 4 4 4 4 4 |           |

10-1+1  
13

- (b). Given student's records with each record containing id, name and age of a student. Write a C++ program to read these records and display the student's record whose age is greater than 18. 2

- (c). Design a class Box in C++ with constructor overloading with following description- 2

Private Member

I. Length

II. Width

III. Height

Public Member

I. A function Display() that displays the values of all members of Box object.

Overload constructor Box with no argument, one argument, two argument and three argument.

- (d). What is friend function? Explain it with a suitable example. 2

**Q.2 Attempt any Two parts of the following. Q. 2(a) is compulsory.**

- (a). Write a C++ function that accepts two parameter n1 and n2 and prints all prime number between them. 4

- (b). Write a program in C++ that finds number of even and odd elements in an array. 2

- (c). Define the following object-oriented programming concepts- 2

I. Inheritance

II. Encapsulation

III. Polymorphism

IV. Class

**Q.3 Attempt any Two parts of the following. Q. 3(a) is compulsory.**

- (a). What are the various types of constructor? Give an example for each. Whether constructors could be overloaded? 4

(b). Define a class ComplexNumber in C++ with following description- 2

Private Members

- I. Real
- II. Imaginary

Public

- I. A function Add() that accepts two complex number objects as argument and return a complex number object which is the addition of parameter passed to function.
- II. A function Multiply() that accepts two complex number objects as argument and return a complex number object which is the multiplication of parameter passed to function.
- III. A function Sub() that accepts two complex number objects as argument and return a complex number object which is the subtraction of parameter passed to function.
- IV. A function Div() that accepts two complex number objects as argument and return a complex number object which is the Division of parameter passed to function.

(c). Differentiate the following terms in brief- 2

- I. Constructor and Destructor
- II. Structure and Class

MCA, 2<sup>nd</sup> Sem  
Minor Test 2018-19  
**Object Oriented Programming with C++**

*Time: 2hrs*

*Marks: 20*

*Note: Attempt all questions.*

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**Q1. Attempt any 3 parts of the following. Q1(a) is compulsory**

- (a) In how many ways a member can be taken in a class? Can we access private members 4 through objects? If your answer is yes then write down the suitable code and if it is no then write down the other ways for accessing private members using appropriate examples?
- (b) Define inline functions. Why do we need inline functions? Write down a code in C++ 2 to show the use of inline function.
- (c) How friend functions are written in C++? Write down a C++ code to explain the use 2 of friend functions.
- (d) Define copy constructors and write down the code to print the values of the two 2 public data members (one is of integer type and other is of float type) using copy constructors.

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**Q2. Attempt any 2 parts of the following. Q2(a) is compulsory**

- (a) Write down the various characteristics of object oriented programming? How are they 4 implemented in C++? Write in short on all of them by giving appropriate example for each.
- (b) What are various object oriented programming languages? Differentiate between any 2 two object oriented programming languages.
- (c) What is the use of scope resolution operator? Write down a C++ program to add any 2 two private data members of integer type using member function and scope resolution operator.

Q3. Attempt any 2 parts of the following. Q3(a) is compulsory

(a) Define constructors and destructors. How they are invoked? What is the order of invocation? How constructors and destructors are different from a normal member functions? Can we have more than one constructor in a class? Define constructor overloading? 4

(b) What is the use of parameterized constructors? Write down the code to print values of three private data members using parameterized constructors by implicit and explicit call both? 2

(c) Why do we need to write a destructor? How are they written? Can we have more than one destructor in a class? Define default constructors and default destructors using suitable examples? 2

Subject Code: MCA-105

Roll No.

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M.C.A.  
EVEN SEMESTER  
MINOR TEST 2017 - 2018

Subject Name: Object Oriented Programming using C++

Time: 2 Hrs.

Max. Marks: 20

Note: Answer all questions.

Q.1 Attempt any Three parts of the following. Q. 1(a) is compulsory.

- (a) Write a C++ function that accepts a number of lines as a parameter and prints the Fibonacci triangle. e.g. Fibonacci triangle of length 5 is 4

1  
1 2  
3 5 8  
13 21 34 55  
89 144 233 377 610

- (b). Write a C++ function that rotates 90 degree clockwise a two-dimensional square array. 2  
e.g. if initial array is

11 22 33  
44 55 66  
77 88 99

After transformation the array will be-

77 44 11  
88 55 22  
99 66 33

- (c). Design a class *Date* in C++ having three private data members day, month and year, a default and parameterize constructor to initialize above data members and a method *getDay()* to print the day of date. e.g. If the date is 12-02-2018 then it should print Monday. 2

- (d) A book shop maintains the inventory of books that are being sold at the shop. The list includes details such as author, title, price, publisher, and stock position. Whenever a customer wants a book, the sales person inputs the title and author and the system searches the list and displays whether it is available or not. If it is not, an appropriate message is displayed. If it is, then the system displays the book details and requests for the number of copies required. If the requested copies are available, the total cost of the requested copies is displayed, otherwise the message "Required copies are not in stock" 2

is displayed. Design a class books in C++ with suitable member functions and constructors. Use new operator in constructors to allocate memory space required.

Q.2 Attempt any Two parts of the following. Q. 2(a) is compulsory.

- (a). Write a C++ function that accepts two parameter n1 and n2 and prints all Pythagorean triplet between n1 and n2. A Pythagorean triplet consists of three positive integers a, b, and c, such that  $a^2 + b^2 = c^2$ . Such a triplet is commonly written (a, b, c), and a well-known example is (3, 4, 5), (5, 12, 13).
- (b). Write a function in C++ that accepts N as parameters and returns the sum of following series upto N terms-

$$199, 195, 191, 187, 183, \dots$$

- (c). Define the following object-oriented programming concepts-

- I. Inheritance
- II. Encapsulation
- III. Polymorphism
- IV. Class

Q.3 Attempt any Two parts of the following. Q. 3(a) is compulsory.

- (a). Design a class *RationalNumber* that emulates a rational number  $p/q$  (where  $q \neq 0$ ) with a suitable constructor and member functions *add()*, *subtract()*, *divide()* and *multiply()* that find sum, difference, division and product of two rational number.
- (b). Design a class *Pattern* in C++ that have a private data member *n*, a constructor to initialize *n* and a method *printPattern()* which print the following pattern upto *n*-levels.  
e.g. if the value of *n* is 4 the pattern will be printed as-

|               |   |
|---------------|---|
| 0             | 0 |
| 0 1 0         | 1 |
| 0 1 2 1 0     |   |
| 0 1 2 3 2 1 0 |   |

- (c). Differentiate the following terms in brief-

- I. Constructor and Destructor
- II. General Function and Member Function
- III. Structure and Class

**MCA, 1<sup>st</sup> Sem.**  
**Major Examination 2022-23**  
**OBJECT ORIENTED PROGRAMMING WITH C++**

*Time: 3hrs**Marks: 50*


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*Note: Attempt all questions. Each question carries equal marks.*

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**Q1. Attempt any 5 parts of the following.**

- (a) Compare Class and Object. Write a C++ program to count the number of objects of a certain class. 2
- (b) Distinguish between Dynamic binding and Message passing. 2
- (c) Explain the use of private and public access specifier? How they are different from each other? 2
- (d) What is the benefit of copy constructor? Explain the necessity of defining your own copy constructor? 2
- (e) What is the need for initialization of object using Constructor? 2
- (f) What are the static data members? Explain with an example. What is the use of static data members? 2
- (g) Differentiate between call by value and call by reference with example. 2

**Q2. Attempt any 2 parts of the following.**

- (a) Define polymorphism. Explain its types. How is the polymorphism implemented in C++? Give suitable example. 5
- (b) What is the need of virtual function? Write a C++ program to demonstrate the use of pure virtual function using base and derived classes. 5
- (c) What is inheritance? How to inherit a base class as protected? Explain it for multiple base classes. 5

**Q3. Attempt any 2 parts of the following.**

- (a) Explain the types of inheritance. What are the rules governing the declaration of the classes of multiple inheritance? Show the use of multiple inheritance with the help of C++ program. 5
- (b) Define the concept of virtual base class with appropriate code. What is the difference between abstract class and concrete class? Explain in detail using suitable example. 5
- (c) Define operator overloading. Explain how to overload unary operator and binary operator. Which operators cannot be overloaded? Write the code to overload + operator so that it can add two complex numbers. 5

**Q4. Attempt any 2 parts of the following.**

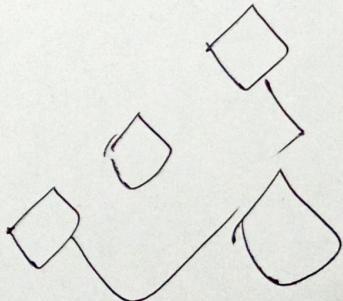
- (a) Explain exception handling. Explain types of exception handling with suitable examples. Write a C++ program to demonstrate the use of try and nested try. 5
- (b) Explain the role of seekg(), seekp(), tellg() and tellp() functions in the process of random access in a file. 5
- (c) What is meant by asynchronous and synchronous exceptions? Discuss the role and significance of try, catch and throw. Explain their syntax and example. 5

**Q5. Attempt any 2 parts of the following.**

- (a) What are the various file modes? Explain any four file modes supported in C++. Write a program to copy the contents of a file ABC.txt into another file XYZ.txt. 5
- (b) How do you reach the end of a file during file handling programming? Write a C++ program involving input/output operations on the characters in a file. 5
- (c) What are the two methods available for opening the files? Write a program in C++ to update the contents of a file by accessing the contents randomly. 5

it read  
in n

in  
app  
at  
down



MCA, 1<sup>st</sup> Sem.

Major Examination 2021-22

## Object Oriented Programming with C++

Time: 3hrs

Marks: 50

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*Note: Attempt all questions. Each question carries equal marks.*

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**Q1. Attempt any 5 parts of the following.**

- (a) Differentiate between virtual function and virtual class. 2
- (b) What are the different memory allocation and deallocation methods in 2  
C++?
- (c) Write down a C++ program to multiply two matrices. 2
- (d) Write a C++ program to generate Fibonacci series using recursion. 2
- (e) Write down a C++ program to check whether an input number is Prime or 2  
not.
- (f) Write down a C++ program to check whether an input number is 2  
Armstrong or not.
- (g) Write an object oriented program in C++ to check whether an input string 2  
is palindrome or not?

**Q2. Attempt any 2 parts of the following.**

- (a) How can we access a private member of any class? What is the difference 5  
between an inline function and a friend function? Why do we require  
these functions? Write down C++ program to show the use of these  
functions.
- (b) How do we denote the constructors and destructors in a C++ program? 5  
What are the types of constructors in C++? Explain using suitable  
examples. When are they invoked? Write a program in C++ to show their  
order of invocation.
- (c) Which type of class members can be inherited and how? Can we inherit a 5  
private member of any class? Explain different types of Inheritance in  
C++ using suitable figures and code fragments.

- Q3. Attempt any 2 parts of the following.**
- (a) Give a taxonomy to represent the types of Polymorphism in C++. Which operators cannot be overloaded and why? Write down a program in C++ for addition of two complex numbers using operator overloading. 5
- (b) Differentiate between function overloading and function overriding. Which of them is archived at compile time and which is archived at run time? Write down C++ codes to show both of these concepts. 5
- (c) How overloading of a unary operator with member function is different from overloading it with friend function? Write down the suitable C++ codes for these two methods of operator overloading to justify your answer. 5
- Q4. Attempt any 2 parts of the following.**
- (a) How does Abstract Base Class help any programmer? Differentiate between Abstract and Concrete classes? Can we instantiate an abstract class? Write down a C++ code for overriding an abstract method. 5
- (b) In file handling, why should we always close the files after their use? Explain the sequential and random-access file operations. Write a C++ program to count a specified word 'the' within a text file MCA.txt. 5
- (c) Describe the C++ stream classes structure using a suitable diagram. Which library holds all the stream classes in the C++? How does the standard streams work for input and output? 5
- Q5. Attempt any 2 parts of the following.**
- (a) What is the need of Templates? How do they work? Differentiate between Function Template and Class Template using suitable examples. Write a C++ program for adding two floating point numbers using function templates. 5
- (b) Explain the benefits of exception handling. Write a C++ program for exception handling. This code should have a try and a catch block to process the arithmetic exception generated by division-by-zero error. 5
- (c) How Exception Handling is done in C++? Differentiate between the Synchronous and Asynchronous Exceptions. Keyboard interrupts and disc failure comes under which type of exception? 5

MCA, 2<sup>nd</sup> Sem  
Major Examination 2018-19  
**Object Oriented Programming with C++**

Time: 3 hrs

Marks: 50

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*Note: Attempt all questions. Each question carries equal marks.*

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**Q1. Attempt any 5 parts of the following.**

- (a) Can a copy constructor accept an object of the same class as parameter instead of reference of the object? For a class MyClass { }; what default methods will the compiler generate? 2
- (b) What are the advantages of using new operator as compared to the function alloc( )? 2
- (c) Write a program to find Maximum out of two numbers using friend function. Note that here one number is a member of one class and the other number is member of some other class. 2
- (d) Write a program to swap private data members of classes named as ABC and XYZ using friend function. 2
- (e) Write an object oriented program which accepts days as integer and displays total number of years, months and days in it. 2
- (f) Write a C++ program to demonstrate the usage of static data member and static member function. 2
- (g) Write an object oriented program to calculate the total expenses. Quantity and price per item are input by the user and discount of 10% is offered if the expense is more than 5000. 2

**Q2. Attempt any 2 parts of the following.**

- (a) Write a function called hms\_to\_secs( ) that takes three int values - for hours, minutes, and seconds - as arguments, and returns the equivalent time in seconds (type long). Create an object oriented program that exercises this function by repeatedly obtaining a time value in hours, minutes, and seconds from the user (format 12:59:59), calling the function, and displaying the value of seconds it returns. 5
- (b) Write an object oriented program to design a class complex to represent complex numbers. The complex class should use an external function (use it as a friend function) to add two complex numbers. The function should return an object of type complex representing the sum of two complex numbers. 5
- (c) Write an object oriented program to create a bank account and provide a user id and password to the account holder who can login using his credentials. If login is successful then user should be able to do the following: 5

- i. Deposit money
- ii. Withdraw money
- iii. Display the balance.

**Q3. Attempt any 2 parts of the following.**

- (a) Differentiate between following using suitable code: 5
  - i. Multilevel inheritance and multiple inheritance
  - ii. Hierarchical inheritance and hybrid inheritance
- (b) Write a program illustrating the use of virtual functions in class. What are the implications of making a function pure virtual? 5
- (c) What is meant by function overloading? Write down a suitable code. Why it is also known as function polymorphism in object oriented programming? 5

**Q4. Attempt any 2 parts of the following.**

- (a) What are the main advantages of passing arguments by reference? Give function prototype of a function fun( ) which is having two objects of class ABC as arguments and returning reference of an object as parameter. 5
- (b) What is an Exception? Explain the terms try, throw and catch with appropriate example? What should be placed inside these blocks? Give an appropriate example. 5
- (c) What are the advantages of using-exception handling mechanism in a program? What happens when a function throws an exception that was not specified by an exception specification for this function? Explain using suitable example. 5

**Q5. Attempt any 2 parts of the following.**

- (a) List at least three new operators added by C++ which supports the object oriented programming. Explain the application of the scope resolution operator in C++ by giving an appropriate code. 5
- (b) What are the benefits of operator overloading? Write a C++ program to overload + operator to add two matrices and == operator to compare two strings. 5
- (c) Write a program for developing a matrix class which can handle integer matrices of different dimensions. Also overload the operator for addition, multiplication and comparison of matrices. 5

MCA, 2<sup>nd</sup> Sem  
 Major Examination 2018-19 (Summer Term)  
**Object Oriented Programming with C++**

Time: 3hrs

Marks: 50

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*Note: Attempt all questions. Each question carries equal marks.*

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**Q1. Attempt any 5 parts of the following.**

- (a) Define constructors and destructors. How they are invoked? Why do we need to write a destructor? How are they written? 2
- (b) Explain type of constructors using suitable examples. Can we have more than one constructor or destructor in a class? 2
- (c) Can we access private members through objects? If your answer is yes then write down the suitable code and if it is no then write down the other ways for accessing private members using appropriate examples? 2
- (d) Define inline functions. Why do we need inline functions? Write down a code in C++ to show the use of inline function. 2
- (e) How friend functions are written in C++? Write down a C++ code to explain the use of friend functions. 2
- (f) Write down the various characteristics of object oriented programming? How are they implemented in C++? 2
- (g) What are various object oriented programming languages? Differentiate between any two object oriented programming languages. 2

**Q2. Attempt any 2 parts of the following.**

- (a) Write an object oriented program to calculate the total fee to be deposited by a student in summer term when the user inputs the number of subjects. Maximum two subjects are allowed to be registered in summer term with fee of Rs 12000/- per subject and additional late fee of Rs 3000/- has to be charged if registration is done by the student after the due date. 5
- (b) Write an object oriented program to create an attendance management model for students and provide a user id and password to the student who can login using his credentials. If login is successful then the user should be able to see the attendance. 5
- (c) Write a program to find smallest of two numbers using friend function. Note that here one number is a member of one class and the other number is member of some other class. 5

**Q3. Attempt any 2 parts of the following.**

- (a) Define Inheritance and its types using suitable diagrams and code fragments. How 5 inheritance contributes to the object oriented programming? Can we inherit private members? Justify your answer.
- (b) What is meant by polymorphism? Explain its types. Differentiate between function 5 overloading and operator overloading by giving suitable examples.
- (c) What do you mean by virtual function? What is its significance? What are the 5 implications of making a function pure virtual?

**Q4. Attempt any 2 parts of the following.**

- (a) What is the significance of exception handling in object oriented programming? What 5 happens when a function throws an exception that is not specified?
- (b) What do you know about exception handling? Explain the terms try, throw and catch 5 with appropriate example?
- (c) Can we pass an object as parameter of a function and return an object through the 5 function? Give the suitable example to justify your answer.

**Q5. Attempt any 2 parts of the following.**

- (a) Differentiate between compile time and run time polymorphism. Write a C++ program 5 to show the use of function overloading for addition operation.
- (b) What are the advantages of operator overloading? Write a C++ program to overload + 5 operator to add two 2D arrays of integer types.
- (c) Which operators cannot be overloaded and why? Explain the application of the scope 5 resolution operator in C++ by giving an appropriate code.

M.C.A.  
EVEN SEMESTER  
MAJOR EXAMINATION 2017 - 2018

OBJECT ORIENTED PROGRAMMING WITH C++

Time: 3 Hrs.

Max. Marks: 50

Note: Attempt all questions. Each question carries equal marks.

**1. Attempt any five parts of the following: (5×2 = 10)**

- (a) Write a C++ function that accepts a number  $N$  and finds the smallest number not less than  $N$ , which has all digits even. e.g. if  $N = 1345$  then output is 2000 as it has all digits even.

- (b) Write a C++ function that accepts two coordinates of a line as  $(x_1, y_1)$  and  $(x_2, y_2)$ , find if the line passing through these points also passes through origin or not.

- (c) Write a C++ function that accepts  $a$  and  $N$  and find out sum of first  $N$  terms of following series-

$$a + a^2 + a^3 + a^4 + a^5 + \dots \dots \dots \quad \text{Ans}$$

- (d) Design a Class *Matrix* in C++ that has data members to represent a matrix and a function that displays the sum of all elements of middle row and middle column of matrix.

- (e) Design a class *Fibonacci* in C++ function that has a data member  $N$ , suitable constructor to initialize it and a method *printFibonacci()* that prints  $N$  terms of Fibonacci series in reverse order e.g. if the value of  $N$  is 5 then it should print 3 2 1 1 0.

- (f) Why constructor is important in object-oriented programming? Explain various types of constructor used in C++ with example.

- (g) Design a class *Pattern* in C++ that has a data member *num*, a suitable constructor to initialize it and a method *printPattern()* to print the following pattern upto level *num*.

i = 1

i = 2

i = 3

i = 4

i = 5

1 1 1 1 1 1 1 1

2 2 2 2 2 2 2

3 3 3 3 3

4 4 4

5

i = j

for (i=1; i<=5; i++)

{

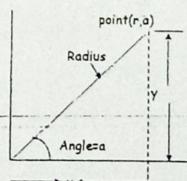
for (j=i; j<=5; j++)

    out

**2. Attempt any two parts of the following: (2×5 = 10)**

- (a) What is inheritance? Explain various types of Inheritance with implementation in C++.

- (b) Design a class *Polar* in C++ which describes a point in the plane using polar coordinates radius and angle. A point in polar coordinates is shown below



Overload + operator using friend function to add two objects of Polar. Note that we cannot add polar values of two points directly. This requires first the conversion of points into rectangular coordinates, then adding the respective rectangular coordinates and

finally converting the result back into polar coordinates. You need to use the following trigonometric formula:

$$x = r\cos\theta \quad y = r\sin\theta \quad \theta = \tan^{-1}(x/y) \quad r = \sqrt{x^2 + y^2}$$

Also define a class *Rectangle* to represent points in rectangle systems. Use type conversion to convert from *Polar* to *Rectangle* and vice-versa.

- (c) Design a class *Matrix* in C++ to represent a matrix and overload operator \*, + and - using friend function to perform multiplication, addition, and subtraction of two matrices.
3. Attempt any two parts of the following: (2×5 = 10)

- (a) Consider the following C++ code and answer the below questions-

```
class Exterior
{
    int OrderId;
    char Address[20];
protected:
    float Advance;
public:
    Exterior();
    void Book();
    void View();
};

class Paint : public Exterior
{
    int WallArea, ColorCode;
protected:
    char Type;
public:
    Paint();
    void PBook();
    void PView();
};

class Bill : public Paint
{
    float Charges;
public:
    Bill();
    void Billing();
    void Print();
};
```

- I. Which type of Inheritance is illustrated in the above example?
- II. Write the names of all the data members, which are directly accessible from the member functions of class *Paint*.
- III. Write the names of all the member functions, which are directly accessible from an object of class *Bill*.
- IV. What will be the order of execution of the constructors, when an object of class *Bill* is declared?
- V. If class *Bill* was derived privately from class *Paint*, then name the member that could be accessed through object of class *Bill*.

- (b) What is type conversion? Explain its various types. Use type conversion to convert class *Array* that represent an array to basic data type. The value of basic data type after conversion is the number of prime elements in array. e.g. if the array contains [2,5,9,10,7], then basic data type will hold value 3 as there are three prime numbers in array.
- (c) What is virtual base classes in C++? Explain it with the help of example. What is the order of constructor calling in case of virtual inheritance?

4. Attempt any two parts of the following: (2×5 = 10)

- (a) Write a program in C++ that reads number written on *Num.txt* to initialize an array and sort it. After sorting, it writes sorted array on file *sort.txt*.
- (b) What are the various file modes in C++? Write a program in C++ to read a file *temp.txt* and find out number of palindrome words available in file *temp.txt*.

- (c) What is binary file? What are its advantages? Write a program in C++ to read numbers written on binary file *bin.out* and write the pattern corresponding to number in binary file *pat.out*. e.g. if the number read from file is 3 then pattern will be-

1  
1      1  
1      2      1  
1      3      3      ,      1

5. Attempt any two parts of the following:  $(2 \times 5 = 10)$

- (a) What is template in C++? Design a class template in C++ to create any type of array and find out first two minimum and maximum elements of array.
- (b) Write the rules for calling function in case of overloaded function and template function. Write a function template in C++ to find number of unique elements in any type of array. e.g. if the array contains [1,2,1,3,4,2] then number of unique elements is 4.
- (c) Write a program in C++ to read a file character by character, word by word and line by line. Also explain about functions used for manipulating file pointers.