

1. C++ REVISION TOUR

2009 Outside Delhi:

1.a) What is the difference between Actual Parameter and Formal Parameter? Give an example in C++ to illustrate both types of parameters. 2

Ans) The parameters in the function call statement (or calling function) are called as Actual Parameters.

The parameters in the function definition (or called function) are called as Formal Parameters.

Eg:

```
void manip(int x, int y)
```

```
{ ---  
  ---  
}
```

```
void main( )
```

```
{  
  int a,b;  
  ----  
  Manip(a,b);  
}
```

Here a,b are Actual Parameters and
x,y are Formal Parameters.

1.b) Write the names of the header files to which the following belong: 1

(i) setw() (ii) sqrt()

Ans: (i) setw() – iomanip.h
(ii) sqrt() - math.h

1.c) Rewrite the following program after removing the syntactical errors (if any). Underline each correction. 2

```
include <iostream.h>  
include <stdio.h>  
class MyStudent  
{ int StudentId=1001;  
  char Name[20];  
public  
  MyStudent() {}  
  void Register( )  
  { cin>>StudentId;  
    gets(Name);  
  }  
  void Display( )  
  { cout<<StudentId<<"."<<Name<<endl;  
  }  
};
```

```
void main( )  
{ MyStudent MS;  
  Register.MS( );  
  MS.Display( );  
}
```

Ans:

#include <iostream.h>

#include <stdio.h>

```
class MyStudent  
{ int StudentId;  
  char Name[20];  
public:  
  MyStudent() {}  
  void Register( )
```

```
{ cin>>StudentId;  
  gets(Name);  
}  
void Display( )  
{ cout<<StudentId<<"."<<Name<<endl;  
}  
};
```

```
void main( )
```

```
{ MyStudent MS;  
  MS.Register( );  
  MS.Display( );  
}
```

1.e) Find the output of the following program:2

```
#include<iostream.h>  
#include<ctype.h>  
void Secret(char Msg[ ], int N);  
void main( )  
{ char SMS[ ]="rEPorTmE";  
  Secret(SMS,2);  
  cout<<SMS<<endl;  
}  
void Secret(char Msg[ ], int N)  
{ for(int C=0;Msg[C]!='\0';C++)  
  if(C%2= =0)  
    Msg[C]=Msg[C]+N;  
  else if(isupper(Msg[C]))  
    Msg[C]=tolower(Msg[C]);  
  else  
    Msg[C]=Msg[C]-N;  
}
```

Ans:

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1.f) Study the following program and select the possible output from it: 2

```
#include<iostream.h>  
#include<stdlib.h>  
const int MAX=3;  
void main( )  
{ randomize( );  
  int Number;  
  Number=50+random(MAX);  
  for(int P=Number;P>=50;P--)  
    cout<<P<<"#";  
  cout<<endl;  
} (i) 53#52#51#50# (ii) 50#51#52#  
(iii) 50#51# (iv) 51#50#
```

Ans:

(iv)51#50#

(Solution: MAX value is 3

That's why random(MAX) can produce 0 or 1 or 2.
(random(N) will produce no. between 1 to n-1)

The Number value may be 50 or 51 or 52.

The P value starts from Number, upto 50,
each time decreases by 1.

So Possible outputs are as follows:

52#51#50#

51#50#

50#

As the output 51#50# is available in given answers, so 51#50# is the answer.)

2008 Delhi:

1.b) Name the header files that shall be needed for the following code: 1

```
void main()
{ char String[ ] = "Peace";
  cout << setw(2)<<String;
}
```

Ans) iomanip.h, ostream.h

1. c) Rewrite the following program after removing the syntactical error(s) if any. Underline each correction. 2

```
#include<iostream.h>
void main( )
{   First = 10, Second = 20;
    Jumppto(First;Second);
    Jumpto(Second);
}
void Jumppto(int N1, int N2 = 20)
{   N1=N1+N2;
    count<<N1>>N2;
}
```

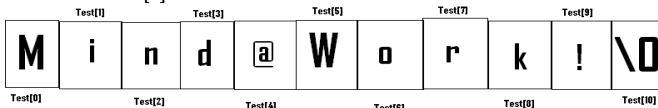
Ans)

```
#include<iostream.h>
void Jumppto(int N1,int N2=20);
//Prototype missing
void main( )
{ int First = 10, Second = 20;
  //Data type missing
  Jumpto(First,Second);
  //Comma to come instead of ;
  Jumpto(Second);
}
void Jumppto(int N1, int N2)
{   N1=N1+N2;
    cout<<N1<<N2;
    //Output operator << required
}
```

d) Find the output of the following program;3

```
#include<iostream.h>
#include<ctype.h>
void main( )
{   char Text[ ] = "Mind@work!";
    for(int I=0; Text[I]!='\0';I++)
    {   if(!isalpha(Text[I]))
        Text[I]='*';
        else if(isupper(Text[I]))
            Text[I]=Text[I]+1;
        else
            Text[I] = Text[I+1];
    }
    cout<<Text;
}
```

Ans: Text[] =



When I=0

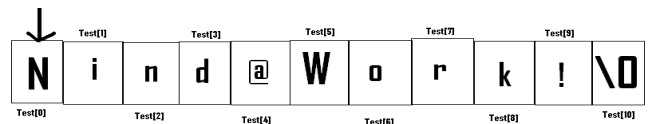
Since Text[0] is 'M', Upper Case Letter, (isupper(Text[I]) will becomes true.

So Text[I] =Text[I+1]

So Text[0]=Text[0]+1

Text[0] =77(ASCII Value of M) + 1 = 78
=N(78 is ASCII Value of N)

Now the String Text[] =



When I=1

Since Text[1] is 'i', Which is a character, but which is not Upper case,

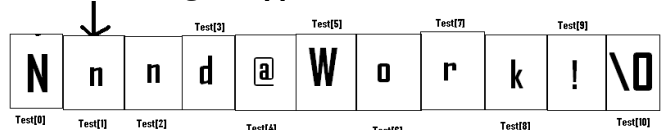
else part will be executed.

Ie Text[I]=Text[I+1]

Here Text[1]=Text[1+1]
=Text[2]

Ie 'n' will be stored in place of 'i'

Now the String Text[] =



When I=2

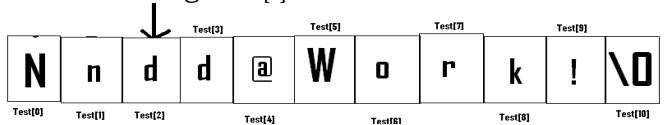
Since Text[2] is 'n', Which is a character, but which is not Upper case, else part will be executed.

Ie Text[I]=Text[I+1]

Here Text[2]=Text[2+1]
=Text[3]

Ie 'd' will be stored in place of 'n'

Now the String Text[] =



When I=3

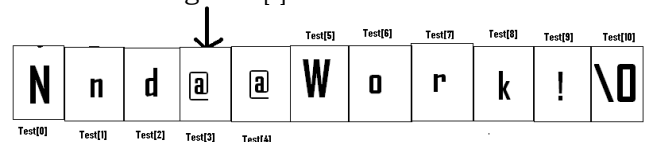
Since Text[3] is 'd', Which is a character, but which is not Upper case, else part will be executed.

Ie Text[I]=Text[I+1]

Here Text[3]=Text[3+1]
=Text[4]

Ie '@' will be stored in place of 'd'

Now the String Text[] =



When I=4

Since Text[4] is '@', Since which is not an alphabet,

(!isalpha(Text[I])) will becomes true.

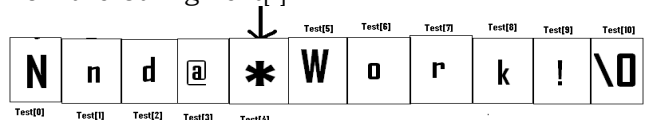
Ie **if(!isalpha(Text[I]))**

Text[I]='*';

Ie Text[4]='*'

Ie '*' will be stored in place of '@'

Now the String Text[] =



When I=5

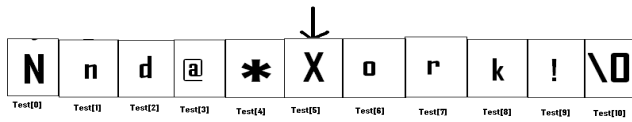
Since Text[5] is 'W', Upper Case Letter, (isupper(Text[I]) will becomes true.

So Text[I] =Text[I+1]

So Text[5]=Text[5]+1

Text[5] =87(ASCII Value of W) + 1 = 88
=X(88 is ASCII Value of X)

Now the String Text[] =

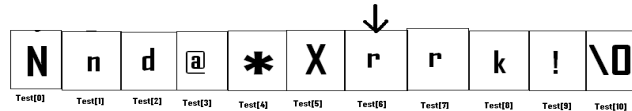


When I=6

Since Text[6] is 'o', Which is a character, but which is not Upper case, else part will be executed.

```
Ie Text[I]=Text[I+1]
Here Text[6]=Text[6+1]
      =Text[7]
```

Ie 'r' will be stored in place of 'o'
Now the String Text[] =

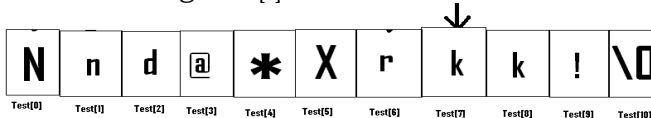


When I=7

Since Text[7] is 'r', Which is a character, but which is not Upper case, else part will be executed.

```
Ie Text[I]=Text[I+1]
Here Text[7]=Text[7+1]=Text[8]
```

Ie 'k' will be stored in place of 'r'
Now the String Text[] =

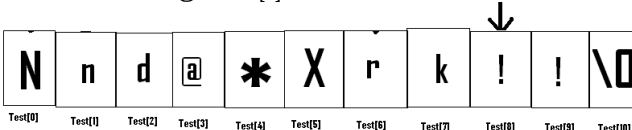


When I=8

Since Text[8] is 'k', Which is a character, but which is not Upper case, else part will be executed. Ie Text[I]=Text[I+1]

```
Here Text[8]=Text[8+1]
      =Text[9]
```

Ie '!' will be stored in place of 'k'
Now the String Text[] =



When I=9

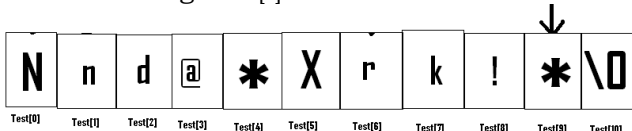
Since Text[9] is '!', Since which is not an alphabet, (!isalpha(Text[I])) will becomes true.

```
Ie if(!isalpha(Text[I]))
    Text[I]='*';
```

Ie Text[9]='*'

Ie '*' will be stored in place of '!'

Now the String Text[] =



Output: **Nnd@*Xrk!***

e) Find the output of the following program: 2

```
#include<iostream.h>
void main( )
{ int U=10,V=20;
  for(int I=1;I<=2;I++)
  { cout<<"[1]"<<U++<<"&"<<V - 5 <<endl;
    cout<<"[2]"<<V++<<"&"<<U + 2 <<endl;
  }
}
```

Ans: Output:

```
[1]10&15
[2]21&13
[1]11&16
[2]22&14
```

f) In the following program, find the correct possible output(s) from the options: 2

```
#include<stdlib.h>
#include<iostream.h>
void main( )
{ randomize( );
  char City[][10]= {"DEL","CHN","KOL","BOM","BNG"};
  int Fly;
  for(int I=0; I<3;I++)
  { Fly=random(2) + 1;
    cout<<City[Fly]<<" ";
  }
}
```

Outputs:

- (i) DEL : CHN : KOL:
- (i) CHN: KOL : CHN:
- (ii) KOL : BOM : BNG:
- (iii) KOL : CHN : KOL:

Ans) Since random(2) gives either 0 or 1, Fly value will be either 1 or 2.

(random(n) gives you any number between 0 to n-1)

City[1] is "CHN". City[2] is "KOL".
Since I value from 0 to 2 (ie<3), 3 iterations will takes place.

So the possible output consists 3 strings separated by :, each of them may be either "CHN" or "KOL".

So the possible output will be

- (ii) CHN : KOL : CHN:
- (iv) KOL :CHN : KOL:

2008 Outside Delhi:

1.b) Name the header files that shall be needed for the following code: 1

```
void main( )
{ char word[]="Exam";
  cout<<setw(20)<<word;
}
```

Ans: iostream.h, iomanip.h

1.c) Rewrite the following program after removing the syntax error(s) if any. Underline each correction. 2

```
#include<iostream.h>
void main( )
{ One=10,Two=20;
  Callme(One;Two);
  Callme(Two);
}
void Callme(int Arg1,int Arg2)
{ Arg1=Arg1+Arg2;
  Count<<Arg1>>Arg2; }
```

Ans:

```
void Callme(int Arg1,int Arg2=20);
#include<iostream.h>
void main( )
{ int One=10,Two=20;
  Callme(One,Two); //Given ; instead of ,
  Callme(Two);
}
void Callme(int Arg1,int Arg2)
{ Arg1=Arg1+Arg2;
```

```
cout<<Arg1<<Arg2;
}
```

1.d) Find the output of the following program: 3

```
#include<iostream.h>
#include<ctype.h>
void main( )
{ char Mystring[ ] = "what@OUTPUT!";
  for(int I=0; Mystring[I]!='\0';I++)
  { if(!isalpha(Mystring[I]))
    Mystring[I]='*';
    else if(isupper(Mystring[I]))
    Mystring[I]=Mystring[I]+1;
    else
    Mystring[I] =Mystring[I]+1];
  }
  cout<<Mystring;}
```

Ans: Output: **hat@*PVUQVU***

e) Find the output of the following program: 2

```
#include<iostream.h>
void main( )
{ int A=5,B=10;
  for(int I=1;I<=2;I++)
  { cout<<"Line1"<<A++<<"&"<<B-2 <<endl;
    cout<<"Line2"<<++B<<"&"<<A +3 <<endl;
  }
}
```

Ans: Output:

Line15&8
Line211&9
Line16&9
Line212&10

f) In the following program, find the correct possible output(s) from the options: 2

```
#include<stdlib.h>
#include<iostream.h>
void main( )
{ randomize( );
  char Area[ ][10]={"NORTH","SOUTH","EAST","WEST"};
  int ToGo;
  for(int I=0; I<3;I++)
  { ToGo=random(2) + 1;
    cout<<Area[ToGo]<<": ";
  }
}
```

Ans: Outputs:

- (i) SOUTH : EAST : SOUTH :
- (ii) NORTH : SOUTH : EAST :
- (iii) SOUTH : EAST : WEST :
- (iv) SOUTH : EAST : EAST :

Ans) Since random(2) gives either 0 or 1, ToGo value will be either 1 or 2.

(random(n) gives you any number between 0 to n-1)

Area[1] is "SOUTH". Area[2] is "EAST".

Since I value from 0 to 2 (ie<3), 3 iterations will takes place.

So the possible output consists 3 strings separated by :, each of them may be either "SOUTH" or "EAST".

So the possible output will be

- (i) SOUTH : EAST : SOUTH :
- (iv) SOUTH : EAST : EAST :

2007 Delhi :

1.a) Differentiate between a Run Time Error and Syntax Error. Also give suitable examples of each in c++. 2

Ans: Run Time Errors: Errors that occur during the execution of a program are called as run time errors. It is caused of some illegal operation taking place or inavailability of desired or required conditions for the execution of the program. For instance, if a program is trying to open a file which does not exist or it could not be opened, it results into an execution error. Similarly, if enough memory is not available or an expression is trying to divide a number by zero are run-time errors.

Eg: Division by zero. c=a/b ;

User will give the values of a and b at the time of program execution.

If he give the value of b as '0', then division by zero, ie a run time error occurs.

Syntax Errors: Syntax errors occur when rules of a programming languages (syntax) is misused. Ie when a grammatical rule of C++ is violated.

Eg (i) c=a+b

In this statement, since there is no semicolon at the end of the statement, there will occurs a syntax error.

(ii) cin<<a;

In this statement, since stream insertion operator (<<) has given instead of stream extraction operation(>>), there will occurs a syntax error.

1.b) Name the header file(s) that shall be needed for successful compilation of the following C++ code. 1

```
void main( )
{ char String[20];
  gets(String);
  strcat(String,"CBSE");
  puts(String);
}
```

Ans) stdio.h string.h

1. c) Rewrite the following program after removing the syntactical error(s) if any.

Underline each correction. 2

```
#include<iostream.h>
const int Max 10;
void main()
{ int Numbers[Max];
  Numbers = {20,50,10,30,40};
  for(Loc=Max-1;Loc>=10;Loc--)
    cout>>Numbers[Loc];
}
```

Ans)

```
#include<iostream.h>
```

```
const int Max=10; //Constant Variable
```

'Max' //must be initialized. Declaration Syntax Error

```
void main( )
```

```
{ int Numbers[Max]={20,50,10,30,40};
```

```
for(Loc=Max-1;Loc>=0;Loc--)
```

```
cout>>Numbers[Loc];
```

} **e)** Find the output of the following program. 3

```
#include<iostream.h>
```

```
void Withdef(int HisNum=30)
```

```

{ for(int I=20;I<=HisNum;I+=5)
    cout<<I<<" ";
  cout<<endl;
}
void Control(int &MyNum)
{ MyNum+=10;
  Withdef(MyNum);
}
void main()
{ int YourNum=20;
  Control(YourNum);
  Withdef();
  cout<<"Number="<<YourNum<<endl;
} Ans: Output:
      20,25,30,
      20,25,30,
      Number=30

```

f) In the following C++ program what is the expected value of MyMarks from options (i) to (iv) given below. Justify answer. 2

```

#include<stdlib.h>
#include<iostream.h>
void main()
{ randomize( );
  int Marks[]={99,92,94,96,93,95},MyMarks;
  MyMarks = Marks [1+random(2)];
  cout<<MyMarks<<endl;
}

```

(i)99 (ii)94 (iii)96 (iv) None of the above.

Ans: Output: **(ii) 94**

2007 Outside Delhi:

1.a) Differentiate between a Logical Error and Syntax Error. Also give suitable examples of each in C++. 2

Ans:

Logical Error: A logical error is that error which causes a program to produce incorrect or undesired output.

An incorrectly implemented algorithm or use of a variable before its initialization, or unmarked end for a loop, or wrong parameters passed are causes logical errors. These must be handled carefully.

For instance, if we are trying to print the table of a number 5 and if we say

```

counter=1;
while(counter>8)
{ cout<<n*counter;
  counter=counter+1;
}

```

Here the loop would not be executed even once as the condition (counter>8) is not fulfilled at all. Therefore, no output will be produced. Such an error is logical error.

Syntax Error: Syntax errors occur when rules of a programming languages (syntax) is misused. Ie when a grammatical rule of C++ is violated.

Eg (i) c=a+b

In this statement, since there is no semicolon at the end of the statement, there will occurs a syntax error.

(ii)cin<<a; In this statement, since stream insertion operator (<<) has given instead of

stream extraction operation(>>), there will occurs a syntax error.

1.b) Name the header file(s) that shall be needed for successful compilation of the following C++ code. 1

```

void main( )
{ char Text[40];
  strcpy(Text,"AISSCE");
  puts(Text);
}

```

Ans: string.h, stdio.h

1.c) Rewrite the following program after removing the syntactical error(s), if any. Underline each correction. 2

```

#include<iostream.h>
const int Size 5;
void main( )
{ int Array[Size];
  Array={50,40,30,20,10};
  for(Ctr=0;Ctr<Size;Ctr++)
    cout>>Array[Ctr];
} Ans)
#include<iostream.h>
const int Size=5;
void main( )
{ int Array[Size];
  Array={50,40,30,20,10};
  for(Ctr=0;Ctr<Size;Ctr++)
    cout<<Array[Ctr];
}

```

1.e) Find the output of the following program 3

```

#include<iostream.h>
void Indirect(int Temp=20)
{ for(int I=10;I<=Temp;I+=5)
  cout<<I<<" ";
  cout<<endl;
}
void Direct(int &Num)
{ Num+=10;
  Indirect(Num);
}
void main( )
{ int Number=20;
  Direct(Number);
  Indirect( );
  cout<<"Number ="<<Number<<endl;
} Ans: Output: 10,15,20,25,30,
10,15,20,
Number =30

```

f) In the following C++ program what is the expected value of Mysore from options (i) to (iv) given below. Justify your answer. 2

```

#include<stdlib.h>
#include<iostream.h>
void main( )
{ randomize( );
  int Score[ ] = {25,20,34,56,72,63},Myscore;
  cout<<Myscore<<endl;
} Ii) 25 (ii) 34 (iii) 20 (iv) None of the above.

```

Ans: Expected Output:

(i) None of the above.

2006 Delhi:

1.a) Name the header file to which the following belong: 1

(i) abs() (ii) isupper()

Ans (i) abs() - math.h, stdlib.h, complex.h
(ii) isupper() - ctype.h

1.e) Find the output of the following program2

```
#include<iostream.h>
void main()
{ long NUM=1234543;
  int F=0,S=0;
  do
  { int R=NUM % 10;
    if (R %2 != 0)
      F += R;
    else
      S += R;
    NUM /= 10;
  } while (NUM>0);
  cout<<F-S;
```

Ans: Output: 2

2006 Outside Delhi:

1.a) Name the header file to which the following belong: 1

(i) pow() (ii) random()

Ans:

(i) abs() - math.h, stdlib.h, complex.h

(ii) random() - stdlib.h

1.e) Find the output of the following program2

```
#include<iostream.h>
void main()
{ long Number=7583241;
  int First = 0, Second =0;
  do
  { int R=Number%10;
    if(R%2 ==0)
      First += R;
    else
      Second += R;
    Number /= 10;
  } while (Number > 0);
  cout<<First-Second;
}
```

Ans: Output -2

2005 Delhi:

1.a) Differentiate between a Call by Value and Call by Reference, giving suitable examples of each. 2

Ans: Call by value: In call by value method, the called function creates a new set of variables and copies the values of arguments into them. The function does not have access to the original variables (actual parameters) and can only work on the copies of values it created. Passing arguments by value is useful when the original values are not to be modified.

In call by reference method, a reference to the actual argument (original variable) is passed to the called function. (Reference is an alias for a predefined variable. Ie the same variable value can be accessed by any of the two names: the original variable's name and the reference name.) Thus, in call by reference method, the changes are reflected back to the original values. The call by reference method

is useful in situations where the values of the original variables are to be changed using a function.

Program to illustrate the call by value method of function invoking:

```
#include<iostream.h>
#include<conio.h>
int change(int);
void main()
{ clrscr();
  int orig=10;
  cout<<"\nThe original value
  is"<<orig<<"\n";
  cout<<"\nReturn value of function
  change()is "<<change(orig)<<"\n";
  cout<<"\nThe value after function change() is
  over"<<orig<<"\n";
  getch();
}
```

int change(int duplicate)

```
{ duplicate=20;
  return duplicate;
}
```

Ans: Output:

The original value is 10

Return value of function change() is 20

The value after function change() is over 10

Program to illustrate the call by Reference method of function invoking:

```
#include<iostream.h>
#include<conio.h>
int change(int&);
void main()
{ clrscr();
  int orig=10;
  cout<<"\nThe original value
  is"<<orig<<"\n";
  cout<<"\nReturn value of function
  change()is "<<change(orig)<<"\n";
  cout<<"\nThe value after function change() is
  over"<<orig<<"\n";
  getch();
}
```

int change(int &duplicate)

```
{ duplicate=20;
  return duplicate;
}
```

Output:

The original value is 10

Return value of function change() is 20

The value after function change() is over 20

1. b) Name the header files to which the following belong: 1

(i) abs() (ii) strcmp()

Ans (i) abs() - stdlib.h, math.h, complex.h
(ii) strcmp() - string.h

1. c) Rewrite the following program after removing the syntactical error(s), if any. Underline each correction. 2

```
#include<iostream.h>
const int Multiple 3;
void main()
{ value = 15;
  for(int Counter = 1;Counter = <5;Counter ++, Value -= 2)
  if(Value%Multiple == 0)
    cout<<Value * Multiple;
```

```

    cout<<endl;
else
    cout<<Value + Multiple <<endl; }

```

Answer:

```

#include<iostream.h>
const int Multiple=3;
void main()
{
    int Value = 15;
    for(int Counter = 1;Counter <=5;Counter ++, Value -= 2)
        if(Value%Multiple == 0)
        { cout<<Value * Multiple;
          cout<<endl;
        }
    else
        cout<<Value + Multiple <<endl;
}

```

1.e) Find the output of the following program2

```

#include<iostream.h>
#include<string.h>
#include<ctype.h>
void Convert(char Str[ ],int Len)
{ for(int Count=0;Count<Len;Count++)
  { if(isupper(Str[Count]))
    Str[Count]=tolower(Str[Count]);
    else if (islower(Str[Count]))
    Str[Count]=toupper(Str[Count]);
    else if(isdigit(Str[Count]))
    Str[Count]=Str[Count]+1;
    else Str[Count]='*';
  }
}
void main()
{ char Text[ ]="CBSE Exam 2005";
  int Size = strlen(Text);
  Convert(Text,Size);
  cout<<Text<<endl;
  for(int C=0,R=Size - 1;C<=Size/2;C++,R--)
  { char Temp=Text[C];
    Text[C]=Text[R];
    Text[R]=Temp;
  }
  cout<<Text<<endl;
}

```

Ans:Output:

**cbse*eXAM*3116
6113*MXAe*esbc**

1. f) Observe the following program SCORE.CPP carefully, if the value of Num entered by the user is 5, choose the correct

possible output(s) from the options from (i) to (iv), and justify your option. 2

```

//Program: SCORE.CPP
#include<stdlib.h>
#include<iostream.h>
void main()
{
    randomize( );
    int Num,Rndnum;
    cin>>Num;
    Rndnum = random(Num) + 5;
    for(int N = 1;N<=Rndnum;N++)
        cout<<N<<" ";
}

```

Output Options:

(i) 1 2 3 4 (ii) 1 2
(iii) 1 2 3 4 5 6 7 8 9
(iv) 1 2 3

Ans: Expected Output:

(iii) 1 2 3 4 5 6 7 8 9

2005 Outside Delhi :

1.b) Name the header files to which the following belong: 1

(i) puts() (ii)isalnum()

Ans)(i) puts() - stdio.h

isalnum() - ctype.h

1.c) Rewrite the following program after removing the syntactical error(s), if any. Underline each correction.2

```

#include<iostream.h>
const int divisor 5;
void main( )
{   Number = 15;
  for(int Count=1;Count<=5;Count++,Number -= 3)
  if(Number % divisor == 0)
    cout<<Number / Divisor;
    cout<<endl;
  else
    cout<<Number + Divisor <<endl;
}

```

Ans:

```

#include<iostream.h>

```

```

const int divisor= 5;

```

```

void main( )

```

```

{   int Number = 15;

```

```

  for(int Count=1;Count<=5;Count++,Number -= 3)

```

```

  if(Number % divisor == 0)

```

```

    { cout<<Number / Divisor;

```

```

      cout<<endl;

```

```

    }

```

```

  else

```

```

    cout<<Number + Divisor <<endl;

```

```

}

```

1.e) Find the output of the following program2

```

#include<iostream.h>

```

```

#include<string.h>

```

```

#include<ctype.h>

```

```

void Change(char Msg[],int Len)

```

```

{ for(int Count=0;Count<Len;Count++)

```

```

  { if(islower(Msg[Count]))

```

```

    Msg[Count] = toupper(Msg[Count]);

```

```

  else if(isupper(Msg[Count]))

```

```

    Msg[Count] = tolower(Msg[Count]);

```

```

  else if (isdigit(Msg[Count]))

```

```

    Msg[Count]=Msg[Count]+1;

```

```

  else Msg[Count] = "*";

```

```

  }

```

```

}

```

```

void main( )

```

```

{ char Message[ ]="2005 Tests ahead";

```

```

  int Size=strlen(Message);

```

```

  Change(Message,Size);

```

```

  cout<<Message<<endl;

```

```

  for(int C=0,R=Size - 1; C<=Size/2;C++,R--)

```

```

  { char Temp=Message[C];

```

```

    Message[C]=Message[R];

```

```

    Message[R]=Temp;

```

```

  }

```

```

  cout<<Message<<endl;

```

```

} Ans: Output:
```

3116*TESTS*AHEAD DAEHA*SSTet*6113

1.f) Observe the following program GAME.CPP carefully, if the value of Num entered by the user is 14, choose the correct possible output(s) from the options from (i) to (iv), and justify your option. 2

```
//Program:GAME.CPP
#include<stdlib.h>
#include<iostream.h>
void main()
{
    randomize();
    int Num,Rndnum;
    cin>>Num;
    Rndnum=random(Num)+7;
    for(int N=1;N<=Rndnum;N++)
        cout<<N<<" ";
}
```

Output Options:

(i) 1 2 3 (ii) 1 2 3 4 5 6 7 8 9 10 11
(iii) 1 2 3 4 5 (iv) 1 2 3 4

Ans: Expected Output

(ii) 1 2 3 4 5 6 7 8 9 10 11

2004 Annual Paper:

1.b) Write the names of the header files to which the following belong:

(i) gets() (ii) strcmp() (iii)abs() (iv)isalnum()

Ans: (i)gets() - stdio.h
(ii)strcmp() - string.h
(iii)abs() - math.h, stdlib.h,complex.h
(iv)isalnum() - ctype.h

1.e) What will be the output of the following program

```
#include<iostream.h>
void main()
{
    int var1=5,var2=10;
    for(int i=1,i<=2;i++)
    {
        cout<<var1++<<'t'<<-- var2<<endl;
        cout<<var2--<<'t'<<+ + var1<<endl;
    }
}
```

Ans: Output:

5	9
9	7
7	7
7	9

f) Write definition for a function SumSequence() in C++ with two arguments/parameters - double X and int n. The function should return a value of type double and it should perform sum of the following series.

1/x - 3!/x² + 5!/x³ - 7!/x⁴ + 9!/x⁵ - -----upto n terms.

Note: The symbol ! represents Factorial of a number ie 5!= 1 X 2 X 3 X 4 X 5.

```
#include<iostream.h>
#include<math.h>
#include<conio.h>
double SumSequence(int x1,int n1);
void main()
{
    int x;
    int n;
```

```
clrscr();
cout<<"Enter the vaue of X and N";
cin>>x>>n;
cout<<"\nThe sum of the series =
    "<<SumSequence(x,n);
getch();
}
```

```
double SumSequence(int x1,int n1)
{
    double sum=0;
    int c=0;
    for(int i=1;i<=(2*n1);i=i+2)
    {
        int f=1;
        for(int j=1;j<=i;j++)
        {
            f=f*j;
        }
        c=c+1;
        if(c%2==1)
        {
            sum=sum+f/(pow(x1,c));
        }
        else
        {
            sum=sum-f/(pow(x1,c));
        }
    }
    return sum;
}
```

2003 Annual Paper:

1.a) What is the difference between global variables and local variables? Give an example to illustrate the same. 2

Ans: The local variables are the variables defined within any function (or block) and are hence accessible only within the block in which they are declared. In contrast to local variables, variables declared outside of all the functions in a program are called global variables. These variables are defined outside of any function, so they are accessible to all functions. These functions perform various operations on the data. They are also known as External Variables.

Eg: #include<iostream.h>

```
int a,b;
void main()
{
    float f;
        ---;
        ---;
}
```

In the above program segment, a and b are global variables, we can access a and b from any function. f is local variable to function main(), we can access f from main() only.

1.b) Name the header file, to which the following built-in function belongs:

(i) strcmp() (ii)getc() 1

Ans: (i) strcmp() - string.h
(ii)getc() - stdio.h

1.c) Rewrite the following program after removing all the syntax error(s) if any.2

```
#include<iostream.h>
void main()
{
    int P[ ]={90,10,24,15};Q,Number=4;
    Q=9;
    for[int I=Number-1;I>=0,I--]
    switch(I)
```



```

{ case 0;
  case 3:cout<<>>P[I]*Q<<endl;break;
  case 1:
  case 2: cout<<P[I]+Q;
}
}

```

Ans:

```

#include<iostream.h>
void main()
{ int P[ ]={90,10,24,15},Q,Number=4;
  Q=9;
  for(int I=Number-1;I>=0;I--)
  switch(I)
  { case 0:
    case 3:cout<<P[I]*Q<<endl; break;
    case 1:
    case 2: cout<<P[I]+Q;
  }
}

```

1.e) Write the output of the following program:

```

#include<iostream.h>
int Execute(int M)
{ if(M%3==0)
  return M*3;
  else
  return M+10;
}
void Output(int B=2)
{ for(int T=0;T<B;T++)
  cout<<Execute(T)<<"*";
  cout<<endl;
}
void main()
{ Output(4);
  Output( );
  Output(3);
}

```

Output:

```

0*11*12*9*
0*11*
0*11*12*

```

f) Write a C++ function SUMFUN () having two parameters Y(of type double) and m(of type integer) with a result type as double to find the sum of the series given below:

$$Y + Y^3 / 2! + Y^5 / 3! + \dots + Y^{2m-1} / m!$$

```

#include<iostream.h>
#include<math.h>
#include<conio.h>
double SUMFUN(int y1,int m1);
void main()
{ int y;
  int m;
  clrscr();
  cout<<"Enter the vaue of Y and M";
  cin>>y>>m;
  cout<<"\nThe sum of the series =
  "<<SUMFUN(y,m);
  getch();
}
double SUMFUN(int y1,int m1)
{ double sum=0;
  double upper;
  for(int i=1;i<=m1;i++)
  { int f=1;
    for(int j=1;j<=i;j++)
    { f=f*j;
    }
  }
}

```

```

upper=pow(y1,(i*2-1));
sum=sum+upper/f;
}
return sum;
}

```

2002:

1.b)Name the header files of C++ to which the following functions belong:2

(i)get() (ii)open() (iii)abs() (iv)strcat()

Ans: (i)get() - iostream.h
(ii)open() - fstream.h
(iii)abs() - math.h, stdlib.h
(iv)strcat() - string.h

1.c)Find the syntax error(s), if any, in the following program. 2

```

#include<iostream.h>
void main()
{ int x;
  cin>>x;
  for( int y=0,y<10,y++)
  cout<<x+y;
}

```

Ans:

```

#include<iostream.h>
void main()
{ int x;
  cin>>x;
  for( int y=0;y<10;y++)
  cout<<x+y;
}

```

1.d)Write the output of the following program2

```

void main()
{ int x=5,y=5;
  cout<<x- -;
  cout<<" ";
  cout<<- - x;
  cout<<" ";
  cout<<y- -<<" "<<- - y;
}

```

Ans: Output:

5,3,4,4

1.e)Write the output of the following program3

```

#include<iostream.h>
void X(int &A,int &B)
{ A=A+B;
  B=A-B;
  A=A-B;
}
void main()
{ int a=4,b=18;
  X(a,b);
  cout<<a<<" "<<b;
}

```

Ans: Output:

18,4

f)Write a function called zero_Small() that has two integer arguments being passed by reference and sets the smaller of the two numbers to 0. Write the main program to access this function. 4

```

#include<iostream.h>
#include<conio.h>
void zero_Small(int &A,int &B)
{ if(A<B)
  A=0;
}

```

```

else
    B=0;
}
void main()
{ clrscr();
  int a,b;
  cout<<"Enter any two values...";
  cin>>a>>b;
  cout<<"Initial values of a and b are ";
  cout<<a<<" "<<b<<endl;
  zero_Small(a,b);
  cout<<endl<<"The final values of a and b are ";
  cout<<a<<" "<<b;
  cout<<endl;
  cout<<"\nPress any key to continue...";
  getch();
}

```

2001:

1.b) Name the header file to be included for the use of the following built in functions:

(i) getc() (ii) strcat() 1

Ans:

(i) getc() - stdio.h
(ii) strcat() - string.h

1.e) Give the output of the following program:

```

#include<iostream.h>
#include<conio.h>
int g=20;
void func(int &x,int y)
{ x=x-y;
  y=x*10;
  cout<<x<<','<<y<<'\n';
}
void main()
{ int g=7;
  func(g,::g);
  cout<<g<<','<<::g<<'\n';
  func(::g,g);
  cout<<g<<','<<::g<<'\n';
}

```

Ans: Output:

-13,-130
-13,20
33,330
-13,33

1.f) Write a function named SUMFIN(), with arguments x, N, which returns the sum of N terms of the following series.: 4

$$x - x^3/3 + x^5/5 - x^7/7 + x^9/9$$

```

#include<iostream.h>
#include<math.h>
#include<conio.h>
double SUMFIN(int x1,int n1);
void main()
{ int x;
  int n;
  clrscr();
  cout<<"Enter the vaue of X and N";
  cin>>x>>n;
  cout<<"\nThe sum of Series = "<<SUMFIN(x,n);
  getch();
}

```

```

double SUMFIN(int x1,int n1)
{ double sum=0;
  int c=0;
  for(int i=1;i<=(2*n1);i=i+2)
  { c=c+1;
    if(c%2==1)
    { sum=sum+(pow(x1,i))/i;
    }
    else
    { sum=sum-(pow(x1,i))/i;
    }
  }
  return sum;
}

```

2000:

1.b) Name the header file, to which following built in function belong: 2

(i) isupper() (ii) setw() (iii) exp() (iv) strcmp()

Ans)

(i) isupper() - ctype.h
(ii) setw() - iomanip.h
(iii) exp() - math.h
(iv) strcmp() - string.h

1.c) Will the following program execute successfully? If not, state the reason(s)

```

#include<stdio.h>
void main()
{ int s1,s2,num;
  s1=s2=0;
  for(x=0;x<11;x++)
  { cin<<num;
    if(num>0)s1+=num;else s2/=num;
  }
  cout<<s1<<s2;
}

```

Ans: The program will not execute successfully.

Because some syntax errors are there in the program. They are

(i) cin and cout, stream objects used but iostream.h header file is not included in the program.

(ii) x is not declared, it should be declared as int.

(iii) With cin, we should use >> instead of <<.

(iv) The shorthand operator /=, is given wrongly as =/.

So the corrected program is as follows:

```

#include<iostream.h>
void main()
{ int s1,s2,num;
  s1=s2=0;
  for(int x=0;x<11;x++)
  { cin>>num;
    if(num>0)s1+=num;else s2/=num;
  }
  cout<<s1<<s2;
}

```

d) Give the output of the following program segment (Assuming all required header files are included in the program): 2

```

char *NAME="a ProFile";
for(int x=0;x<strlen(NAME);x++)
if(islower(NAME[x]))
NAME[x]=toupper(NAME[x]);

```

```

else if(isupper(NAME[x]))
    if(x%2!=0)
        NAME[x]=tolower(NAME[x-1]);
    else
        NAME[x]--;
cout<<NAME<<endl;

```

Ans: Output: **AOR0oIiE**
1.e) Write the output of the following program

```

#include<iostream.h>
int func(int &x,int y=10)
{ if(x%y==0) return ++x;else return y- -;
}
void main()
{ int p=20,q=23;
  q=func(p,q);
  cout<<p<<q<<endl;
  p=func(q);
  cout<<p<<q<<endl;
  q=func(p);
  cout<<p<<q<<endl;
}

```

Ans: Output: **2023**
1023
1111

f) Write a function seqsum() in C++ with two arguments, double x and int n. The function should return a value of type double and it should find the sum of the following series. $4 + x/2! + x^2/4! + x^3/6! + x^4/8! + x^5/10! + \dots + x^n/(2n)!$

```

#include<iostream.h>
#include<math.h>
#include<conio.h>
double seqsum(int x1,int m1);
void main()
{ int x;
  int m;
  clrscr();
  cout<<"Enter the vaue of X and M";
  cin>>x>>m;
  cout<<"\n\nThe sum of the series =
    "<<seqsum(x,m);
  getch();
}
double seqsum(int x1,int m1)
{ double sum=1;
  for(int i=1;i<=m1;i++)
  { int f=1;
    for(int j=1;j<=2*i;j++)
    { f=f*j;
    }
    sum=sum+pow(x1,i)/f;
  }
  return sum;
}

```

1999 Annual Paper:
1.a) Why main() function is so special. Give two reasons? **1**

Ans: Execution of the program starts and ends at main(). The main() is the driver function of the program. If it is not present in a program, no execution can take place.

1.b) Name the header file of C++ to which following functions belong. (i)strcat()

(ii) scanf() (iii) getchar() (iv)clrscr()
Ans: (i)strcat() - string.h
(ii)scanf() - stdio.h
(iii)getchar() - stdio.h
(iv)clrscr() - conio.h

1.c) Find the syntax error(s), if any, in the following program:

```

#include<iostream.h>
main()
{ int x[5],*y,z[5];
  for(i=0;i<5;i++)
  { x[i]=i;
    z[i]=i+3;
    y=z;
    x=y;
  }
}

```

Ans (i) Line No 5: Undefined symbol 'i'. The variable 'i' is not declared in the program.

(ii)Line No 10:Assign the value of a pointer to an integer variable. Ie error in x=y.

1.e) Write the output of the following program.

```

#include<iostream.h>
static int i=100;
void abc()
{ static int i=8;
  cout<<"first ="<<i;
}
main()
{ static int i=2;
  abc();
  cout<<"second ="<<i<<endl;
}

```

Ans: Output: **First =8second =2**

1.f) Write a C++ function that converts a 2-digit octal number into binary number and prints the binary equivalent.

```

#include<iostream.h>
#include<conio.h>
void binary(int a)
//member function for conversion
{ int i,b[5]; //integer array 6
  for(i=3;i>=1;i--)
  { b[i]=a%2;
    a=a/2;
  }
  for(i=1;i<=3;i++)
  cout<<b[i];
}

```

```

void main()
{ int n,x,y;
  clrscr();
  cout<<"Enter a two digit octal number: ";
  cin>>n;
  x=n/10;
  y=n%10;
  binary(x);
  binary(y);
  getch();
}

```

1998 Annual Paper:
1.b)Name the header files, to which the following built in functions belongs to:

(i)cos() (ii)setw() (iii)toupper() (iv)strcpy()

Ans: (i) cos() - math.h

- (ii) setw() - iomanip.h
- (iii) toupper() - ctype.h
- (iv) strcpy() - string.h

1.c) Find the syntax error(s), if any, in the following program:

```
include<iostream.h>
void main( )
{ int R; W=90;
  while W>60
  { R=W-50;
    switch(W)
    { 20:cout<<"Lower Range"<<endl;
      30:cout<<"Middle Range "<<endl;
      40:cout<<"Higher Range"<<endl;
    } }
}
```

Ans:

- (i) Line 1: It should be, #include<iostream.h>
- (ii) Line 4: Variables should be separated using commas. It should be int R,W=90;
- (iii) Line 5: Test expression should be in braces. It should be while (W>60)
- (iv) Line 10: It should be case 20;
- (v) Line 11: It should be case 30;
- (vi) Line 13: It should be case 40;

So the corrected version of the program is as follows:

```
#include<iostream.h>
void main( )
{ int R, W=90;
  while (W>60)
  {R=W-50;
  switch(W)
  { case 20:cout<<"Lower Range"<<endl;
    case 30:cout<<"Middle Range "<<endl;
    case 40:cout<<"Higher Range"<<endl;
  } }
}
```

1.d) Give the output of the following program

```
segment: char *NAME="INTRANEt";
for(int x=0;x<strlen(NAME); x++)
if(islower(NAME[x])
NAME[x]=toupper(NAME[x]));
else if(isupper(NAME[x]))
if(x%2==0)
NAME[x]=tolower(NAME[x]);
else
NAME[x]=NAME[x-1];
puts(NAME);
```

Ans: Output: **INTTANEt**

1.f) Write the output of the following program:

```
#include<iostream.h>
void Execute(int &X,int Y=200)
{ int TEMP=X+Y;
  X+=TEMP;
  if(Y!=200)
  cout<<TEMP<<X<<Y<<endl;
}
void main( )
{ int A=50,B=20;
  Execute(B);
  cout<<A<<B<<endl;
```

Output:
50240
290340240
340240

```
Execute(A,B);
cout<<A<<B<<endl;
}
```

1.f) Write a C++ function having two value parameters X and N with result type float to find the sum of series given below:

$$1 + x^1/2! + x^2/3! + x^3/4! + x^4/5! + \dots + x^n/(n+1)!$$

```
#include<iostream.h>
#include<conio.h>
#include<math.h>
float sum_series(float X,int N) //function
being declared
{ float sum=0,term;
  int fact,f;
  sum+=1;
  for(int i=1;i<=N;i++)
  { fact=1;
    for(f=1;f<=(i+1);f++)
    fact*=f;
    term=pow(X,i)/fact;
    sum+=term;
  }
  return(sum);
}
void main( )
{ clrscr( );
  float x1;
  int n1;
  cout<<"\nEnter the value of X and N";
  cin>>x1>>n1;
  cout<<"\nThe Sum of the Series
  ..."<<sum_series(x1,n1);
  getch(); }
```

Model Paper 1 for 2008-09 Batch

Q1. (a) What is the difference between Global Variable and Local Variable?
2

Answer:

Global Variable	Local Variable
<ul style="list-style-type: none"> • It is a variable, which is declared outside all the functions • It is accessible throughout the program 	<ul style="list-style-type: none"> • It is a variable, which is declared with in a function or with in a compound statement • It is accessible only within a function/compound statement in which it is declared

```
#include <iostream.h>
float NUM=900; //NUM is a global variable
void LOCAL(int T)
{ int Total=0; //Total is a local variable
  for (int I=0;I<T;I++)
  Total+=I;
  cout<<NUM+Total;
}
void main()
{ LOCAL(45);
}
```

(1/2 Mark for each point of difference)

(1/2 Mark for example of Global Variable)
 (1/2 Mark for example of Local Variable) **OR**
 (Full 2Marks to be awarded if the difference is explained with the help of suitable example)

1.b) Write the names of the header files to which the following belong: 1
 (i) strcmp() (ii) fabs()

Answer: (i) string.h (ii) math.h
 (1/2 Mark for mentioning name of each header file)

1.c) Rewrite the following program after removing the syntactical errors (if any). Underline each correction. 2
 #include [iostream.h]

```
class PAYITNOW
{ int Charge;
  PUBLIC:
  void Raise(){cin>>Charge;}
  void Show{cout<<Charge;}
};
void main()
{ PAYITNOW P;
  P.Raise();
  Show();
}
```

Answer:

```
#include <iostream.h>
class PAYITNOW
{ int Charge;
  public:
  void Raise(){cin>>Charge;}
  void Show(){cout<<Charge;}
};
void main()
{ PAYITNOW P;
  P.Raise();
  P.Show();
}
```

(1/2 Mark for correcting each error) **OR**
 (1 Mark for identifying all the 4 errors with no correction)

1.e) Find the output of the following program2

```
#include <iostream.h>
#include <ctype.h>
void Encrypt(char T[])
{ for (int i=0;T[i]!='\0';i+=2)
  if (T[i]=='A' || T[i]=='E')
    T[i]='#';
  else if (islower(T[i]))
    T[i]=toupper(T[i]);
  else
    T[i]='@';
}
void main()
```

```
{ char Text[]="SaVE EArth";
//The two words in the string Textare separated by single space
Encrypt(Text);
cout<<Text<<endl;
```

Answer:

@a@E@E#rTH

(1 Mark for writing all alphabets at correct positions)

(1/2 Mark for writing @ at correct positions)

(1/2 Mark for writing # at correct position)

1.f) In the following program, if the value of N given by the user is 15, what maximum and

minimum values the program could possibly display? 2

```
#include <iostream.h>
#include <stdlib.h>
void main()
{ int N,Guessme;
  randomize();
  cin>>N;
  Guessme=random(N)+10;
  cout<<Guessme<<endl;
```

Answer:

Maximum Value:24 Minimum Value:10

(1 Mark for writing correct minimum value)

(1 Mark for writing correct maximum value)

Model Paper 2 for 2008-09 Batch

1.b) Write the names of the header files to which the following belong: 1

(i) frexp() (ii) isalnum()

Answer:

(i) math.h (ii) ctype.h

(1/2 Mark for mentioning name of each header file)

1.d) Find the output of the following program3

```
#include <iostream.h>
void Changethecontent(int Arr[], int Count)
{ for (int C=1;C<Count;C++)
  Arr[C-1]+=Arr[C];
}
void main()
{ int A []={3,4,5},B[]={10,20,30,40},C[]={900,1200};
  Changethecontent(A,3);
  Changethecontent(B,4);
  Changethecontent(C,2);
  for (int L=0;L<3;L++)
    cout<<A[L]<<'#';
  cout<<endl;
  for (L=0;L<4;L++)
    cout<<B[L] <<'#';
  cout<<endl;
  for (L=0;L<2;L++)
    cout<<C[L] <<'#';
}
```

Answer:

7#9#5#
 30#50#70#40#
 2100#1200#

(1 Mark for each correct line of output) Note:

Deduct ½ Mark for not showing : in the output

Deduct ½ Mark for not considering endl

1.f) In the following program, if the value of N given by the user is 20, what maximum and minimum values the program could possibly display? 2

```
#include <iostream.h>
#include <stdlib.h>
void main()
{ int N,Guessnum;
  randomize();
  cin>>N;
  Guessnum=random(N-10)+10;
  cout<<Guessnum<<endl;
```

Answer:

Maximum Value:19 Minimum Value:10

(1 Mark for writing correct minimum value)
(1 Mark for writing correct maximum value)

Header files – Important Functions.

From Old Papers

Name the header files that shall be needed for the following

2009 Outside Delhi:

- (i) setw() – iomanip.h
- (ii) sqrt() – math.h

2008 Delhi & OD:

Due to cout, include **iostream.h**
Due to setw(), include **iomanip.h**

2007 Delhi & OD:

Due to strcat(), include **string.h**
Due to gets(), include **stdio.h**

2006 Delhi:

- (i) **abs()** - math.h, stdlib.h
- (ii) **isupper()** - ctype.h

2006 Outside Delhi

- (i) **abs()** - math.h, stdlib.h
- (ii) **random()** - stdlib.h

2005 Delhi:

- (i) **abs()** - stdlib.h, math.h
- (ii) **strcmp()** - string.h

2005 OD:

- (i) **puts()** - stdio.h
- (ii) **isalnum()** - ctype.h

2004 :

- (i) **gets()** - stdio.h
- (ii) **strcmp()** - string.h
- (iii) **abs()** - math.h, stdlib.h
- (iv) **isalnum()** - ctype.h

2003:

- (i) **strcmp()** - string.h
- (ii) **getc()** - stdio.h

2002:

- (i) **get()** - iostream.h
- (ii) **open()** - fstream.h
- (iii) **abs()** - math.h, stdlib.h
- (iv) **strcat()** - string.h

2001:

- (i) **getc()** - stdio.h
- (ii) **strcat()** - string.h

2000:

- (i) **isupper()** - ctype.h
- (ii) **setw()** - iomanip.h
- (iii) **exp()** - math.h
- (iv) **strcmp()** - string.h

1999:

- (i) **strcat()** - string.h
- (ii) **scanf()** - stdio.h
- (iii) **getchar()** - stdio.h
- (iv) **clrscr()** - conio.h

1998:

- (i) **cos()** - math.h
- (ii) **setw()** - iomanip.h
- (iii) **toupper()** - ctype.h
- (iv) **strcpy()** - string.h

Model Paper 1:

(i) **strcmp()** – string.h

(ii) **fabs()** – math.h

Model Paper 2:

(i) **frexp()** – math.h

(ii) **isalnum()** – ctype.h

ctype.h (Character functions)

isalnum(), isalpha(), isdigit(), islower(),
isupper(), tolower(), toupper()

string.h (Generally starts with str)

strcat(), strcmp(), strcpy(), strlen(),
strchr(), stricmp(), strlwr(), strew(),strupr()

iomanip.h

setw(), setprecision(), endl, flush().

stdlib.h

abs(), labs(), free(), random(), atof(), atoi(),
atol(), strtol(), strtod(), calloc(), malloc(),
realloc()

iostream.h

(cout, cin – these are streams available in
iostream.h)

get() getline() read() write() put()
open() close() flush()
seekg() seekp() tellg() tellp()
bad() eof() fail() good()
clear()

stdio.h (Many of the functions starting with f)

printf() scanf()
fflush() fgetc() fgetchar() fgets() fopen()
fprintf() fputc() fputchar()
fputs() fread() freopen() fscanf() fseek()
fsetpos() fwrite() ftell()
fwrite() getc() getchar() gets() getw()
putc() putchar() puts() putw()
remove() rename()

conio.h

clrscr() getch() gotoxy() cprintf()

dos.h

sound() nosound() delay()

process.h

exit(0)

math.h

acos() acosl(), etc, etc div() exp() ceil()
ceill() fabs() floor() fmod() log()
pow() modf() poly() sqrt()

**“ The fear of the
Lord
is the beginning of wisdom”**

All the best My Dear Children

2. STRUCTURES

2008 Delhi:

1.a) What is the difference between #define and const? Explain with suitable example. 2

Ans: While they both serve a similar purpose, #define and const act differently. When using #define the identifier gets replaced by the specified value by the compiler, before the code is turned into binary. This means that the compiler makes the substitution when you compile the application.

Eg: #define number 100

In this case every instance of "number" will be replaced by the actual number 100 in your code, and this means the final compiled program will have the number 100 (in binary).

#define with different types of data:

- The #define preprocessor allows us to define symbolic names and constants.

Eg: #define PI 3.14159

- The #define allows you to make text substitutions before compiling the program.

Eg: #define MAX 70

Before compilation, if the C++ preprocessor finds MAX as one word, in the source code, it replaces it with the number 70.

- The #define preprocessor can be used in the creation of macros (code substitution).

Eg: #define SQUARE(x) x*x

Before compilation, if the C++

preprocessor finds

SQUARE(x), where x is any value in the source code, it

replaces it with its square (ie x*x).

Here a macro

substitutes text only; It does not

check for data types.

On the other hand, when we use **const** and the application

runs, memory is allocated for the constant and the value gets replaced when the application is run.

Syntax: const type variable_name=value;

Eg: const int a=10;

The value of a constant is fixed and in the above example, the value for a in entire program is 10 only. You cannot change the value of a, since it is declared as constant.

Difference between #define and const in declaration:

1.#define: #define symbolic_constant value.

Eg: #define number 100 //No semicolon, no equal to symbol.

2.const: const type variable_name=value;

Eg: const number=100; //Semicolon, equal to symbol.

2008 Outside Delhi:

1.a) What is the purpose of using a typedef command in C++? Explain with suitable example. 2

Ans: C++ allows you to define explicitly new data type names by using the keyword typedef. Using typedef does not actually create a new data class, rather it defines a new name for an existing type. This can increase the portability of a program as only the typedef statements would have to be changed. Typedef makes your code easier to read and understand. Using typedef can also aid in self documenting your code by allowing descriptive names for the standard data types. The syntax of the typedef statement is

typedef type name;

Where type is any C++ data type and name is the new name for this type. This defines another name for the standard type of C++. For example, you could create a new name for float values by using the following statement:

typedef float amount;

This statement tells the compiler to recognize amount as an alternative name for float. Now you could create float variables using amount.

amount loan, saving, installment;

Using typedef does not replace the standard C++ data type name with the new name, rather the new name is in addition to the existing name. You still can create float variables using float. Once a new name has been defined by typedef, it can be used as a type for another typedef also.

Eg: typedef amount money;

Now, this statement tells the compiler to recognize money as another name for amount, which itself is another name for float. Typedef does not create any new data types rather provides an alternative name for standard types. Reference provides an alias name for a variable and typedef provides an alias name for a data type.

2006 Delhi:

1.b) Illustrate the use of #define in C++ to define a macro. 2

Ans: The #define preprocessor can be used in the creation of macros (code substitution).

Eg: #define SQUARE(x) x*x

Before compilation, if the C++ preprocessor finds SQUARE(x),

where x is any value in the source code, it replaces it with its square (ie x*x). Here a macro substitutes text only; It does not check for data types.

1.C) Rewrite the following program after removing the syntactical error(s), if any. Underline each correction. 2

```
#include<iostream.h>
void main( )
{
    struct STUDENT
    {
        char stu_name[20];
        char stu_sex;
        int stu_age=17;
    }student;
    gets(stu_name);
    gets(stu_sex);
}
```

Ans: #include<iostream.h>

```
#include<stdio.h>
void main( )
{
    struct STUDENT
    {
        char stu_name[20];
        char stu_sex;
        int stu_age;
    }student;
    gets(student.stu_name);
    cin>>student.stu_sex;
}
```

//Initialization of variables inside a structure is not allowed.

```
gets
}
```

//A single character cannot be read using gets

1.f) What are Nested Structures? Give an example. 2

Ans: Nested structures are structures as member of another structure. For example, the date of birth is a structure within the structure of a student as shown below. These types of structures are known as nested structures.

Name	Roll	DOB			Marks
		DD	MM	YY	

Eg1:

```
struct date
{
    int dd;
    int mm;
    int yy;
};
struct student
{
    char name[20];
    int roll;
    date dob;
    int marks;
};
```

The member of a nested structure is referenced from the outermost to innermost with the help of dot operators.

student stud;

Then the members of the nested structure can be accessed as

stud.dob.mm=10;

Eg2:

```
struct addr
{
    int houseno;
    char area[26];
    char city[26];
    char state[26];
};
struct emp
{
    int empno;
    char name[26];
    char design[16];
    addr address;
    float basic;
};
emp worker;
```

2006 Outside Delhi:

1.C) Rewrite the following program after removing the syntactical error(s), if any. Underline each correction. 2

```
#include<iostream.h>
void main( )
{
    struct movie
    {
        char movie_name[20];
        char movie_type;
        int ticket_cost=100;
    }MOVIE;
    gets(movie_name);
    gets(movie_type);
}
```

Ans: #include<iostream.h>

```
#include<stdio.h>
void main( )
{
    struct movie
    {
        char movie_name[20];
        char movie_type;
        int ticket_cost;
    }MOVIE;
    gets(MOVIE.movie_name);
    cin>>MOVIE.movie_type;
}
```

//Initialization of variables inside a structure is not allowed.

```
using gets
}
```

//A single character cannot be read

using gets

}

2005 Delhi:

1.d) Find the output of the following program:

```
#include<iostream.h>
struct MyBox
{
    int Length,Breadth,Height;
};
void Dimension(MyBox M)
{
    cout<<M.Length<<"x"<<M.Breadth<<"x"
;
    cout<<M.Height<<endl;
}
void main( )
{
    MyBox B1={10,15,5},B2,B3;
    ++B1.Height;
    Dimension(B1);
    B3=B1;
}
```

Output:

10x15x6
11x16x6

10x16x11


```

    ++B3.Length;
    B3.Breadth++;
    Dimension(B3);
    B2=B3;
    B2.Height+=5;
    B2.Length--;
    Dimension(B2);
}

```

2005 Outside Delhi:

1.d) Find the output of the following program:

```

#include<iostream.h>
struct Package
{ int Length,Breadth,Height; };
void Occupies(Package M)
{ cout<<M.Length<<"x"<<M.Breadth<<"x"
;
    cout<<M.Height<<endl;
}
void main( )
{ Package P1={100,150,50},P2,P3;
  ++P1.Height;
  Occupies(P1);
  P3=P1;
  ++P3.Lengh;
  P3.Breadth++;
  Occupies(P3);
  P2=P3;
  P2.Height+=50;
  P2.Length--;
  Occupies(P2);
}

```

Output:

```

100x150x51
101x151x51
100x151x101

```

2004 :

1.c) Rewrite the corrected code for the following program. Underline each correction if any.

```

#include<iostream.h>
structure Supergym
{ int member number;
  char membername[20];
  char membertype[4]="HIG";
};
void main( )
{ Supergym person1,person2;
  cin>>"Member Number: ";
  cin>>person1.membhernumber;
  cout<<"Member Name: ";
  cin>>person1.membername;
  person1.member type = "MIG";
  person2=person1;
  cin>>"Member Number;“
    <<person2.membernumber;
  cin<<"Member Name“
    <<person2.membername;
  cin<<"Member Number:“
    <<person2.membertype;
}

```

Ans: #include<iostream.h>
 #include<string.h>
 struct Supergym

```

{ int membernumber;
  char membername[20];
  char membertype[4];
};
void main( )
{ Supergym person1,person2;
  cin>>"Member Number: ";
  cin>>person1.membernumber;
  cout<<"Member Name: ";
  cin>>person1.membername;
  strcpy(person1.membertype,"MIG");
  person2=person1;
  cin>>"Member Number;“
    >>person2.membernumber;
  cin>>"Member Name“
    >>person2.membername;
  cin>>"Member Number:“
    >>person2.membertype;
}

```

2003 :

1.d) Give the output of the following program:

```

#include<iostream.h>
struct Pixel
{ int C,R;
};
void Display(Pixel P)
{
  cout<<"col"<<P.C<<"Row"<<P.R<<endl
;
}
void main( )
{
  Pixel X={40,50},Y,Z;
  Z=X;
  X.C+=10;
  Y=X;
  Y.R+=20;
  Z.C-=15;
  Display(X);
  Display(Y);
  Display(Z);
}

```

Output:

```

col50Row50
col50Row70
col25Row50

```

2001 :

1.e) Give the output of the following program. 3

```

#include<iostream.h>
#include<conio.h>
int g=20;
void func(int &x,int y)
{ x=x-y;
  y=x*10;
  cout<<x<<','<<y<<'\n';
}
void main( )
{ int g=7;
  func(g,::g);
  cout<<g<<','<<::g<<'\n';
  func(::g,g);
  cout<<g<<','<<::g<<'\n';
}

```

Answer:

```

-13,-130
-13,20
33,330
-13,33

```

*“If wealth is lost,
nothing is lost
If health is lost,
something is lost
If character is lost,
everything is lost”*

3.OBJECT ORIENTED PROGRAMMING

2005 Delhi:

2.a) Define the term Data Hiding in the context of Object Oriented Programming. Give a suitable example using a C++ code to illustrate the same. 2

Ans: A class groups its members into three sections: private, protected and public. The private and protected members remain hidden from outside world. Thus through private and protected members, a class enforces data – hiding.

(The outside world is given only the essential and necessary information through public members, rest of the things remain hidden, which is nothing but abstraction. The act of representing only essential features without including background details is known as abstraction.)

```
Eg: class ABC
{
    private:  int a,b;
    protected: int c,d;
    public:   int e,f;
            void disp( )
            {
            ----
            }
            ----
}
```

In the above class public members (ie e,f and disp()) only will be available to outside the class.. The other private members (a,b), protected members (c,d) will not be available to outside the class. This concept is called data hiding.

2005 Outside Delhi:

2.a) Define the term Data Encapsulation in the context of Object Oriented Programming. Give a suitable example using a C++ code to illustrate the same. 2

Ans: Encapsulation is wrapping up of characteristics and behavior into one unit. While implementing encapsulation, following things are taken care:

- a) Anything that an object does not know or cannot do is excluded from the objects.

b) Encapsulation is used to hide unimportant implementation details from other objects.
c) Packaging an object’s variables within the protective custody of its methods is called encapsulation and this task is accomplished through classes. Ie the data and associated functions are wrapped up in one unit called class.

A class binds together data and its associated functions under one unit thereby enforcing encapsulation.

```
Eg: class Rectangle
{
    private: float len,bre,area;
    public:  void readData( )
            { cout<<"\nEnter the length and
              breadth..";
              cin>>len>>bre;
            }
            void calculate( )
            {   area=len*bre;
            }
            void display( )
            {   cout<<"\nThe area of the rectangle =
              "<<area;
            }
};
```

Eg: Here in the above class the data members ie len,bre,area and the member functions ie readData(), calculate(), display() are bind together in a class named as Rectangle. Ie The member functions can access any data member in the class.

Benefits with encapsulation:

- (i) Modularity.
- (ii) Information hiding.

2004

1.a) What is polymorphism? Give an example in C ++ to show its implementation in C++.

Ans: Polymorphism is the attribute that allows one interface to be used with different situation. C++ implements polymorphism through virtual functions, through overloaded functions and overloaded operators.

A virtual function is used to specify the interface in abstract class, but its implementation details are made available by the concrete class(es).

An overloaded function refers to a function having (one name and) more than one distinct meanings. Similarly, when two or more distinct meanings are defined for an operator, it is said to be an ‘overloaded operator’. It is the compiler’s job to select the specific action as it applies to each situation.

Eg: The program in the next answer.

2003:

2.a) What do you understand by function overloading? Give an example illustrating its use in a c++ program.

Ans: A function name having several definitions that are differentiable by the number or types of their arguments, is known as an overloaded function and this process is known as function overloading.

Function overloading not only implements polymorphism but also reduces number of comparisons in a program and thereby makes the program run faster.

Example program illustrating function overloading:

//Program to find out area of a circle or area of rectangle using //function overloading.

```
#include<iostream.h>
#include<conio.h>
void area(float r)
{ cout<<"\nThe area of the circle =
  "<<3.1415*r*r; }
void area(float l,float b)
{ cout<<"\nThe area of the rectangle =
  "<<l*b; }
void main( )
{ float rad,len,bre;
  int n;
  clrscr( );
  cout<<"\n1. Area of a Circle...";
  cout<<"\n2. Area of a Rectangle...";
  cout<<"\n\nEnter your choice: ";
  cin>>n;
  switch(n)
  {
    case 1: cout<<"\nEnter the radius: ";
            cin>>rad;
            area(rad);
            break;
    case 2: cout<<"\nEnter the length
            and breadth: ";
            cin>>len>>bre;
            area(len,bre);
            break;
    default: cout<<"\nYou have to enter
            either 1 or 2";
  } //end of switch
  getch( );
}
```

2000:

1.a) Illustrate the concept of function overloading with the help of an example. 1

Ans: The above answer.

1998:

1.a) Define the following terms: (i) Inheritance
(ii) Encapsulation.

Ans:a) Inheritance: The capability of one class to inherit properties from another class is called as inheritance. The class inheritance, lets you generate a model that is closer to the real world. The class inheritance lets you derive new classes (derived class) from old ones (base class), with the derived class inheriting the properties, including the methods of the old class.

Uses of Inheritance:

- i) Capability to express the inheritance relationship which ensures the closeness with the real world models.
- ii) Reusability.
- iii) Transitive nature of inheritance.

b) Encapsulation: The wrapping up of data and functions into a single unit (class) is called as encapsulation.

*"The moment which is lost,
is lost for ever.*

*"So utilize the time
properly"*

4. CLASSES AND OBJECTS

2008 Delhi:

2.a) Differentiate between public and private visibility modes in context of Object Oriented Programming using a suitable example illustrating each.

Ans: public and private visibility modes in context of OOP:

The visibility mode (private or public or protected) in the definition of the derived class specifies whether the features of the base class are privately derived or publicly derived or protected derived. The visibility modes basically control the access specifier to be for inheritable members of base class, in the derived class.

Public visibility mode: The public derivation means that the derived class can access the public and protected members of the base class but not the private members of the base class. With publicly derived class, the public members of the base class become the public members of the derived class, and the protected members of the base class become the protected members of the derived class.

Private visibility mode: The private derivation means, the derived class can access the public and private members of the base class privately. With privately derived class, the public and protected members of the base class become private members of the derived class. That means the inherited members can be accessed only through member functions of the derived class.

Visibility Mode	Inheritable public member becomes (in derived class)	Inheritable protected member becomes (in derived class)	Private member of base class are not directly accessible to derived class.
public	Public	protected	
private	Private	private	

public and private access specifiers in context of OOP: public access specifier is used to define any method or a variable which may be accessed by any member function of the same class and also from outside the class. Private access specifier is used to make any variable or a method which has a limited access within the class only. The concept of

data hiding is implemented through the private access specifier only.

Eg:

```
class student
{ private:
    int rno;
    char name[21];
    public:
    int age;
    void input( );
    void display( );
}
```

Here, since rno and name are declared in private, they can be accessed only inside the class. Since age, input() and display() are declared in public, they can be accessed from outside class also.

2008 Outside Delhi:

2.a) Differentiate between private and protected visibility modes in context of object oriented programming using a suitable example illustrating each.

Ans: private and protected visibility modes in context of OOP:

The visibility mode (private or public or protected) in the definition of the derived class specifies whether the features of the base class are privately derived or publicly derived or protected derived. The visibility modes basically control the access specifier to be for inheritable members of base class, in the derived class.

Private visibility mode: The private derivation means, the derived class can access the public and private members of the base class privately. With privately derived class, the public and protected members of the base class become private members of the derived class. That means the inherited members can be accessed only through member functions of the derived class.

Protected visibility mode: The protected derivation means that the derived class can access the public and private members of the base class protectedly. With protectedly derived class, the public and protected members of the base class become protected members of the derived class. That means the inherited members are now not available to the outside world and can be accessed only through the member functions of the derived class and the classes based upon the derived classes. These members can be inherited further if any classes are inheriting from the derived class.

Visibility Mode	Inheritable public member becomes (in derived class)	Inheritable protected member becomes (in derived class)	Private member of base class are not directly accessible to derived class.
protected	Protected	protected	
private	Private	private	

private and protected access specifiers in context of OOP:

private access specifier is used to make any variable or a method which has a limited access within the class only.

At the time of inheritance, these variables cannot be accessed (inherited) to the derived class.

protected access specifier is used to make any variable or a method which has a limited access within the class only (here like private). But at the time of inheritance, these variables can be inherited to the derived class.

Except regarding inheritance, both access specifiers ie private and protected will work same.

Eg:

```
class student
{ private:
    int rno;
    char name[21];
  protected:
    int age;
    void input( );
    void display( );
}
```

Here, since rno and name are declared in private, they can be accessed only inside the class. Since age, input() and display() are declared in protected, they also can be accessed only inside the class but they can be inherited, where as private members (rno and name) cannot be inherited.

2006 Delhi:

2.c) Define a class named ADMISSION in C++ with the following descriptions:

Private Members:

AD_NO	integer(Ranges 10 – 2000)
NAME	Array of characters(String)
CLASS	Character
FEES	Float

Public Members:

Function Read_Data() to read an object of ADMISSION type. Function Display() to display the details of an object. Function Draw-Nos.() to choose 2 students randomly. And display the details. Use random function to generate admission nos. to match with AD_NO.

Ans:

```
class ADMISSION
{ int AD_NO;
  char NAME[31];
  char CLASS;
  float FEES;
public:
  void Read_Data( )
  { cout<<"\nEnter the Admission Number: ";
    cin>>AD_NO;
    cout<<"\nEnter the Student Name: ";
    gets(NAME);
    cout<<"\nEnter the Class: ";
    cin>>CLASS;
    cout<<"\nEnter the Fees: ";
```

```
    cin>>FEES;
  }
  void Display()
  { cout<<"\nThe Admission Number of the
    student: "<<AD_NO;
    cout<<"\nThe name of the Student: "
    <<NAME;
    cout<<"\nThe Class of the Student:"
    <<CLASS;
    cout<<"\nThe Fees of the Student: "
    <<FEES;
  }
  void Draw_Nos();
};
void ADMISSION::Draw_Nos( )
{ //Dear Students, a test for you. Complete
  this member function.
}
```

2006 Outside Delhi:

1.b) Illustrate the use of Inline function in C++ with the help of an example. 2

Ans: INLINE FUNCTIONS: The inline functions are a C++ enhancement designed to speed up programs. The coding of normal functions and inline functions is similar except that inline functions definitions start with the keyword inline.

The working of inline functions:

After writing any program, it is first compiled to get an executable code, which consists of a set of machine language instructions. When this executable code is executed, the operating system loads these instructions into the computer's memory, so that each instruction is stored in a specific memory location. Thus, each instruction has a particular memory address.

After loading the executable program in the computer memory, these instructions are executed step by step. When a function call instruction is encountered, the program stores the memory address of the instruction immediately following the function call statement, loads the function being called into the memory, copies argument values, jumps to the memory location of the called function, executes the function code, stores the return value of the function, and then jumps back to the address of the instruction that was saved just before executing the called function.

With inline code, the compiler replaces the function call statement with the function code itself (this process is called expansion) and then compiles the entire code. Thus, with inline functions, the compiler does not have to jump to another location to execute the function, and then jump back as the code of the called function is already available to the calling program.

Inline functions run a little faster than the normal functions as function calling overheads are saved, however there is a memory penalty. If 10 times an inline

function is called, there will be 10 copies of the function inserted into the code.

A function can be declared inline by placing the keyword inline before it. An inline function definition should be placed above all the functions that call it. The functions should be inlined only when they are small. Since for large functions, they will become memory penalty.

The inlining does not work for following situations:

- a. For functions that return values and are having a loop or a switch or a goto.
- b. For functions not returning values, if a return statement exists.
- c. If functions contain static variables.
- d. If the function is recursive(a function that calls itself).

Inlining and the member functions:

The member function of a class, if defined within the class definition, are inlined by default. Therefore, only very small member functions should be defined within the class definition.

The member functions defined outside the class definition can be made explicitly inline by placing the keyword inline before their definition.

Inline functions are best for small functions that are called often. The compiler may even ignore your attempt to inline a function if it consists more than 50 lines of code.

2. c) Define a class named HOUSING in C++ with the following descriptions: 4

Private Members:

REG_NO integer(Ranges 10-1000)
 NAME Array of characters(String)
 TYPE Character
 COST Float

Public Members:

Function Read_Data() to rread an object of HOUSING type.
 Function Display() to display the details of an object.
 Function Draw_Nos() to choose and display the details of 2 houses selected randomly from an array of 10 objects of type HOUSING. Use random function to generate the registration nos. to match with REG_NO from the array.

Ans:

```
class HOUSING
{ int REG_NO;
  char NAME[31];
  char TYPE;
  float COST;
public:
  void Read_Data()
  { cout<<"\nEnter the House Registration
    Number: ";
    cin>>REG_NO;
    cout<<"\nEnter the House Name: ";
    gets(NAME);
    cout<<"\nEnter the House Type: ";
```

```
    cin>>TYPE;
    cout<<"\nEnter the House Cost: ";
    cin>>COST;
  }
  void Display()
  { cout<<"\nThe Registration Number of the
    House: "<<REG_NO;
    cout<<"\nThe name of the House: "
    <<NAME;
    cout<<"\nThe Type of the House: "<<TYPE;
    cout<<"\nThe Cost of the House: "<<COST;
  }
  void Draw_Nos();
};
void HOUSING::Draw_Nos()
{ //Dear Students, a test for you. Complete
  this member function.
}
```

2004:

2.b) Declare a class myfolder with the following specifications:

Private members of the class:

Filenames an array of strig of size[10][25]
 (to represent all the names of files inside myfolder)
 Availspace long
 (to represent total number of bytes available in myfolder)
 Usedspace long
 (to represent total number of bytes used in myfolder)

Public members of the class:

Newfileentry() : A function to accept values of Filenames, Availspace and Usedspace from user.

Retavailspace(): A function that returns the value of total kilobytes available (1 kilobyte=1024 bytes)

Showfiles(): A function that displays the names of all the files in myfolder

Ans:

```
class myfolder
{ char Filenames[10][25];
  long Availspace;
  long Usedspace;
public:
  void Newfileentry()
  { cout<<"\nEnter any 10 file names: ";
    for(int i=0;i<=9;i++)
    {cout<<"\nEnter the "<<i+1<<" file name:
";
      gets(Filenames[i]);
    }
  }
  cout<<"\nEnter the Available Space (In
    Kilobytes): ";
  cin>>Availspace;
  cout<<"\nEnter the Used Space (In
    Kilobytes): ";
  cin>>Usedspace;
}
long RetavailSpace()
{ ret Availspace;
}
void Showfiles()
{ cout<<"\nThe names of the files in
```

```

        myfolder object....";
for(i=0;i<=9;i++)
{   puts(Filenames[i]);
    cout<<endl;
}
}

```

2002:

2.a) What do you understand about a member function? How does a member function differ from an ordinary function?

Ans: A member function is a function declared within a class. It is said to be defined in two ways. I.e Outside the class and inside the class. When a member function is defined outside the class, the name of the function must be the full name including the class name as well. When a member function is defined inside the class, the name of the function is similar to an ordinary function but it will become an **inline** function.

2.b) Define a class Student for the following specifications.

Private members of the Student are:

roll_no integer
name array of characters of size 20
class_st array of characters of size 8
marks array of integers of size 5
Percentage float

Calculate() that calculates overall percentage marks and returns the percentage

Public Members of the Student are:

Readmarks reads mark and invoke the calculate function

Displaymarks prints the data.

Ans:

```

class Student
{ int roll_no;
  char name[20];
  char class_st[8];
  int marks[5];
  float percentage;
  float calculate( )
  { percentage=(marks[0]+marks[1]+marks[2]+
    marks[3]+marks[4])/5;
    return percentage;
  }
public:
  void Readmarks( )
  { cout<<"\nEnter any 5 subject marks;
    cin>>marks[0]>>marks[1]>>marks[2]>>
      marks[3]>>marks[4];
    calculate( );
  }
  void Displaymarks( )
  { cout<<"\nThe Roll Number of the
    Student: "<<roll_no;
    cout<<"\nThe Name of the Student:"
      <<name;
    cout<<"\nThe class of the Student: "
      <<class_st;
    cout<<"\n5 subject marks of the
      student... \n";
    cout<<marks[0]<<"\t"<<marks[1]<<"\t"<<
      marks[2]<<"\t";

```

```

    cout<<marks[3]<<"\t"<<marks[4]<<"\n";
    cout<<"Percentage ="<<percentage;
  }
};

```

2001:

2.b) Declare a class to represent bank account of 10 customers with the following data members. Name of the depositor, account number, type of account (S for Savings and C for Current), Balance amount. The class also contains member functions to do the following:

(i) To initialize data members.

(ii) To deposit money

(iii) To withdraw money after checking the balance (minimum balance is Rs.1000)

(iv) To display the data members.

[Note: You are also required to give detailed function definitions.]

```

class Bank
{   char name[15];
    int acc_no;
    char acc_type;
    float bal_amount;
public:
  void readData( )
  {   cout<<"\nEnter the name: ";
      gets(name);
      cout<<"\nEnter the account number: ";
      cin>>acc_no;
      cout<<"\nEnter the account type: ";
      cin>>acc_type;
      cout<<"\nEnter the amount to
deposit: ";
      cin>>bal_amount;
  }
  void deposit( )
  { float deposit;
    cout<<"\nEnter your account number: ";
    cin>>acc_no;
    cout<<"\nEnter the amount to deposit: ";
    cin>>deposit;
    bal_amount=bal_amount + deposit;
  }
  void withdraw( )
  { float w_amount;
    cout<<"\nEnter your account number:
";
    cin>>acc_no;
    cout<<"\nEnter amount to withdraw";
    cin>>w_amount;
    if((bal_amount-w_amount)<1000)
      cout<<"\nWithdraw is not possible";
    else
      { bal_amount=bal_amount-w_amount;
        cout<<"\nThe balance is
          "<<bal_amount-w_amount;
      }
  }
  void display( )
  {   cout<<"\nName of the depositor: "
      <<name;
      cout<<"\nAccount Number: "<<acc_no;
      cout<<"\nAccount Type: "<<acc_type;

```

```

        cout<<"\nThe balance amount is
            "<<bal_amount;
    }
};
2000 :
2.b) Define a class worker with the following
specification. 4
Private member of class worker:
wname          25characters
hrwrk,wgrate   float (hours worked and
                wagherate per hour)
totwage        float(hrwrk*wgrate)
cakcwg()       A function to find hrwrk*wgrate
                with float return type
Public members of class worker:
In_data() :    A function to accept values for
wno, wname, hrrwrk, wgrate and invoke
calcwg() to calculate totpay.
Out_data() :  A function to display all the data
members on the screen you should give
definitions of functions.
class worker
{
    char wname[25];
    float hrwrk,wgrate;
    float totwage;
    float cakcwg()
    {
        return hrwrk*wgrate;
    }
public:
void In_data()
{
    cout<<"\nEnter Worker number,name,hours
worked and wage rate";
    cin>>wno;
    gets(wname);
    cin>>hrwrk>>wgrate;
    calcwg();
}
void Out_data()
{
    cout<<"\nThe Worker Number: "<<wno;
    cout<<"\nThe Name of the worker:
        "<<wname;
    cout<<"\nNumber of hours worked by the
worker: "<<hrwrk;
    cout<<"\nThe Wage Rate of the Worker:
        "<<wgrate;
    cout<<"\nThe total wages of the worker:
        "<<totwage;
}
}
1999 :
2.b) Define a class Teacher with the following
class specification:
Private members:
Name           20 characters
Subject        10 characters
Basic, DA, HRA float
Salary         float
Calculate()    function computes the
salary and returns it. Salary is sum of Basic,
DA and HRA
Public members:
ReadData() :   Function accepts the data
values and invoke the calculate function.
DisplayData() :Function prints the data on the
screen.

```

```

class Teacher
{
    char Name[20];
    char subject[10];
    float Basic,DA,HRA,Salary;
    float Calculate()
    {
        Salary=Basic+DA+HRA;
        return Salary;
    }
public:
void ReadData()
{
    cout<<"\nEnter Basic, Dearness
        Allowance and "
    cout<<" House Rent Allowance: ";
    cin>>Basic>>DA>>HRA;
    Calculate();
}
void DisplayData()
{
    cout<<"\nThe Basic : "<<Basic;
    cout<<"\nThe Dearness
        Allowance: "<<DA;
    cout<<"\nThe House Rent
        Allowance: "<<HRA;
    cout<<"\nThe Salary: "<<Salary;
}
}
};

```

1998 Annual:

2.b) Define a class student with the following specifications:

Private members of class student:

Admno	integer
Sname	20 character
English	float
Math	float
Science	float
Total	float
Ctotal()	A function to calculate English + math + science with float return type

Public member functions of class student:

Takedata():Function to accept values for admno,sname, English, math, science and invoke ctotal to calculate total.
Showdata():Function to display all the data members on the screen.

```

class student
{
    int Admno;
    char Sname[20];
    float English,Math,Science,Total;
    float Ctotal()
    {
        Total=English+math+science;
        return Total;
    }
public:
void Takedata()
{
    cout<<"\nEnter the admission
        number,name of the student: ";
    cin>>Admno;
    gets(sname);
    cout<<"\nEnter English, Maths,
        Science Marks: ";
    cin>>English>>Math>>Science;
    Ctotal();
}
}
void Showdata()

```



```

{ cout<<"\n\nThe admission number of
  the student: "<<Admno;
  cout<<"\n\nThe name of the student:
    "<<Sname;
  cout<<"\n\nEnglish , Maths and
    Science Marks are...";
  cout<<english<<"\t"<<math<<"\t"
    <<science<<"\n";
  cout<<"\n\nTotal marks of the
    student: "<<Total;
};

```

5.CONSTRUCTORS & DESTRUCTORS

DELHI 2008

2.b) Answer the questions (i) and (ii) after going through the following program: 2

```

#include <iostream.h>
#include<string.h>
class bazaar
{ char Type[20] ;
  char product [20];
  int qty ;
  float price ;
  bazaar()
//function 1
  { strcpy (type , "Electronic") ;
    strcpy (product , "calculator");
    qty=10;
    price=225;
  }
public :
void Disp() //function 2
{ cout<< type <<"-"<<product<<":"
  <<qty<< "@" << price << endl ;
}
};
void main ()
{ Bazaar B ; //statement 1
  B. disp() ; //statement 2
}

```

(i) Will statement 1 initialize all the data members for object B with the values given in the function 1 ? (YES OR NO).

Justify your answer suggesting the correction(s) to be made in the above code.

Ans: No. The reason is the constructor should be defined under the public visibility label.

(ii) What shall be the possible output when the program gets executed ? (Assuming, if required _ the suggested correction(s) are made in the program).

Ans: Possible Output:

Electronic-Calculator:10@225

2.c) Define a class Garments in c++ with following descriptions 4

private members :

GCode of type string
 GType of type string
 Gsize of type intiger

Gfabric of type istring
 Gprice of type float
 A function **Assign()** which calculate and the value of GPrice as follows.

For the value of GFabric "COTTON" ,

GType	GPrice(RS)
TROUSER	1300
SHIRT	1100

For GFabric other than "COTTON", the above mentioned

GPrice gets reduced by 10%

public members:

A constructor to assign initial values of GCode,GType and GFabric with the a word "NOT ALLOTTED"and Gsize and Gprice with 0.

A function Input ()to the values of the data membersGCode, GType,Gsize and GFabric and invoke the Assign() function.

A function Display () which displays the content of all the data members for a garment.

```

#include<iostream.h>
#include<string.h>
#include<conio.h>
#include<stdio.h>
class Garments
{ char GCode[21],GType[21];
  int Gsize;
  char Gfabric[21];
  float Gprice;
  void Assign( )
  {
if(strcmp(strupr(Gfabric),"COTTON")==0)
  { if(strcmp(strupr(GType),"TROUSER")==0)
    Gprice=1300;
    if(strcmp(strupr(GType),"SHIRT")==0)
    Gprice=1100;
  }
else
  {if(strcmp(strupr(GType),"TROUSER")==0)
    Gprice=1300*0.90;
    if(strcmp(strupr(GType),"SHIRT")==0)
    Gprice=1100*0.90;
  }
}
}
public:
Garments( )
{
  strcpy(GCode,"NOT ALLOTTED");
  strcpy(GType,"NOT ALLOTTED");
  Gsize=0;
  strcpy(Gfabric,"NOT ALLOTTED");
  Gprice=0;
}
void Input( )
{ cout<<"\n\nEnter the Grament Code: ";
  gets(GCode);
  cout<<"\n\nEnter the Garment Type: ";
  gets(GType);
  cout<<"\n\nEnter the Garment Size: ";
  cin>>Gsize;
  cout<<"\n\nEnter the Garment Fabric: ";
  gets(Gfabric);
  Assign( );
}
void display( )
{ cout<<"\n\nThe Garment Code: "<<GCode;

```

```

cout<<"\nThe Garment Type: "<<GType;
cout<<"\nThe Garment Size: "<<Gsize;
cout<<"\nThe Garment Fabric: "<<Gfabric;
cout<<"\nThe Garment Price: "<<Gprice;
}
};
void main()
{ Garments G;
  G.Input();
  G.display(); }

```

OUTSIDE DELHI 2008:

2.b) Answer the questions (i) and (ii) after going through the following program:

```

#include<iostream.h>
#include<string.h>
class Retail
{ char category[20];
  char item[20];
  int qty;
  float price;
  retail () //function 1
  { strcpy (category, "cerial");
    strcpy (Item, "Rice");
    qty =100 ;
    price =25 ;
  }
public;
  void show() //function 2
  { cout << category <<"-"<< Item << "
    :"<<Qty<<"@"<< price<<endl;
  }
};
void main()
{ Retail R; //statement 1
  R. show (); //statement 2
}

```

(i) will statement 1 initialize all the data members for objects R with the given in the function 1 ? (YES OR NO). Justify your Answer suggesting the correction(s) to be made in the above code.

Ans:No. The reason is the constructor should be defined under the public visibility label.

(ii) What shall be the possible out put when the program gets executed ? (Assuming, if required the suggested correction(s) are made in the program)

Ans: Possible Output:

cerial-Rice:100@25

2.c) Define a class clothing in c++ with the following descriptions :

private members :

code of type string
 type of type string
 size of type intiger
 material of type string
 price of type float

A function **calc_price()** which calculates and assigns the value of GPrice as follows ;

For the value of material as "COTTON" :

Type	price (Rs)
TROUSER	1500.
SHIRT	1200.

for material other than "COTTON", the above mentioned GPrice price gets reduced by 25%

public members :

* A constructor to assign initial values of code ,type and material with the word "NOT ASSIGNED "and size and price with 0.

* A function enter() to input the values of the data members code, type, size and material and invoke the calcPrice () function.

* A function show which displays the content of all the data members for a clothing.

```

#include<iostream.h>
#include<string.h>
#include<conio.h>
#include<stdio.h>
class clothing
{ char Code[21],Type[21];
  int size;
  char material[21];
  float price;
  void calc_price()
  {
  if(strcmp(strupr(material),"COTTON")==0)
  { if(strcmp(strupr(Type),"TROUSER")==0)
    price=1500;
    if(strcmp(strupr(Type),"SHIRT")==0)
    price=1200;
  }
  else
  { if(strcmp(strupr(Type),"TROUSER")==0)
    price=1500*0.75;
    if(strcmp(strupr(Type),"SHIRT")==0)
    price=1200*0.75;
  }
}
public:
  clothing()
  { strcpy(Code,"NOT ALLOTTED");
    strcpy(Type,"NOT ALLOTTED");
    size=0;
    strcpy(material,"NOT ALLOTTED");
    price=0;
  }
  void enter()
  { cout<<"\nEnter the Cloth Code: ";
    gets(Code);
    cout<<"\nEnter the Cloth Type: ";
    gets(Type);
    cout<<"\nEnter the Cloth Size: ";
    cin>>size;
    cout<<"\nEnter the cloth material:
";
    gets(material);
    calc_price();
  }
  void show()
  { cout<<"\nThe Cloth Code: "<<Code;
    cout<<"\nThe Cloth Type: "<<Type;
  }
}

```

```

    cout<<"\nThe Cloth Size: "<<size;
    cout<<"\nThe Cloth Material: "
        <<material;
    cout<<"\nThe Cloth Price: "<<price;
} };
void main( )
{ clothing C;
  C.enter( );
  C.show( );
}

```

DELHI 2007:

2.a) Differentiate between Constructor and Destructor function in context of Classes and Objects Using C++? 2

Ans:

Constructor: A constructor is used to initialize the objects of that class type with a legal initial value. If a class has a constructor, each object of that class will be initialized before any use is made of the object.

(A member function with the same name as its class is called Constructor and it is used to initialize the objects of that class type with a legal initial value.)

Destructor: A destructor is used to destroy the objects that have been created by a constructor. A destructor destroys the values of the object being destroyed.

2.b) Answer the question (i) and (ii) after going through the following class: 2

```

class Maths
{ char Chapter[20]
  int Marks;
public:
  Maths() //Member Function 1
  { strcpy (Chapter, "Geometry");
    Marks=10;
    cout <<"Chapter Initialised ";
  }
  ~Maths() //Member Functions 2
  { cout<<"Chapter Over";
  }
};

```

Constructor	Destructor
Purpose: Is used to initialize the objects of that class type with a legal initial value	Purpose: Is used to destroy the objects that have been created by a constructor
Name: The name of the class	Name: The name of the class preceded by a ~.
Calling: It will be called automatically at the time of creation of the object. Ie Implicite calling	Calling: It will be called automatically at the time of destruction of an object. Ie Implicite calling
Return Type: No return type not even void	Return Type: No return type not even void

(i) Name the specific features of class shown by member Function 1 and Member Function 2 in the above example.

Ans: Member function 1 is a (non-parameterized or default) constructor (, which will be executed automatically at the time of creation of an object of class Maths).

Member function 2 is a destructor (, which will be executed automatically at the time of destruction of an object of class Maths).

(ii) How would Member Function 1 and Member Function 2 get executed ?

Ans: They will be executed automatically. Member function 1 will be executed at the time of creation of an object of class Maths. Member function 2 will be executed at the time of destruction of an object of class Maths.

2.c) Define a class Tour in C++ with the description given below 4

Private Members:

- TCode of type string
- No of Adults of type integer
- No of Kids of type integer
- Kilometers of type integer
- TotalFare of type float

Public Members:

- A constructor to assign initial values as follows:
TCode with the word "NULL"
No of Adults as 0
No of Kids as 0
Kilometers as 0
TotalFare as 0
- A function AssignFare() which calculates and assigns the value of the data member Totalfare as follows
For **each** Adult

Fare (Rs)	For Kilometers
500	>=1000
300	<1000 & >=500
200	<500

For **each** Kid the above Fare will be 50% of the Fare mentioned in the above table

For Example:

If Kilometers is 850, Noofadults =2 and NoofKids =3 Then TotalFare should be calculated as

$$\text{Numof Adults} * 300 + \text{NoofKids} * 150$$

i.e., $2 * 300 + 3 * 150 = 1050$

- A function EnterTour() to input the values of the data members TCode, NoofAdults, NoofKids and Kilometers ; and invoke the AssignFare() function.

- A function ShowTour() which displays the content of all the data members for a Tour.

Ans:

```
#include<conio.h>
#include<stdio.h>
#include<string.h>
#include<iostream.h>
class Tour
{ char TCode[21];
  int NoofAdults,NoofKids,Kilometres;
  float TotalFare;
public:
  Tour()
  { strcpy(TCode,"NULL");
  NoofAdults=NoofKids=Kilometres=TotalFare=0;
  }
  void AssignFare( )
  { if(Kilometres>=1000)
  TotalFare=NoofAdults*500+NoofKids*250;
  else if(Kilometres>=500)
  TotalFare=NoofAdults*300+NoofKids*150;
  else
  TotalFare=NoofAdults*200+NoofKids*100;
  }
  void EnterTour( )
  { cout<<"\nEnter the Tour Code: ";
  gets(TCode);
  cout<<"\nEnter the Number of Adults: ";
  cin>>NoofAdults;
  cout<<"\nEnter the Number of Kids: ";
  cin>>NoofKids;
  cout<<"\nEnter the Number of Kilometres: ";
  cin>>Kilometres;
  AssignFare( );
  }
  void ShowTour( )
  { cout<<"\nThe Tour Code: "<<TCode;
  cout<<"\nThe Number of Adults:"
  <<NoofAdults;
  cout<<"\nThe Number of Kids: "<<NoofKids;
  cout<<"\nThe Number of Kilometres: "
  <<Kilometres;
  cout<<"\n\nThe Total Fare: "<<TotalFare;
  }
};
void main( )
{ clrscr();
  Tour T;
  T.EnterTour( );
  T.ShowTour( );
  getch();
}
```

OUTSIDE DELHI: 2007:

2.b) Answer the questions (i) and (ii) after going through the following class : 2

```
class Science
{ char Topic[20] ;
  int Weightage ;
public :
```

```
Science () //Function 1
{ strcpy (Topic, "Optics") ;
  Weightage =30
  cout<<"Topic Activated";
}
~Science() //Function 2
{ cout<<"Topic Deactivated"; }
};
```

(i) Name the specific features of class shown by Function 1 and Function 2 in the above example.

Ans: Member function 1 is a (non-parameterized or default) constructor (, which will be executed automatically at the time of creation of an object of class Science).

Member function 2 is a destructor (, which will be executed automatically at the time of destruction of an object of class Science).

(ii) How would Function 1 and Function 2 get executed ?

Ans: They will be executed automatically. Member function 1 will be executed at the time of creation of an object of class Science. Member function 2 will be executed at the time of destruction of an object of class Science.

2.c) Define a class Travel in C++ with the description given below : 4

Private Members:

T_Code of type string
 No_of_Adults of type integer
 No_of_Children of type integer
 Distance of type integer
 TotalFare of type float

Public Members:

- A constructor to assign initial values as follows:
 TCode with the word "NULL"
 No_of_Adults as 0
 No_of_Children as 0
 Distance as 0
 TotalFare as 0
- A function AssignFare() which calculates and assigns the value of the data member Totalfare as follows
 For **each** Adult

Fare (Rs)	For Kilometers
500	>=1000
300	<1000 & >=500
200	<500

For **each** Child the above Fare will be 50% of the Fare mentioned in the above table

For Example:

If Distance is 750, No_of_adults =3 and No_of_Children =2

Then TotalFare should be calculated as
 Num_of_Adults *300+ No_of_Children *150
 i.e., 3*300+ 2 *150 =1200

- A function EnterTour() to input the values of the data members T_Code, No_of_Adults, No_of_Children and Distance ; and invoke the AssignFare() function.
- A function ShowTravel() which displays the content of all the data members for a Travel.

```
#include<conio.h>
#include<stdio.h>
#include<string.h>
#include<iostream.h>
class Travel
{ char T_Code[21];
int No_of_Adults,No_of_Children,Distance;
float TotalFare;
public:
Travel()
{ strcpy(T_Code,"NULL");
No_of_Adults=No_of_Children=Distance=
TotalFare=0;
}
void AssignFare( )
{ if(Distance>=1000)
TotalFare=No_of_Adults*500+No_of_Children*
250;
else if(Distance>=500)
TotalFare=No_of_Adults*300+No_of_Children*
150;
else
TotalFare=No_of_Adults*200+No_of_Children*
100;
}
void EnterTravel( )
{ cout<<"\nEnter the Travel Code: ";
gets(T_Code);
cout<<"\nEnter the Number of
Adults: ";
cin>>No_of_Adults;
cout<<"\nEnter the Number of
Children: ";
cin>>No_of_Children;
cout<<"\nEnter the Distance in
Kilometres: ";
cin>>Distance;
AssignFare( );
}
void ShowTravel( )
{ cout<<"\nThe Travel Code: "
<<T_Code;
cout<<"\nThe Number of Adults: "
<<No_of_Adults;
cout<<"\nThe Number of Children: "
<<No_of_Children;
cout<<"\nThe Distance in
Kilometres: "<<Distance;
cout<<"\n\nThe Total Fare:
"<<TotalFare;
}
};
void main( )
```

```
{
clrscr();
Travel T;
T.EnterTravel( );
T.ShowTravel( );
getch();
}
```

DELHI 2006:

2.b) Answer the following questions (i) and (ii) after going through the following class. 2

```
class Interview
{ int Month;
public:
interview(int y) {Month=y;}
//constructor 1
interview(Interview&t);
//constructor 2
};
```

(i) create an object, such that it invokes Constructor 1.

Ans: Interview A(10); //invoking constructor 1 by passing a number.

(ii) write complete definition for Constructor 2.

Ans: Interview(Interview &t) //This is a copy constructor.

```
{ Month=t.Month;
}
```

OUTSIDE DELHI 2006:

1.f) What is a default constructor? How does it differ from destructor? 2

a) Default constructor: A constructor that accepts no parameter is called the default constructor.

With a default constructor, objects are created just the same way as variables of other data types are created.

```
class X
{ int i ;
public:
int j, k ;
----- //Members
Functions
-----
```

```
};
Eg: X ob1;
Student s1;
```

If a class has no explicit constructor defined, the compiler will supply a default constructor. This implicitly declared default constructor is an **inline public** members of its class. Declaring a constructor with arguments hides the default constructor.

There can be a default constructor as well as another constructor with arguments for a class, having multiple constructors is called as constructor overloading.

2.b) Answer the following questions (i) and (ii) after going through the following class. 2

```
class Exam
{
    int Year;
public:
    Exam(int y) //Constructor 1
    {
        Year=y;
    }
    Exam(Exam &t);
        //Constructor 2
};
```

(i) Create an object, such that it invokes Constructor 1

Ans: Exam E((2008);

(ii) Write complete definition for constructor 2.

Ans: Exam(Exam &t)

//Copy Constructor.

```
{
    Year=t.Year;
}
```

DELHI 2005:

2.b) Answer the following questions (i) and (ii) after going through the following class.

```
class Test
{
    char Paper[20];
    int Marks
public:
    Test() //Function 1
    {
        strcpy(Paper,"Computer");
        Marks=0;
    }

    //Function 2
    Test(char P[])
    {
        strcpy(Paper,P);
        Marks=0;
    }

    //Function 3
    Test(int M)
    {
        strcpy(Paper,"Computer");
        Marks=M;
    }

    Test(char P[],int M)
    //Function 4
    {
        strcpy(Paper,P);
        Marks=M;
    }
};
```

(i) Which feature Object Oriented programming is demonstrated using Function 1, Function 2, Function 3 and Function 4 in the above class text?

Ans: Function overloading (here it is constructor overloading).

(ii) Write statements in C++ that would execute Function 2 and Function 4 of class Text.

Ans: (let char name[20];

int X=60;

strcpy(name,"COMPUTERSCIENCE");
are declared in the program)

(i) Test A(name);
//Will execute Function 2

(ii) Test B(name,X);
//Will execute Function 4

2.c) Define a class Travelplan in C++ with the following descriptions:

Private Members:

Plancode of type long
Place of type

character array(string)

Number_of_travellers of type integer

Number_of_buses of type integer

Public Members:

*A constructor to assign initial values of PlanCode as 1001, Place as

"agra",Number_of_travellers as

5,Number_of_buses as 1

* A function NewPlan() which allows user to enter PlanCode, Place and Number_of travelers. Also, assign the value of Number_of_buses as per the following conditions:

Number_of travellers less than 20

Number_of buses 1

Equal to or more than 20 and less than 40

2

Equal to 40 or more than 40 - 3

* A function ShowPlan() to display the 3

content of all the data members on the screen.

Ans:

```
#include<iostream.h>
```

```
#include<conio.h>
```

```
#include<stdio.h>
```

```
#include<string.h>
```

```
class TravelPlan
```

```
{ long PlanCode;
```

```
char Place[21];
```

```
int Number_of_travellers,Number_of_buses;
```

```
public:
```

```
TravelPlan( )
```

```
{ PlanCode=1001;
```

```
strcpy(Place,"Agra");
```

```
Number_of_travellers=5;
```

```
Number_of_buses=1;
```

```
}
```

```
void NewPlan( )
```

```
{ cout<<"\nEnter the Plan Code: ";
```

```
cin>>PlanCode;
```

```
cout<<"\nEnter the Place to Travel: ";
```

```
gets(Place);
```

```
cout<<"\nEnter the Number of Travellers: ";
```

```
cin>>Number_of_travellers;
```

```
if(Number_of_travellers>=40)
```

```
Number_of_buses=3;
```

```
else if(Number_of_travellers>=20)
```

```
Number_of_buses=2;
```

```
else
```

```
Number_of_buses=1;
```

```
}
```

```
void ShowPlan( )
```

```
{ cout<<"\nThe Plan Code: "<<PlanCode;
```

```
cout<<"\nThe Place of Travel: "<<Place;
```

```
cout<<"\nNumber of Travellers: "
```

```

        <<Number_of_travellers;
    cout<<"\nNumber of Buses: "
        <<Number_of_buses;
    }
};
void main()
{ clrscr();
  TravelPlan T;
  T.NewPlan();
  T.ShowPlan();
  getch();
}

```

OUTSIDE DELHI 2005:

1.a) Differentiate between a default constructor and copy constructor, giving suitable examples of each.

Ans: A default constructor also called as non-parameterized constructor will take no argument and initialize the object with the predefined values in that constructor,

Where as a copy constructor will take an already created object of that class and stores that object values into the newly created object of that class. A copy constructor takes a reference to an object of the same class as an argument.

2.b) Answer the following questions (i) and (ii) after going through the following class.

```

class Exam
{
    int Marks;
    char Subject[20];
public:
    Exam() //Function 1
    { strcpy(Subject,"Computer");
      Marks=0;
    }
    Exam(char S[]) //Function 2
    { strcpy(Subject,S);
      Marks=0;
    }
    Exam(int M) //Function 3
    { strcpy(Subject,"Computer");
      Marks=M;
    }
    Exam(char S[],int M) //Function 4
    { Strcpy(Subject,P);
      Marks=M;
    }
};

```

(i) Write statements in C++ that would execute Function 3 and Function 4 of class Exam.

(let char name[20];

int X=60;

strcpy(name,"COMPUTERSCIENCE");
are declared in the program)

(i) Exam A(X);

//Will execute Function 3

(ii) Exam B(name,X);

//Will execute Function 4

(ii) Which feature Object Oriented Programming is demonstrated using Function 1, Function 2, Function 3 and Function 4 in the above class text?

Ans: Function overloading (here it is constructor overloading).

2.c) Define a class Travel in C++ with the following descriptions:

Private Members:

Travelcode	of type long
Place	of type character
array(string)	
Number_of_travellers	of type integer
Number_of_buses	of type integer

Public Members:

* A constructor to assign initial values of TravelCode as 201,

Place as "Nainital", Number_of_travellers as 10, Number_of_buses as 1

* A function NewTravel() which allows user to enter TravelCode, Place and Number_of travelers. Also, assign the value of Number_of_buses as per the following conditions:

Number_of travellers less than 20

Number_of buses 1

Equal to or more than 20 and less than 40

2

Equal to 40 or more than 40 - 3

* A function ShowTravel() to display the content of all the data members on the screen.

Ans:

```

#include<iostream.h>
#include<conio.h>
#include<stdio.h>
#include<string.h>
class Travel
{ long TravelCode;
  char Place[21];
  int No_of_travellers,No_of_buses;
public:
    Travel()
    { TravelCode=201;
      strcpy(Place,"Nainital");
      No_of_travellers=5;
      No_of_buses=1;
    }
    void NewTravel()
    { cout<<"\nEnter the Travel Code: ";
      cin>>TravelCode;
      cout<<"\nEnter the Place to Travel: ";
      gets(Place);
      cout<<"\nEnter the Number of Travellers: ";
      cin>>No_of_travellers;
      if(No_of_travellers>=40)
          No_of_buses=3;
      else if(No_of_travellers>=20)
          No_of_buses=2;
      else
          No_of_buses=1;
    }
    void ShowTravel()
    { cout<<"\nThe Plan Code: "<<TravelCode;
      cout<<"\nThe Place of Travel: "<<Place;
      cout<<"\nNumber of Travellers: "
        <<No_of_travellers;
      cout<<"\nNumber of Buses: "

```

```

        <<No_of_buses;
    }
};
void main( )
{ clrscr( );
  Travel T;
  T.NewTravel( );
  T.ShowTravel( );
  getch();
}

```

DELHI 2004:

2.a) Given the following C++ code, answer the questions (i) and (ii)

```

class TestMeOut
{ public:
  ~TestMeOut( ) //Function 1
  {
    cout<<"Leaving the examination hall"<<endl;
  }
  TestMeOut( ) //Function 2
  {
    cout<<"Appearing for examination"<<endl;
  }
  void MyWork( )
  {
    cout<<"Attempting Questions"<<endl;
  }
};

```

- (i) In Object Oriented programming, what is Function 1 referred as and when does it get invoked/called?

Ans: Function 1 is called as Destructor, It will automatically executed at the time of destruction of the object of class TestMeOut.

- (ii) In Object Oriented Programming, what is Function 2 referred as and when does it get invoked/called?

Ans: Function 2 is called as constructor (Non-parameterized or default constructor), it will automatically executed at the time of creation of the object of class TestMeOut.

DELHI 2003:

2.b) Define a class **Play** in C++ with the following specifications:

Private members of class **Play**

*Play code integer
 *Playtime 25 character
 *Duration float
 *Noofscenes integer

Public member function of class **Play**

*A constructor function to initialize Duration as 45 and Noofscenes as
 *Newplay() function to values for Playcode and Playtitle.
 *Moreinfor() to assign the values of assign the values of Duration and Noofscenes with the of

corresponding values passed as parameters to this function.

*Shoplay() function to display all the dataq members on the screen.

Ans: #include<iostream.h>

#include<conio.h>

#include<string.h>

#include<stdio.h>

class Play

{ int Playcode;

char Playtitle[25];

float Duration;

int Noofscenes;

public:

Play()

{ Duration=45;

Noofscenes=5;

}

void Newplay()

{ cout<<"\nEnter the Play Code: ";

cin>>Playcode;

cout<<"\nEnter the Play Title: ";

gets(Playtitle);

}

void Moreinfor(float D,int N)

{ Duration = D;

Noofscenes = N;

}

void Showplay()

{ cout<<"\nThe Play Code : "

<<Playcode;

cout<<"\nThe Play Title : "

<<Playtitle;

cout<<"\nThe Duration :"

<<Duration;

cout<<"\nThe No of

Scenes:"<<Noofscenes;

}

};

void main()

{ clrscr();

Play P;

P.Newplay();

float Dur;

int NS;

cout<<"\nEnter the Duration and

Number of Scenes: ";

cin>>Dur>>NS;

P.Moreinfor(Dur,NS);

P.Showplay();

getch();

}

DELHI 2002:

2.c) Write the output of the following program

Ans: #include<iostream.h>

class Counter

{ private:

unsigned int count;

public:

Counter()

{ count=0;

Output:

C1=0

C2=0

C1=1

C2=2


```

    }
    void inc_Count()
    {
        count++;
    }
    int get_Count()
    {
        return count;
    }
};
void main()
{
    Counter C1,C2;
    cout<<"\nC1="<<C1.get_Count();
    cout<<"\nC2="<<C2.get_Count();
    C1.inc_Count();
    C2.inc_Count();
    C2.inc_Count();
    cout<<"\nC1="<<C1.get_Count();
    cout<<"\nC2="<<C2.get_Count();
}

```

DELHI 2000:

2.a) Why is destructor function required in classes? Illustrate with the function with an example.

Ans: A destructor is a function which de-allocates/frees the memory which was reserved by the constructor.

Eg:

```

class Sample
{
    Int i,j;
    Public:
        Sample(int a, int b)
//Constructor
    {
        i=a; j=b; }
    ~Sample()
    {
        cout<<"Destructor at work\n"; }
    -----
};
void main()
{
    Sample s1(3,4); //Local object s1
    constructed with values 3
                // and 4 using Sample ()
    -----
    ----//Automatically s1 is destructed at the
    end of the block
        //using destructor ~Sample()
}

```

Here in the above example the destructor ~Sample() will be automatically executed at the time of destruction of an object, and which is used to de-allocate the memory, before doing it whatever written in the destructor will be executed.

In the above example whenever an object of the class is being destroyed, "Destructor at work" will be displayed.

DELHI 1998:

2.a) What is a copy constructor? What do you understand by constructor overloading?

Ans: copy constructor is a constructor of the form **classname(classname &)**. The compiler will use the copy constructor whenever you initialize an instance using values of another instance of same type.

Eg: Sample S1;

//Default constructor used

Sample S2 = S1;

//Copy constructor used. Also

//Sample S2(S1);

In the above code, for the second statement, the compiler will copy the instance S1 to S2 member by member. If you have not defined a copy constructor, the compiler automatically, creates it and it is public.

A copy constructor takes a reference to an object of the same class as an argument.

Constructor Overloading:

With same constructor name, having several definitions that are differentiable by the number or types of their arguments (ie Parameterized, non-parameterized and copy constructors) is known as an overloaded constructor and this process is known as constructor overloading.

Constructor overloading implements polymorphism.

An Example using Constructor Overloading:

1. Program to find area of a circle using class, constructor functions and destructor.

```

#include<iostream.h>
#include<conio.h>
class Circle
{
    float r,a; //r and a are private
    public:
        Circle() //Non parameterized or
        Default Constructor
        {
            r=0.0; a=0.0; }
        Circle(float rad) //Parameterized
        Constructor
        {
            r = rad;
            a = 3.1415*r*r;
        }
        Circle(Circle &obj) //Copy Constructor
        {
            r = obj.r;
            a = obj.a;
        }
        ~Circle()
        {
            cout<<"\nThe object is being
            destroyed...."; }
        void take()
        {
            cout<<"Enter the value of Radius: ";
            cin>>r;
        }
        void calculate()
        {
            a = 3.1415*r*r; }
        void display()
        {
            cout<<"\nThe Radius of the Circle = "<<r;
            cout<<"\nThe Area of the Circle = "<<a;
        }
};

```

```

void main()
{ clrscr();
  Circle c1; /*Default Constructor will be called
implicitly.ie c1.r = 0.0 and c1.a = 0.0 */
  Circle c2(10.3); //Parameterized
//Constructor will be called mplicitely
  Circle c3(c2);
//Copy Constructor will be called implicitly
  c1.take();
  c1.calculate();
  c1.display();
  c2.display();
  c3.display();
getch();}

```

6. INHERITANCE

DELHI 2008:

2.d) Answer the questions (i) to(iv) based on the following code :

```

class Dolls
{ char Dcode[5];
  protected:
    float Price;
    void CalcPrice(float);
  public:
    Dolls();
    void DInput();
    void DShow();
};
class SoftDolls:public Dolls
{ char SDName[20];
  float Weight;
  public:
    SoftDolls();
    void SDInput();
    void DShow();
};
class ElectronicDolls:public Dolls
{ char EDName[20];
  char BatteryType[10];
  int Batteries;
  public:
    ElectronicDolls();
    void EDInput();
    void EDShow();
};

```

(i)Which type of Inheritance is shown in the above example?

Ans: Hierarchical Inheritance.

Since the sub classes are derived from a single base class(Dolls).

(ii)How many bytes will be required by an object of the class ElectronicDolls ?

Ans: 41 Bytes

(Explonation: The memory will be reserved as follows:

```

char Dcode[5];           //5 Bytes
float Price;             //4 Bytes
char EDName[20];        //20 Bytes
char BatteryType[10];   //10 Bytes
int Batteries;          //2 Bytes

```

Total = 41 Bytes)

iii)Write name of all data members accessible from member function of the class SoftDolls.

Ans: Dolls::Price,
SoftDolls:: SDName,
SoftDolls::Weight

(iv)Write name of member functions accessible an object of the class ElectronicDolls?

Ans: ElectronicDolls::EDInput(),
ElectronicDolls::EDShow(),
Dolls::DInput(),
Dolls::DShow()

OUTSIDE DELHI 2008:

2.d) Answer the questions (i) to(iv) based on the following code :

```

class Toys
{ char Tcode[5];
  protected:
    float Price;
    void Assign(float);
  public:
    Toys();
    void Tentry();
    void Tdisplay();
};
class SoftToys:public Toys
{ char STName[20];
  float Weight;
  public:
    SoftToys();
    void STentry();
    void STdisplay();
};
class ElectronicToys:public Toys
{ char ETName[20];
  int No_of_Batteries;
  public:
    ElectronicToys();
    void ETentry();
    void ETdisplay();
};

```

(i)Which type of Inheritance is shown in the above example?

Ans: Hierarchical Inheritance.

Since the sub classes are derived from a single base class(Dolls).

(ii)How many bytes will be required by an object of the class SoftToys ?

Ans: 33 Bytes

(Explonation: The memory will be reserved as follows:

```

char Tcode[5];           //5 Bytes
float Price;             //4 Bytes
char STName[20];        //20 Bytes

```

```
float Weight;           // 4 Bytes
Total = 33 Bytes)
```

(iii) Write name of all data members accessible from member function of the class SoftToys.

Ans: Toys::Price,
SoftToys::STName,
SoftToys::Weight

(iv) Write name of member functions accessible an object of the class ElectronicToys ?

Ans: ElectronicToys::ETEntry(),
Electronic Toys::ETDisplay(),
Toys::TEntry(),
Toys::TDisplay()

DELHI 2007:

2.d) Answer the questions (i) to(iv) based on the following code:4

```
class Trainer
{ char TNo[5],Tname[20],specialization[10];
  int Days;
protected :
  float Remuneratoin;
  void AssignRem(float);
public:
  Trainer();
  void TEntry();
  void TDisplay();
};

class Learner
{
char Regno[10],LName[20],Program[10];
protected:
  int Attendance,grade;
public:
  Learner();
  void LEntry();
  void LDisplay();
};

class Institute:public Learner,public
Trainer
{ char ICode[10],IName[20];
public:
  Institute();
  void IEntry();
  void IDisplay();
};
```

(i) Which type of inheritance is depicted by above example ?

Ans: Multiple Inheritance.

Since here the class Institute is deriving from the classes Learner and Trainer.

(ii) Identify the member function(s) that cannot be called directly from the objects of class Institute from the following

```
TEntry()
LDisplay()
IEntry()
```

Ans: All the above 3 member functions can be called directly from the objects of class Institute.

(iii) Write name of all member(s) accessible from member functions of class institute.

Ans: Data Members – Trainer::Remuneration,
Learner::Attendance,
Learner::Grade,
Institute::ICode,
Institute::IName

Member functions – Trianer::AssignRem(),
Trainer::TEntry(),
Trainer::TDisplay(),
Learner::LEntry(),
Learner::LDisplay(),
Institute::IEntry()

(LDisplay can call IEntry())

Institute::LDisplay()

(IEntry can call LDisplay())

(iv) If class institute was derived privately from class Learner and privately from class Trainer, then name the member function(s) that could be accessed through Objects of class Institute.

Ans: Institute::IEntry(),
Institute::IDisplay(),

OUT SIDE DELHI 2007:

2.a) Differentiate between Protected and Private members of a class in context of inheritance using C++.

2

Ans: Protected members will be inherited into the derived class (they are accessible from the derived class). But Private members cannot be accessed from the derived class.

(Remember that the memory will be reserved for private as well as protected members for the derived class object)

2.d) Answer the questions (i) to(iv) based on the following code:

```
class Teacher
{ char TNo[5],Tname[20],Dept[10];
  int Workload;
protected :
  float Salary;
  void AssignSal(float);
public:
  Teacher();
  void TEntry();
  void TDisplay();
};

class Student
{ char
  Admno[10],SName[20],Stream[10];
protected:
  int Attendance,Totmarks;
public:
  Student();
  void SEntry();
  void SDisplay();
};

class School:public Student,public
Teacher
{ char SCode[10],SName[20];
public:
  School( );
  void SchEntry();
  void SchDisplay(); }
```

(i) Which type of inheritance is depicted by above example?

Ans: Multiple Inheritance.

(ii) Identify the member function(s) that cannot be called directly from the objects of class School from the following

TEntry()
SDisplay()
SchEntry()

Ans: All the above three member function(s) can be called from the objects of class School.

(iii) Write name of all member(s) accessible from member functions of class School.

Ans: Data Members : Teacher::Salary
Student::Attendance
Student::Totmarks
School::SCode
School::SName

Member Functions: Teacher::AssignSal()
Teacher::TEntry()
Teacher::TDisplay()
Student::Sentry()
Student::SDisplay()
School::SChEntry()
School::SChDisplay()

(iv) If class School was derived privately from class Learner and privately from class Trainer, then name the member function(s) that could be accessed through Objects of class School.

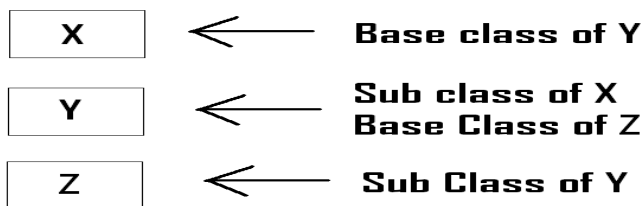
Ans: School::SChEntry()
School::SChDisplay()

DELHI 2006:

2.a) Define Multilevel and Multiple inheritance in context of Object Oriented Programming. Give suitable example to illustrate the same?

Ans:

Multilevel Inheritance: When a subclass inherits from a class that itself inherits from another class, it is known as multilevel inheritance.



Multi level Inheritance

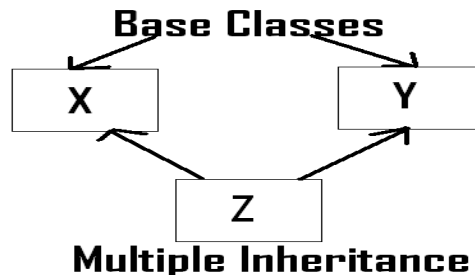
Eg: (for Multi Level Inheritance)

```

class A
{
  -----
  -----
}
class B:public class A
{
  -----
  -----
}
class C:protected B
{
  
```

```

-----
-----
}
Multiple Inheritance: When a sub class inherits from multiple base classes, it is known as multiple inheritance.
  
```



Eg: (for Multiple Inheritance)

```

class A
{
  -----
  -----
}
class B
{
  -----
  -----
}
class C:public A,protected B
{
  -----
  -----
}
2.d) Answer the questions (i) to(iv) based on the following code
  
```

```

class stationary
{
  char Type;
  char Manufacture[10];
public:
  stationary( );
  void Read_sta_details( );
  void Disp_sta_details( );
};
class office:public stationary
{
  int no_of_types;
  float cost_of_sta;
public:
  void Read_off_details( );
  void Disp_off_details( );
};
class printer:private office
{
  int no_of_users;
  char delivery_date[10];
public:
  void Read_pri_details( );
  void Disp_pri_details( );
};
void main( )
{
  printer MyPrinter;
}
  
```

(i) Mention the member names which are accessible by MyPrinter declared in main() function.

Ans: printer::Read_pri_details();

```
printer::Disp_pri_details( );
```

(ii) What is the size of MyPrinter in bytes?

Ans: 29 Bytes

(iii) Mention the names of functions accessible from the member function Read_pri_details() of class printer.

Ans:

```
stationary::Read_sta_details( )
stationary::Disp_sta_details( )
office::Read_off_details( )
office::Disp_off_details( )
printer::Disp_pri_details( )
```

OUT SIDE DELHI 2006:

2.d) Answer the questions (i) to(iv) based on the following code:4

```
class furniture
{
    char Type;
    char Mode[10];
public:
    furniture( );
    void Read_fur_details();
    void Disp_fur_details();
};
class sofa:public furniture
{
    int no_of_seats;
    float cost_sofa;
public:
    void Read_sofa_details();
    void Disp_sofa_details();
};
class office:public sofa
{
    int no_of_pieces;
    char delivery_date[10];
public:
    void Read_office_details();
    void Disp_office_details();
};
void main()
{
    office MyFurniture;
}
```

(i) Mention the member names which accessible by Myfurniture declared in main() function.

Ans:

Data Members: No data member can be called from Myfurniture object.

Member Functions:

```
Furniture::Read_fur_details()
Furniture::Disp_fur_details()
Sofa::Read_sofa_details()
Sofa::Disp_sofa_details()
Office::Read_office_details()
Office::Disp_office_details()
```

(ii) what is the size of Myfurniture in bytes?

Ans: 29 Bytes

(iii) Mention the names of functions accessible from the member function Read_office_details() of class office.

Ans:

```
Furniture::Read_fur_details( )
Furniture::Disp_fur_details( )
```

```
Sofa::Read_sofa_details( )
Sofa::Disp_sofa_details( )
Office::Disp_office_details( )
```

DELHI 2005:

2.d) Answer the questions (i) to(iv) based on the following code:4

```
class Medicine
{
    char Category[10];
    char Date_of_manufacture[10];
    char Company[20];
public:
    Medicine();
    void entermedicinedetails();
    void showmedicinedetails();
};
class capsule:public Medicine
{
protected:
    char capsule_name[30];
    char volume_lable[20];
public:
    float Price;
    capsules();
    void entercapsuledetails();
    void showcapsuledetails();
};
class Antibiotics:public Capsule
{
    int Dosage_units;
    char side_effects[20];
    int Use_within_days;
public:
    Antibiotics();
    void enterdetails();
    void showdetails();
};
```

(i) How many bytes will be required by an object of class Medicines and an object of class Antibiotics respectively?

Ans: Medicine – 40 Bytes
Antibiotics Object – 118 Bytes

(ii) Write the names of all the member functions accessible from the object of class Antibiotics.

Ans:

```
Medicine::entermedicinedetails()
Medicine::showmedicinedetails()
Capsules::entercapsuledetails()
Capsules::showcapsuledetails()
Antibiotics::enterdetails()
Antibiotics::showdetails()
```

(iii) Write the names of all the members accessible from member functions of class capsules.

Ans:Data Members:

```
Capsule::capsule_name[30]
Capsule::volume_lable[20]
Capsule::Price
```

Member Functions:

```
Medicine::entermedicinedetails()
Medicine::showmedicinedetails()
Capsule::entercapsuledetails()
```

Capsule::showcapsuledetails()

(iv) Write names of all the data members which are accessible from objects of class antibiotics.

Data members:

Capsule::Price

OUTSIDE DELHI 2005:

2.d) Answer the questions (i) to(iv) based on the following code:

```
class Drug
{
    char Category[10];
    char Date_of_manufacture[10];
    char Company[20];
public:
    Medicines();
    void enterdrugdetails();
    void showdrugdetails();
};
class tablet:public Drug
{
protected:
    char tablet_name[30];
    char volume_lable[20];
public:
    float Price;
    Tablet();
    void entertabletdetails();
    void showtabletdetails();
};
class PainReliever:public Tablet
{
    int Dosage_units;
    char side_effects[20];
    int Use_within_days;
public:
    PainReliever();
    void enterdetails();
    void showdetails();
};
```

(i) How many bytes will be required by an object of class Drug and an object of class PainReliever respectively?

Ans: Drug Object - 40 Bytes
Pain Reliever - 118 Bytes

(ii) Write the names of all the member functions accessible from the object of class PainReliever.

Ans: Drug::enterdrugdetails()
Drug::void showdrugdetails()
Tablet::entertabletdetails()
Tablet::showtabletdetails()
PainReliever::enterdetails()
PainReliever::showdetails()

(iii) Write the names of all the members accessible from member functions of class Tablet.

Ans:Data Members:

Tablet::tablet_name[30];
Tablet::volume_lable[20];
Tablet::Price;

Member Functions:

Drug::enterdrugdetails()
Drug::showdrugdetails()
Tablet::entertabletdetails()

Tablet::showtabletdetails()

(iv) Write names of all the data members which are accessible from objects of class PainReliever.

Ans:Data Members:

Tablet::Price

DELHI 2004:

2.c) Given the following definitions answer the following:

```
class livingbeing
{
    char specification[20];
    int average;
public:
    void read();
    void show();
};
class ape: private livingbeing
{
    int no_of_organs,no_of_bones;
protected:
    int iq_level;
public:
    void readape();
    void showape();
};
class human:public ape
{
    char race[20];
    char habitation[30];
public:
    void readhuman();
};
```

(i) Name the members, which can be accessed from the member functions of class human.

Ans: Data Members - ape::iq_level
human::race
human::habitation
Member Function - ape::readape()
ape::showape()

(ii) Name the members, which can be accessed by an object of class human.

Ans: Data Members - No data members can be accessed.

Member Functions: ape::readape();
ape::showape();
human::readhuman();

(iii) What will be the size of an object of the (in bytes) of class human?

Ans: 78 Bytes.

DELHI 2003:

2.c) Consider the following and answer the questions given below

```
class MNC
{
    char Cname[25];
    //Company name
protected:
    char Hoffice[25]; //Head
office
public:
    MNC( );
    char Country[25];
    void EnterData( );
    void DisplayData( );
```

```

};
class Branch:public MNC
{ long NOE; //Number of
Employees
char Ctry[25]; //Country
protected:
void Association( );
public:
Branch( );
void Add( );
void Show( );
};
class Outlet:public Branch
{
char State[25];
public:
Outlet( );
void Enter( );
void Output( );
};

```

Ans: i) Which class constructor can be called first at the time of declaration of an object of class Outlet?

Ans: MNC class constructor can be called first at the time of declaration of an object of class Outlet.

(When an object of the derived class is declared, in order to create it, firstly the constructor of the base class is invoked and then, the constructor of the derived class is invoked. On the other hand, when an object of the derived class is destroyed, first the destructor of the derived class is invoked followed by the destructor of the base class).

ii) How many bytes does an object belonging to class Outlet require?

Ans: 133 Bytes

iii) Name the member function(s) which are accessed from the object(s) of class Outlet.

Ans: Outlet::Enter()
Outlet::Output()
MNC::EnterData()
MNC::DisplayData()
Branch::Add()
Branch::Show()

iv) Name the data member(s), which are accessible from the object(s) of class Branch.

Ans: MNC::Country

DELHI 2002:

1.a) Illustrate the concept of Inheritance with the help of an example. 2

Ans: The capability of one class to inherit properties from another class, is called as inheritance.

The most important advantage of inheritance is code reusability.

There are 5 types of inheritance:

- (i) Single Inheritance: When a sub class inherits only from one base

class, it is known as single inheritance.

(ii) Multiple Inheritance: When a sub class inherits from multiple base classes, it is known as multiple inheritance.

(iii) Hierarchical Inheritance: When many sub classes inherit from a single base class, it is known as hierarchical inheritance.

(iv) Multilevel Inheritance: When a subclass inherits from a class that itself inherits from another class, it is known as multilevel inheritance.

(v) Hybrid Inheritance: Hybrid inheritance combines two or more forms of inheritance.

2001:

1.a) Reusability of classes is one of the major properties of OOP. How is it implemented in C++. 2

Ans: Reusability of classes can be implemented through Inheritance. I.e. After developing a class, if you want a class which consists the features of this class (ie members) and the other features also, then instead of developing a class which consists all these features, you can inherit the existing features (members) and you can develop new class consists the remaining features using **inheritance (in Object Oriented Programming ie in C++.)**

DELHI 2000:

2.c) Consider the following and answer the questions given below:

```

class School
{ int A;
protected:
int B,C;
public:
void INPUT(int);
void OUTPUT();
};
class Dept:protected School
{
int X,Y;
protected:
void IN(int,int)
public:
void OUT();
};
class Teacher:public Dept
{ int P;
void DISPLAY(void);
public:
void ENTER();
};

```

(i) Name the base class and derived class of the class Dept.

Ans: Base class of Dept - School
Derived class of Dept - Teacher

(ii)Name the data member(s) that can be accessed from function OUT().

Ans: Dept::X Dept::Y
School::B
School::C

(iii)Name the private member function(s) of class Teacher.

Ans: Teacher::Display()

(iv)Is the member function OUT() accessible the objects of Dept?

Ans: Yes. Since it is public member function.

DELHI 1999:

2.a)What do you understand by visibility modes in class derivations? What are these modes? 2

Ans: It is given in chapter 4, classes and object as two answers. Ie Difference between private and protected, private and public.

2.c)Consider the following declarations and answer the questions below:

```
class vehicle
{ int wheels;
protected:
    int passenger;
    void inputdata(int,int);
    void outputdata();
};
class heavy_vehicle:protected vehicle
{
    int diesel_petrol;
protected:
    int load;
public:
    void readdata(int,int);
    void writedata();
};
class bus:private heavy_vehicle
{
    char make[20];
public:
    void fetchdata(char);
    void displaydata();
};
```

(i)Name the base class and derived class of the class heavy_vehicle.

Ans: Base class of heavy_vehicle – vehicle
Derived class of heavy_vehinle – bus

(ii)Name the data member(s) that can be accessed from function displaydata.

Ans: bus::make
heavy_vehicle::load
vehicle::passenger

(iii)Name the data member(s) that can be accessed by an object of bus class.

Ans: No data member can be accessed by an object of bus class.

(iv)Is the member function outputdata accessible to the objects of heavy_vehicle class?

Ans: No.

DELHI 1998:

2.c) Consider the following declarations and answer the questions below:

```
class PPP
{ int H;
protected:
    int S;
public:
    void INPUT(int);
    void OUT();
};
class QQQ:private PPP
{ int T;
protected:
    int U;
public:
    void INDATA(int,int);
    void OUTPUT();
};
class RRR:public QQQ
{ int M;
public:
    void DISP(void);
};
```

(i)Name the base class and derived class of the class QQQ.

Ans:Base class of QQQ – PPP
Derived class of QQQ – RRR

(ii)Name the data member(s) that can be accessed from function DISP().

Ans: QQQ::U , RRR::M

(iii)Name the member function(s) , which can be accessed from the object of class RRR.

Ans: QQQ::INDATA()
QQQ::OUTPUT() RRR::DISP()

(iv) Is the member function OUT() accessible by the objects of the class QQQ? **Ans:** No.


```

        cout << " Record Updated" ;
        File.close() ;
    }

```

Write the Statement to position the File Pointer at the beginning of the Record for which the Candidate's Id matches with the argument passed, and Statement 2 to write the updated Record at that position.

4.b) Write a function in C++ to count the number of uppercase alphabets present in a text file "ARTICLE.TXT".

Solution:

```

void UpperLetters()
{ clrscr();
  ifstream fin("ARTICLE.TXT",ios::in);
  char ch;
  int uppercount=0;
  while(fin)
  { fin.get(ch);
    if(isupper(ch))
      uppercount++; }
  cout<<"\nTotal number of Uppercase
  alphabets in the file = "<<uppercount;
  getch();
}

```

4.c) Given a binary file TELEPHON.DAT, containing records of the following class Directory :

7.DATA FILE HANDLING

OUTSIDE DELHI 2008:

4.a) Observe the program segment given below carefully, and answer the question that follows

```

class candidate
{ long Cid ; // Candidate's Id
  char CName[20] ; // Candidate's Name
  float Marks ; // Candidate's Marks
  public ;
  void Enter() ;
  void Display() ;
  void MarksChange() ;
  //Function to change marks
  long R_Cid() {return Cid ;}
};
void MarksUpdate (long Id)
{ fstream File ;
File.open ("CANDIDATE.DAT", ios ::
  binary | ios::in | ios :: out) ;
  Candidate C ;
  int Record = 0, Found = 0 ;
while (!Found&&File.read((char*)&C, sizeof(C)))
  { if (Id ==C.R_Cid())
    { cout << "Enter new Marks" ;
      C.MarksChange() ;
File.seekp(File.tellp() -sizeof(C));
      //Statement 1
//File.seekp(Record*sizeof(C));
File.write((char*)&C,sizeof(C));
      //Statement 2
//File.write((char*)&C,sizeof(Candidate));
      Found = 1 ;
    }
    Record++ ;
  }
  if (Found == 1)

```

```

class Directory
{ char Name[20] ;
  char Address[30] ;
  char AreaCode[5] ;
  char phone_No[15] ;
  public ;
  void Register() ;
  void Show() ;
  int CheckCode(char AC[] )
  { return strcmp(AreaCode, AC) ;
  }
};

```

Write a function COPYABC() in C++, that would copy all those records having AreaCode as "123" from TELEPHON.DAT to TELEBACK.DAT.

Solution:

```

void COPYABC()
{ ifstream fin("TELEPHON.DAT",ios::in |
  ios::binary);
  ofstream
  fout("TELEBACK.DAT",ios::out,ios | binary);
  Directory D;
  while(fin) // or while(!fin.eof())
  { fin.read((char*)&D,sizeof(D));
    if(D.CheckCode("123")== 0)
      fout.write((char*)&D,sizeof(D));
  }
  fin.close();
  fout.close();
}

```

```
}
```

DELHI : 2008:

4.a) Observe the program segment given below carefully, and answer the question that follows

```
class Applicant
{   long Aid ;           // Applicant's Id
    char Name[20] ; // Applicant's
Name
    float Score ;      // Applicant's Score
public ;
    void Enroll( ) ;
    void Disp( ) ;
    void MarksScore( ) ; //Function to
                          //change Score
    long R_Aid( ) {return Aid ;
} ;
void ScoreUpdate (long Id)
{   ifstream File ;
    File.open ("APPLI.DAT" , ios :: binary |
              ios :: in | ios :: out) ;
    Applicant A ;
    int Record = 0, Found = 0 ;
    while (!Found &&
File.read( (char*)&C, sizeof(c) ) )
    {   if (Id == A.R_Aid( ) )
        {   cout << "Enter new Score" ;
            A.MarksScore( ) ;
            File.seekp(File.tell( )-sizeof(A));
                //Statement 1
                //File.seekp(Record*size
of(Applicant));
File.write((char*)&A,sizeof(A)); //Statement2
                Found=1;
            }
            Record++ ;
        }
    if (Found == 1)
        cout << "Record Updated" ;
    File.close( ) ;
} ;
```

Write the Statement1 to position the File Pointer at the beginning of the Record for which the Applicant's Id matches with the argument passed, and Statement 2 to write the updated record at that position.

4.b) Write a function in C++ to count the number of lowercase alphabets present in a text file "BOOK.TXT".

Solution:

```
void LowerLetters( )
{   clrscr( ) ;
    ifstream fin("BOOK.TXT",ios::in);
    char ch;
    int lowercount=0;
    while(fin)
    {fin.get(ch);
    if(islower(ch))
        lowercount++;
```

```
    }
    cout<<"\nTotal number of Lowercase
alphabets in the file = "<<lowercount;
    getch( ) ;
} ;
```

4.c) Given a binary file PHONE.DAT, containing records of the following structure type

```
class phonlist
{   char Name[20] ;
    char Address[30] ;
    char AreaCode[5] ;
    char PhoneNo[15] ;
public ;
    void Register( ) ;
    void Show( ) ;
    int CheckCode(char AC[ ])
    {   return strcmp(AreaCode, AC) ;
    }
} ;
```

Write a function TRANSFER() in C++, that would copy all those records which are having AreaCode as "DEL" from PHONE.DAT to PHONBACK.DAT.

Solution:

```
void TRANSFER( )
{   ifstream
fin("PHONE.DAT",ios::in,ios::binary);
    ofstream
fout("PHONBACK.DAT",ios::out,ios::binary);
    phonlist P;
    while(fin) // or while(!fin.eof( ))
    {   fin.read((char*)&P,sizeof(P));
        if(P.CheckCode("DEL")== 0)
            fout.write((char*)&P,sizeof(P));
    }
    fin.close( ) ;
    fout.close( ) ;
} ;
```

DELHI : 2007

4.a) Observe the program segment given below carefully, and answer the question that follows

```
class PracFile
{   int Pracno ;
    char PracName[20] ;
    int TimeTaken ;
    int Marks ;
public :
    void EnterPrac( ) ;
//Function to enter PracFile details
    void ShowPrac( ) :
//Function to display PracFile details
    int RTime( )
//function to return Time Taken
    {return TimeTaken;}
    void Assignmarks(int
M) //Function to assign Marks
```

```

        { Marks = M ; }
};

void AllocateMarks()
{
    fstream File ;
    File.open ("MARKS.DAT", ios ::
binary | ios :: in | ios :: out ) ;
    PracFile P ;
    int Record = 0 ;
    while (File.read ( (char*) &P,
sizeof (P) ) )
    {
        if (P.RTime() > 50)
            P.Assignmarks(0)
        Else
            P.Assignmarks(10)
        File.seekp(File.tell( )-sizeof(P));
//Statement 1
//File.seekp(Record*sizeof(P));
File.write((char*)&P,sizeof(P)); //Statement2
//File.write((char*)&P,sizeof(PracFile));
        Record++;
    }
    File . close() ;
}

```

If the function AllocateMarks() is supposed to Allocate Marks for the records in the file MARKS.DAT based on their value of the member TimeTaken. Write C++ statements for the **statement 1** and **statement 2**, where, **statement 1** is required to position the file write pointer to an appropriate place in the file and **statement 2** is to perform the write operation with the modified record.

4.b) Write a function in C++ to print the count of the word **is** as an independent word in a text file DIALOGUE.TXT.

For example,if the content of the file DIALOGUE.TXT is

This **is** his book. **Is** this book good ?

Then the output of the program should be 2.

Solution:

Ans) Dear Children, try this answer.

4.c)Given a binary file GAME.DAT, containing records of the following structure type

```

struct Game
{
    char GameName[20] ;
    char Participate[10][30] ;
};

```

Write a function in C++ that would read contents from the file GAME.DAT and creates a file named BASKET.DAT copying only those records from GAME.DAT where the game name is "Basket Ball".

Solution:

```

void BPlayers()
{
    ifstream
    fin("GAME.DAT",ios::in,ios::binary);

```

```

    ofstream fout("BASKET.DAT",ios::out |
ios::binary);
    Game G;
    while(fin // or while(!fin.eof() )
    {
        fin.read((char*)&G,sizeof(Game));
        if(strcmp(G.GameName,"Basket Ball")= = 0)
            fout.write((char*)&G,sizeof(G));
    }
    fin.close() ;
    fout.close() ;
}

```

OUTSIDE DELHI : 2007

4.a) Observe the program segment given below carefully, and answer the question that follows:

```

class Labrecord
{
    int Expno ;
    char Experiment[20] ;
    char Checked ;
    int Marks ;
public :
    void EnterExp() ;
    //function to enter Experiment details
    void ShowExp() ;
    //function to display Experiment details
    char RChecked()
    //function to return Expno
    {return Checked;}
    void Assignmarks (int M)
    //function to assign Marks
    { Marks = M ; }
};

void ModifyMarks()
{
    fstream File ;
    File.open ("Marks.Dat", ios ::
binary | ios :: in | ios :: out) ;
    Labrecord L ;
    int Rec=0 ;
    while (File.read ( (char*) &L,sizeof (L) ) )
    {
        if (L.RChecked()= ='N')
            L.Assignmarks (0)
        else
            L.Assignmarks (10)
        File.seekp(File.tell( )-
sizeof(L)); //Statement 1
//File.seekp(Rec*sizeof(L)
));
File.write((char*)&L,sizeof(L));
//Statement 2
//File.write((char*)&L,siz
eof(Labrecord));
        Rec++ ;
    }
    File.close() ;
}

```

If the function ModifyMarks() is supposed to modify marks for the records in the file MARKS.DAT based on their status of the member Checked (containing value either 'Y' or

'N'). Write C++ statements for the statement 1 and statement 2, where, statement 1 is required to position the file write pointer to an appropriate place in the file and statement 2 is to perform the write operation with the modified record.

4.b) Write a function in C++ to print the count of the word **the** as an independent word in a text file STORY.TXT.

For example, if the content of the file STORY.TXT is

There was a monkey in the zoo. The monkey was very naughty.

Then the output of the program should be 2.

Solution:

Ans: Dear Children, try this answer.

4.c) Given a binary file SPORTS.DAT, containing records of the following structure type :

```
struct Sports
{ char Event[20];
  char Participant[10][30];
};
```

Write a function in C++ that would read contents from the file SPORTS.DAT and creates a file named ATHLETIC.DAT copying only those records from SPORTS.DAT where the event name is "Athletics".

Solution:

```
void AthletsList()
{ ifstream
fin("SPORTS.DAT", ios::in, ios::binary);
  ofstream fout("ATHLETIC.DAT", ios::out |
ios::binary);
  Sports S;
  while(fin) // or while(!fin.eof())
  { fin.read((char*)&S, sizeof(Sports));
    if(strcmp(S.Event, "Athletics") == 0)
      fout.write((char*)&S, sizeof(S));
  }
  fin.close();
  fout.close();
}
```

DELHI : 2006

```
4.a) void main()
{ char ch = 'A';
  fstream fileout("data.dat", ios::out);
  fileout << ch;
  int p = fileout.tellg();
  cout << p;
}
```

What is the output if the file content before the execution of the program is the string "ABC"

(Note that " " are not part of the file).

Ans) 1 (Since, the file is opened in out mode, it loses all the previous content, if the file mode is app, then result will be 4)

4.b) Write a function to count the number of words present in a text file named "PARA.TXT". Assume that each word is separated by a single blank/space character and no blanks/spaces in the beginning and end of the file.

Solution:

```
void WordsCount()
{ clrscr();
  ifstream fin("PARA.TXT", ios::in);
  char ch;
  int Words=1;
  if(!fin)
  { cout << "No words at all in the file";
    exit(0);
  }
  while(fin)
  {fin.get(ch);
   if(ch == ' ')
     Words++;
  }
  cout << "\nTotal number of Words in the file = " << Words;
  getch();
}
```

4.c) Following is the structure of each record in a data file named "COLONY.DAT"

```
struct COLONY
{ char Colony_Code[10];
  char Colony_Name[10];
  int No_of_People;
};
```

Write a function in C++ to update the file with a new value of No_of_People. The value of Colony_Code and No_of_People are read during the execution of the program.

Solution:

```
void Update()
{ fstream finout("COLONY.DAT", ios::in |
ios::out);
  COLONY C;
  finout.seekg(0);
  while(finout)
  { finout.read((char*)&C, sizeof(C));
    cout << "\nThe Colony Code is " << C.Colony_Code;
    cout << "\nThe Colony Name is " << C.Colony_Name;
    cout << "\nEnter the Number of People";
    cin >> C.No_of_People;
    finout.seekp(finout.seekp() -
sizeof(C));
    finout.write((char*)&C, sizeof(C));
  }
}
```

OUTSIDE DELHI : 2006

```
4.a)void main()
    { char ch = 'A';
      ofstream fileout("data.dat", ios ::
app) ;
      fileout<<ch ;
      int p = fileout.tellg( ) ;
      cout << p ;
    }
```

What is the output if the file content before the execution of the program is the string "ABC"

(Note that " " are not part of the file)

Ans)4 (Since, the file is opened in app mode, it retains the previous content also, if the file mode is out, then result will be

0 since it will loose all the old content of the file.)

4.b)Write a function to count the number of blanks present in a text file named "PARA.TXT" .

Solution:

```
void BlanksCount()
{ clrscr( );
  ifstream fin("PARA.TXT",ios::in);
  char ch;
  int Blanks=0;
  if(!fin)
  { cout<<"No words at all in the file. So no
blank spaces";
    exit(0);
  }
  while(fin)
  {fin.get(ch);
   if(ch= =' ')
    Blanks++;
  }
  cout<<"\nTotal number of Blank Spaces in
the file = "<<Blanks;
  getch( );
}
```

4.c) Following is the structure of each record in a data file named "PRODUCT.DAT" .

```
struct PRODUCT
{ char Product_Code[10] ;
  char Product_Description[10] ;
  int Stock ;
};
```

Write a function in C++ to update the file with a new value of Stock. The Stock and the Product_Code, whose Stock to be updated, are read during the execution of the program.

Solution:

```
void Update( )
```

```
{ ifstream
finout("PRODUCT.DAT",ios::in|ios::out);
PRODUCT P;
finout.seekg(0);
while(finout)
{ finout.read((char *)&P, sizeof(P));
  cout<<"\nThe Product Code is
"<<P.Product_Code;
  cout<<"\nThe Product Description
is "<<P.Product_Description;
  cout<<"\nEnter the Stock: ";
  cin>>P.Stock;
  finout.seekp(finout.seekp( )-
sizeof(P));
  finout.write((char *)&P,sizeof(P));
}
}
```

DELHI : 2005

4.a) Observe the program segment given below carefully, and answer the question that

```
class Book
{ int Book_no ;
  char Book_name[20] ;
public ;
  //function to enter Book details
void enterdetails( ) ;
  //function to display Book details
void showdetails( ) ;
  //function to return Book_no
int RBook_no( ) {return
Book_no ;
}; void Modify (Book NEW)
{ ofstream File ;
  File.open("BOOK.DAT", ios ::
binary | ios :: in | ios :: out) ;
  Book OB ;
  int Record = 0, Found = 0 ;
  while (!Found && File.read((char*) &OB,
sizeof(OB) ) )
  { Recordsread++ ;
    if (NEW.RBook_no( ) == OB.RBook_no( ) )
    { _____ //Missing Statement
      File.write((char*) &NEW, size of(NEW)) ;
      Found = 1 ;
    }
    else
      File.write((char*) &OB, sizeof(OB)) ;
  }
  if (!Found)
    cout << "Record for modification does not
exist" ;
  File.close( ) ;
}
```

If the function Modify() is supposed to modify a record in file BOOK.DAT with the values of Book NEW passed to its argument, write the appropriate statement for **Missing Statement** using seekp() or seekg(), whichever needed, in the above code that would write the modified record at its proper place.

4.b) Write a function in C++ to count and display the number of lines starting with alphabet 'A' present in a text file "LINES.TXT".

Example :

If the file "LINES.TXT" contains the following lines,

A boy is playing there.
 There is a playground.
 An aeroplane is in the sky.
 Alphabets and numbers are allowed in the password.

The function should display the output as 3

4.c) Given a binary file STUDENT.DAT, containing records of the following class Student type

```
class Student
{
    char
    S_Admno[10];          //Admission
    number of student
    char
    S_Name[30];          //Name of
    student
    int
    Percentage;          //Marks
    Percentage of student
    public :
        void EnterData()
        { gets(S_Admno);
          gets(S_Name); cin >> Percentage;
        }
        void DisplayData()
        { cout << setw(12) <<
          S_Admno;
            cout << setw(32) << S_Name;
            cout << setw(3) <<
          Percentage << endl;
        }
        int ReturnPercentage() {return
    Percentage;}
};
```

Write a function in C++, that would read contents of file STUDENT.DAT and display the details of those Students whose Percentage is above 75.

OUTSIDE DELHI : 2005

4.a) Observe the program segment given below carefully, and answer the question that follows :

```
class Member
{
    int Member_no;
    char Member_name[20];
    public :
        //function to enter Member details
        void enterdetails ();
        //function to display Member details
        void showdetails ();
```

```
//function to return Member_no
int RMember_no() {return
Member_no;}
};
void Update (Member NEW)
{
    fstream File;
    File.open("MEMBER.DAT" , ios ::
    binary | ios :: in | ios :: out);
    Member OM;
    int Recordsread = 0, Found = 0;
    while (!Found && File.read((char*) &
    OM, sizeof(OM)))
    {
        Recordsread++;
        if (NEW.RMember_no() ==
        OM.RMember_no())
        { _____ //Missing Statement
        File.write((char*) & NEW , sizeof(NEW);
        Found = 1;
        }
        else
        File.write((char*) & OM, sizeof(OM));
    }
    if (!Found)
    cout<<"Record for modification does not
    exist";
    File.close();
}
```

If the function Update() is supposed to modify a record in file MEMBER.DAT with the values of Member NEW passed to its argument, write the appropriate statement for **Missing statement** using seekp() or seekg(), whichever needed, in the above code that would write the modified record at its proper place.

2.b) Write a function in C++ to count and display the number of lines not starting with alphabet 'A' present in a text file "STORY.TXT".

Example :

If the file "STORY.TXT" contains the following lines,

The rose is red.
 A girl is playing there.
 There is a playground.
 An aeroplane is in the sky.
 Numbers are not allowed in the password.

The function should display the output as 3

4.c) Given a binary file APPLY.DAT, containing records of the following class Applicant type 3

```
class Applicant
{
    char A_Rno[10];
    //Roll number of applicant
    char A_Name[30];
    //Name of applicant
    int A_Score;
    //Score of applicant
```

```

public :
    void Enrol( )
    {
        gets(A_Rno) ;
    }
    gets(A_Name) ; cin >> A_Score ;
    void Status( )
    {
        cout << setw(12) <<
A_Admno ;
        cout << setw(32) << A_Name ;
        cout << setw(3) << A_Score <<
endl ;
    }
    int ReturnScore( ) {return
A_Score ;
    } ;

```

Write a function in C++, that would read contents of file APPLY.DAT and display the details of those Students whose A_Score is above 70.

DELHI : 2004

4.a) Assuming that a text file named FIRST.TXT contains some text written into it, write a function named **vowelwords()**, that reads the file FIRST.TXT and creates a new file named SECOND.TXT, to contain only those **words** from the file FIRST.TXT which start with start with a lowercase vowel (i.e. with 'a', 'e', 'I', 'o', 'u'). For example if the file FIRST.TXT contains

Carry umbrella and overcoat when it rains

Then the file SECOND.TXT shall contain:
umbrella and overcoat it

4.b) Assuming the class Computer as follows:

```

class computer
{
    char chiptype[10];
    int speed;
public:
    void getdetails( )
    {
        get(chiptype);
        cin>>speed;
    }
    void showdetails( )
    {
        cout<<"Chip"<<chipt
ype<<"Speed = "speed;
    }
};

```

4.c) Write a function **readfile()** to read all the records present in already existing binary file SHIP.DAT and display them on the screen, also count the number of records present in the file.

DELHI : 2003

4.a)Write a user defined function in C++ to read the content from a text file NOTES.TXT,

count and display the number of blank spaces present in it.

4.b) Assuming a binary file FUN.DAT is containing objects belonging to a class LAUGHTER (as defined below). Write a user defined function in C++ to add more objects belonging to class LAUGHTER at the bottom of it.

```

class LAUGHTER
{ int Idno; // Identification number
  char Type[5]; //LAUGHTER
  Type
  char Desc[255]; //Description
public :
  void Newentry( )
  { cin>>Idno;gets(Type);gets(Desc);}
  void Showonscreen( )
  {cout<<Idno<<":"<<Type<<endl<<Desc<<endl
};

```

DELHI : 2002

4.a) What is the difference between pub() and write ()?

4.b) Write a C++ program, which initializes a string variable to the content "Time is a great teacher but unfortunately it kills all its pupils. Berlioz" and outputs the string one character at a time to the disk file OUT.TXT. You have to include all the header files if required.

DELHI : 2001

4.a) Distinguish between ios::out and ios::app. The ios::out mode opens the file in output mode only.

The ios::app mode opens the file in append mode, where the file can be appended.

4.b) Consider the class declaration

```

class FLIGHT
{ protected:
    int flight_no;
    char destination[20];
    float distance;
public:
    void INPUT( );
//To read an object from the keyboard
    void write_file(int);
//To write N objects into the file,
//Where N is passed as argument.
    void OUTPUT( ); //To display the file
// contents on the monitor.
};

```

Complete the member functions definitions.

2000:

Q 4 (a) Name two member functions of ofstream class

Q 4 (b) Assuming the class DRINKS defined below, write functions in C++ to perform the following:

- (i) Write the objects of DRINKS to a binary file.
- (ii) Read the objects of DRINKS from binary file and display them on screen when DNAME has value "INDY COLA".

```
class DRINKS
{   int DCODE;
    char DNAME[13]; //Name of the drink
    int DSIZE; //Size in liters float
    DPRICE;public:
    void getdrinks( )
{cin>>DCODE>>DNAME>>DSIZE>>DPRICE;}
    void showdrinks( )
{cout<<DCODE<<DNAME<<DSIZE<<DPRICE<
<endl;}
    char *getname( ){return DNAME;}
};
```

1999:

Q 4 (a) Differentiate between functions read() and write().

Q 4 (b) Assuming the class FLOPPYBOX, write a function in C++ to perform following:

- (i) Write the objects of FLOPPYBOX to a binary file.
- (ii) Reads the objects of FLOPPYBOX from binary file and display them on screen.

```
class FLOPPYBOX
{ int size;
  char name[10];
public:
  void getdata(){cin>>size;gets(name);}
  void showdata(){cout<<size<<"
<<name<<endl;}
};
```

1998:

Q 4(a) Write name of two member functions belonging to fstream class.

Q 4(b) Assuming the class EMPLOYEE given below, write functions in C++ to perform the following:

- (i) Write the objects of EMPLOYEE to a binary file.
- (ii) Read the objects of EMPLOYEE from binary file and display them on the screen.

```
class EMPLOYEE
{   int ENO;
    char ENAME[10];
public:
    void GETIT( )
    {   cin>>ENO;
        gets(ENAME);
```

```
    }
    void SHOWIT( )
    {   cout<< ENO<<ENAME<<endl;
        }
};
```


8. POINTERS

2007 Delhi:

1.d) Find the output of the following program:2
#include<iostream.h>

```
void main( )
{ int Array[]={4,6,10,12};
  int *pointer=Array;
  for(int I=1;I<=3;I++)
  { cout<<*pointer<<"#";
    pointer++;
  }
  cout<<endl;
  for(I=1;I<=4;I++)
  { (*pointer)*=3;
    --pointer;
  }
  for(I=1;I<5;I++)
    cout<<Array[I-1]<<"@";
  cout<<endl;
}
```

Output:

4#6#10#

12@18@30@36@

2007 Outside Delhi:

1.d) Find the output of the following program:2
#include<iostream.h>

```
void main( )
{ int Numbers[]={2,4,8,10};
  int *ptr=Numbers;
  for(int C=1;C<3;C++)
  { cout<<*ptr<<"@";
    ptr++;
  }
  cout<<endl;
  for(C=0;C<4;C++)
  { (*ptr)*=2;
    --ptr;
  }
  for(C=0;C<4;C++)
    cout<<Numbers[C]<<"#";
  cout<<endl; }
```

Output:

2@4@

4#8#16#10#

2006 Delhi:

1.d) Find the output of the following program:3
#include<iostream.h>

```
#include<string.h>
class state
{ char *state_name;
  int size;
public:
  state( )
  { size=0;
    state_name=new char[size+1];
  }
  state(char *s)
  { size=strlen(s);
    state_name=new char[size+1];
    strcpy(state_name,s);
  }
  void display( )
  { cout<<state_name<<endl;
  }
  void Replace(state &a, state &b)
  { size=a.size+b.size;
    delete state_name;
    state_name=new char[size+1];
    strcpy(state_name,a.state_name);
    strcat(state_name,b.state_name);
  }
};
```

```
void main( )
{ char *temp="Delhi";
  state
  state1(temp),state2("Mumbai"),state3("Nagpur"
),S1,S2;
  S1.Replace(state1,state2);
  S2.Replace(S1,state3);
  S1.display( );
  S2.display( );
}
```

Output:

DelhiMumbai

DelhiMumbaiNagpur

2006 Outside Delhi:

1.d) Find the output of the following program3
#include<iostream.h>

```

#include<string.h>
class student
{
    char *name;
    int I;
public:
    student( )
    {
        I=0;
        name=new char[I+1];
    }
    student(char *s)
    {
        I=strlen(s);
        name=new char[I+1];
        strcpy(name,s);
    }
    void display( )
    {
        cout<<name<<endl;
    }
    void manipulate(student &a, student &b)
    {
        I=a.I+b.I;
        delete name;
        name=new char[I+1];
        strcpy(name,a.name);
        strcat(name,b.name);
    }
};

```

```

void main( )
{
    char *temp="Jack";
    Student name1(temp),name2("Jill"),name3
        ("John" ),S1,S2;
    S1.manipulate(name1,name2);
    S2.manipulate(S1,name3);
    S1.display( );
    S2.display( );
}

```

2006 Outside Delhi:

Output:

JackJill

JackJillJohn

2.a) What is "this" pointer? Give an example to illustrate the use of it in C++.

Ans: A special pointer known as this pointer stores the address of the object that is currently invoking a member function. The this pointer is implicitly passed to the member functions of a class whenever they are invoked.

(As soon as you define a class, the member functions are created and placed in the memory space only once. That is, only one copy of member functions is maintained that is shared by all the objects of the class. Only space for data members is allocated separately for each object.

When a member function is called, it is automatically passed an implicit(in built) argument that is a pointer to the object that invoked the function. This pointer is called this. If an object is invoking a member function, then an implicit argument is passed to that member function that points to (that) object. The programmer also can explicitly specify 'this' in the program if he desires.)

Eg: Example program to demonstrate the usage of this pointer.

```

#include<iostream.h>
#include<conio.h>
class Rectangle
{
    float area,len,bre;
public:
    void input( )
    {
        cout<<"\nEnter the length and breadth: ";
        cin>>this->len>>this->bre;
    }
    void calculate( )
    {
        area=len*bre;
    }
    //Here Implicit 'this' pointer will be worked.
    void output( )
    {
        cout<<"\nThe Area of the Rectangle:
            "<<this->area;
    }
};
void main( )
{
    Rectangle R;
    clrscr( );
    R.input( );
    R.calculate( );
    R.output( );
    getch();
}

```

2004:

1.d) What will be the output of the following program:

```

#include<iostream.h>
#include<conio.h>
#include<ctype.h>
#include<string.h>
void ChangeString(char Text[],int
    &Counter)
{
    char *Ptr=Text;
    int Length=strlen(Text);
    for(;Counter<Length- 2;
        Counter+=2,Ptr++)
    {
        *(Ptr+Counter)=toupper(*(Ptr+Counter));
    }
}

```

Output:

PoiNteRs Fun@10

```

void main( )
{
    clrscr( );
    int Position=0;
    char Message[]="Pointers Fun";
    ChangeString(Message,Position);
    cout<<Message<<"@"<<Position;
}

```

2001:

1.c) Identify the syntax error(s), if any, in the following program. Also give reason for errors.

```

void main( )
{

```

2

```

const int i=20;
const int* const ptr=&i;
(*ptr)++;
int j=15;
ptr=&j;
}

```

Ans:

Error Line 5 : Cannot modify a const object.
 Error Line 7 : Cannot modify a const object.
 Warning Line 8 : 'j' is assigned a value that is never used.
 Warning Line 8 : 'ptr' is assigned a value that is never used.

Explonation:

- (1) Error 1 is in Line no.5 ie (*ptr)++
 Here ptr is a constant pointer ie the contents can't be modified.
- (2) Error 2 is in Line no.7 ie ptr=&j;
 Here ptr is a constant pointer the address in this pointer can't be modified. (It is already pointing the address of i.)

1.d) Give the output of the following program segment. (Assuming all required header files are included in the program) 2

```

void main( )
{ int a=32,*x=&a;
  char ch=65,&cho=ch;
  cho+=a;
  *x+=ch;
  cout<<a<<','<<ch<<endl; }

```

Output:
 129,a

2.a) Distinguish between

```

int *ptr=new int(5);
int ptr=new int[5];

```

2

Ans: The int *ptr=new int(5); declares and creates the space for the new data directly.

ie The new operator reserves 2 bytes of memory from heap memory (free pool) and returns the address of that memory location to a pointer variable called ptr, 5 is the initial value to be stored in the newly allocated memory.

The int *ptr = new int[5]; initializes an array element. A memory space for an integer type of array having 5 elements will be created from the heap memory (free pool).

2.c) Give the output of the following program4
 #include<iostream.h> #include<string.h>

```

class per
{ char name[20];
  float salary;
public:

```

Name:REEMA
Salary:10000
Name:KRISHNAN
Salary:20000

```

per(char *s, float a)
{ strcpy(name,s);
  salary=a;
}
per *GR(per &x)
{ if(x.salary>=salary)
  return &x;
  else
  return this;
}
void display( )
{ cout<<"Name:"<<name<<"\n";
  cout<<"Salary:"<<salary<<"\n";
}
};

void main( )
{ Per P1("REEMA",10000),
  P2("KRISHNAN",20000),
  P3("GEORGE",5000);
  per *P;
  P=P1.GR(P3);P->display( );
  P=P2.GR(P3);P->display( ); } 1999:

```

1.d) Give the output of the following program.
 #include<stdio.h>
 void main()
 { char *p="Difficult";
 char c; c=*p++; printf("%c",c);
 }

Output:

D

9.ARRAYS

DELHI 2008:

3.a) Write a function in C++, which accepts an integer array and its size as parameters and rearranges the array in reverse.

Example: If an array of nine elements initially contains the elements as 4, 2, 5, 1, 6, 7, 8, 12, 10 Then the function should rearrange the array as
10,12, 8, 7, 6, 1, 5, 2, 4

Solution:

```
void receive(int A[ ], int size)
{ int temp;
  for(i=0,j=size-1;i<size/2;i++,j--)
  { temp=A[i];
    A[i]=A[j];
    A[j]=temp;
  }
} //end of receive function.
```

3.b) An array Arr[40][10] is store in the memory along the column with each element occupying 4 bytes. Find out the base address of the location Arr[3][6] if the location Arr[30][10] is stored at the address 9000.

Solution: Children, Try this answer as an assignment.

3.d) Write a function in C++ to print the product of each column of a two dimensional array passed as the arguments of the function.

1	2	4
3	5	6
4	3	2
2	1	5

20	40	10
40	50	30
60	30	20
40	20	30

Example :

If the two dimensional array contains
Then the output should appear as:

Product of Column 1 = 24

Product of Column 2 = 30

Product of Column 3 =240

```
void receive(int A[ ][ ],int r,int c)
{ int i,j,B[c];
  for(i=0;i<c;i++)
  B[i]=1;
  for(i=0;i<r;i++)
  for(j=0;j<c;j++)
  B[j]=B[j]*A[i][j];
  for(i=0;i<c;i++)
  cout<<"\nProduct of Column
"<<i+1<<" = "<<B[i];
}
```

OUTSIDE DELHI 2008:

3.a) Write a function in C++, which accepts an integer array and its size as arguments and swap the elements of every even location with its following odd location.

Example : If an array of nine elements initially contains the elements as
2,4,1,6,5,7,9,23,10
then the function should rearrange the array as
4,2,6,1,7,5,23,9,10

```
void SwapArray(int A[ ], int N)
{ int i,j,temp;
  /* cout<<"\nThe elements before
  doing the desired alterations...";
  for(i=0;i<N;i++)
  cout<<A[i]<<'\\t'; */
  for(i=0;i<N-1;i+=2)
  { temp=A[i];
    A[i]=A[i+1];
    A[i+1]=temp;
  }
  /* cout<<"\nThe elements after
  completed the desired
  alterations...";
  for(i=0;i<N;i++)
  cout<<A[i]<<'\\t'; */
}
```

3.b) An array Arr[50][10] is store in the memory along the row with each element

occupying 2 bytes. Find out the Base address of the location Arr[20][50], if the location Arr[10][25] is stored at the address 10000.

Solution: Children, Try this answer as an assignment.

3.d) Write a function in C++ to print the product of each row of a two dimensional array passed as the arguments of the function

Example: if the two dimensional array contains
Then the output should appear as:

Product of Row 1 = 8000
Product of Row 2 = 6000
Product of Row 3 = 3600
Product of Row 4 = 2400

```
void receive(int A[ ][ ],int r,int c)
{ int i,j,B[r];
  for(i=0;i<r;i++)
  B[i]=1;
  for(i=0;i<r;i++)
  for(j=0;j<c;j++)
  B[i]=B[i]*A[i][j];
  for(i=0;i<r;i++)
  cout<<"\nProduct of Row "<<i+1<<"
  = "<<B[i];
}
```

DELHI 2007:

3.a) Write function in C++ which accepts an integer array and size as arguments and replaces elements having odd values with thrice its value and elements having even values with twice its value.

Example : if an array of five elements initially contains elements as 3, 4, 5, 16, 9
The the function should rearrange the content of the array as 9, 8, 75, 32, 27

Solution:

```
void manipulate (int a[ ],int size)
{ for (i=0;i<size;i++)
  { if (a[i]%2== 1)
    a[i]=a[i]*3;
    else
    a[i]=a[i]*2;
    cout<<a[i]<<',';
  }
}
```

3.b) An array Array[20][15] is stored in the memory along the **column** with each element occupying 8 bytes. Find out the base address of the element Array[2][3] if the element Array[4][5] is stored at the address 1000.

Solution:

Given Data: Aray [20][15] W=8 B=?
R=20 C=15 L_r=0 L_c=0
Address of Array [2][3] =?

Address of Array[4][5] =1000.

Address of an element (I,J) in column major =B + W ((I-L_r) + R(J-L_c))

Therefore 1000=B+8*((4-0)+20(5-0))
1000=B+8*(4+20*5)
1000 =B+8*104
1000=B+832
B =1000-832
B =168

Therefore Address of

Array[2][3]=168+8*((2-0)+20(3-0))
=168+8*(2+20*3)
=168+8*62
=168+496
=664

3.d) Write a function in C++ which accepts a 2D array of integers and its size as arguments and displays the elements which lie on diagonals. [Assuming the 2D Array to be a square matrix with odd dimension i.e., 3x3, 5x5, 7x7 etc...]

Example : if the array content is

```
5 4 3
6 7 8
1 2 9
```

Out put through the function should be :

Diagonal One : 5 7 9
Diagonal Two : 3 7 1

Solution:

```
void accept(int a[ ][ ],int size)
{ cout<<"Diagonal One:";
  for (int i=0;i<size;i++)
  for(int j=0;j<size;j++)
  if (i= j)
  cout<<a[i][j]<<'t';
  cout<<"\n Diagonal Two:";
  for (i=0;i<size;i++)
  for(j=0;j<size;j++)
  if((i+j)= =(size-1))
  cout<<a[i][j]<<'t';
}
```

OUTSIDE DELHI 2007:

3.a) Write a function in C++ which accepts an integer array and its size as arguments and replaces elements having even values with its half and elements having odd values with twice its value .

Example : If an array of five elements initially contains the elements as 3, 4, 5, 16, 9 then the function should rearrange content of the array as 6, 2, 10, 8, 18

Solution:

```
void accept(int a[ ],int size)
{ for (int i=0;i<size;i++)
  { if (a[i]%2= =0)
    a[i]=a[i]/2;
```

```

else
    a[i]=a[i]*2;
cout<<a[i]<<',';
}
}

```

3.b) An array Arr[15][20] is stored in the memory along the **row** with each element occupying 4 bytes. Find out the Base address of the location Arr[3][2], if the location Arr[5][2] is stored at the address 1500.

Solution: Given Data: Arr[15][20]
W=4 B=? R=15 C=20 L_r=0 L_c=0
Address of Arr[3][2] = ?
Address of Arr[5][2] = 1500.

Address of an element (I,J) in row major = B+W(C(I-L_r)+(J-L_c))

Therefore, 1500 = B+4(20(5-0)+(2-0))

$$1500 = B+4(20*5+2)$$

$$1500 = B+4*102$$

$$1500 = B+408$$

$$B = 1500-408$$

$$B = 1092$$

Address of Arr[3][2]
= 1092+4(20*3+2)
= 1092+4(62)
= 1092+248
= 1340.

3.d) Write a function in C++ which accepts a 2D array of integers and its size as arguments and displays the elements of middle row and the elements of middle column. [Assuming the 2D Array to be a square matrix with odd dimension i.e., 3x3, 5x5, 7x7 etc...]

Example : If the array content is

```

3 5 4
7 6 9
2 1 8

```

Output through the function should be :

Middle Row : 7 6 9

Middle Column : 5 6 1

Solution:

```

void accept(int a[ ][ ],int size)
{ cout<<"Middle Row:";
  for (int i=0;i<size;i++)
    for(int j=0;j<size;j++)
      if (i= = size/2)
        cout<<a[i][j]<<'\t';
  cout<<"\n Middle Column:";
  for (i=0;i<size;i++)
    for(j=0;j<size;j++)
      if(j= =size/2)
        cout<<a[i][j]<<'\t';
}

```

DELHI 2006:

3.a) Write function in C++ which accepts an integer array and size as arguments and

assign values into a 2D array of integers in the following format :

If the array is 1, 2, 3, 4, 5, 6

The resultant 2D array is given below

```

1 2 3 4 5 6
1 2 3 4 5 0
1 2 3 4 0 0
1 2 3 0 0 0
1 2 0 0 0 0
1 0 0 0 0 0

```

If the array is 1, 2, 3

The resultant 2D array is given :

```

1 2 3
1 2 0
1 0 0

```

Solution:

```

void input (int a[ ],int size)
{ int b[size] [size];
  for (int i=0;i<size;i++)
  {
    for (int j=0;j<size;j++)
    {
      if(( i+j)>=size)
        b[i][j]=0;
      else
        b[i][j]=a[j];
      cout<<b[i][j]<<'\t';
    }
    cout<<endl;
  }
}

```

3.b) An array MAT[30][10] is stored in the memory along column wise with each element occupying 8 bytes of the memory. Find out the Base address and the address of element MAT[20][5] , if the location MAT[3][7] is stored at the address 1000.

Solution: Children, Try this answer as an assignment.

OUTSIDE DELHI 2006:

3.a) Write function in C++ which accepts an integer array and size as arguments and assign values into a 2D array of integers in the following format :

If the array is 1, 2, 3, 4, 5, 6

The resultant 2D array is given below :

```

1 0 0 0 0 0
1 2 0 0 0 0
1 2 3 0 0 0
1 2 3 4 0 0
1 2 3 4 5 0
1 2 3 4 5 6

```

If the array is 1, 2, 3

The resultant 2D array is given :

```

1 0 0
1 2 0

```

1 2 3

Solution:

```
void input (int a[ ],int size)
{ int b[size] [size];
  for (int i=0;i.<size;i++)
  { for (int j=0;j.<size;j++)
    { if(( i<j)
      b[i][j]=0;
    else
      b[i][j]=a[j];
    cout<<b[i][j]<<'\t';
  }
  cout<<endl;
}
```

3.b)An array MAT[20][10] is stored in the memory along the row with each element occupying 4 bytes of the memory. Find out the Base address and the address of element MAT[10][5] , if the location MAT[3][7] is stored at the address 1000.

Solution: Children, Try this answer as an assignment.

DELHI 2005:

3.a)Write a function in C++ which accepts an integer array and its size as arguments and exchanges the values of first half side elements with the second half side elements of the array.

Example :

If an array of 8 elements initial content as
2, 4, 1, 6, 7, 9, 23, 10
The function should rearrange array as
7, 9, 23, 10, 2, 4, 1, 6

Solution:

```
void change(int a[ ],int size)
{
  int i,j,temp;
  for(i=0,j=size/2;j.<size;i++,j++)
  { temp=a[i];
    a[i]=a[j];
    a[j]=temp;
  }
}
```

3.b)An array Arr[15][35] is stored in the memory along the row with each of its element occupying 4 bytes . Find out the Base address and the address of element Arr[2][5] , if the location Arr[5][10] is stored at the address 4000.

Solution: Children, Try this answer as an assignment.

3.d)Write a function in C++ to print sum of all values which either are divisible by 2 or

divisible by 3 present in a 2D array passed as the argument of the function.

Solution:

```
void Sum(int A[ ][ ],int R,int C)
{ int i,j,S=0;
  for(i=0;i.<R;i++)
  for(j=0;j.<C;j++)
  if(A[i][j]%2= = 0 || A[i][j]%3= = 0)
  S=S+A[i][j];
  cout<<"\n\nThe Sum of all the values which
are divisible by 2 or 3 in the array = "<<S;
}
```

OUTSIDE DEHI 2005:

3.a)Write a function in C++ which accepts an integer array and its size as arguments and exchanges the values of first half side elements with the second half side elements of the array.

Example :

If an array of 8 elements initial content as
8, 10, 1, 3, 17, 90, 13, 60
The function should rearrange array as
17, 90, 13, 60, 8, 10, 1, 3

Solution: Refer Delhi 2005 Q.3a.

3.b)An array Arr[35][15] is stored in the memory along the row with each of its element occupying 4 bytes . Find out the Base address and the address of element Arr[20][5] , if the location Arr[2][2] is stored at the address 3000.

Solution: Children, Try this answer as an assignment.

3.d) Write a function in C++ to print sum of all values which either are divisible by 3 or divisible by 5 present in a 2D array passed as the argument of the function.

Ans:-

```
void Sum(int A[ ][ ],int R,int C)
{ int S=0,i,j;
  for(i=0;i.<R;i++)
  for(j=0;j.<C;j++)
  if((a[i][j]%3= =0) || (a[i][j]%5= =0))
  S=S+A[i][j];
  cout<<" n\n\nThe Sum of all the values which
are divisible by 3 or 5 in the array = "<<S;
}
```

DELHI 2004:

3.a) Define the function **SwapArray(int[], int)**, that would expect a 1D integer array NUMBERS and its size N. the function should rearrange the array in such a way that the values of that locations of the array are exchanged. (Assume the size of the array to be even).

Example :

If the array initially contains

{2, 5, 9, 14, 17, 8, 19, 16}

Then after rearrangement the array should contain {5, 2, 14, 9, 8, 17, 16, 19}

Solution:

```
void SwapArray(int NUMBERS[ ], int N)
{ int i,j,temp;
  /* cout<<"\nThe elements before
    doing the desired alterations...";
    for(i=0;i<N;i++)
      cout<<NUMBERS[i]<<"\t";
    */
  for(i=0;i<N-1;i+=2)
  { temp=NUMBERS[i];
    NUMBERS[i]=NUMBERS[i+1];
    NUMBERS[i+1]=temp;
  }
  /* cout<<"\nThe elements after
    completed the desired
    alterations...";
    for(i=0;i<N;i++)
      cout<<NUMBERS[i]<<"\t";
    */
}
```

3.b) An array ARR[5][5] is stored in the memory with each element occupying 3 bytes of space. Assuming the base address of ARR to be 1500, compute the address of ARR[2][4], when the array is stored :

Solution: Children, Try this answer as an assignment.

3.c) Write a function in C++ to find the sum of diagonal elements from a 2D array of type float. Use the array and its size as parameters with float as its return type.

Solution:

```
float diasum(float A[ ][ ],int R,int C)
{ int i,j;
  float Dsum=0.0;
  for(i=0;i<R;i++)
    for(j=0;j<C;j++)
      if((i= j) | | (i+j)= =(size-1))
        Dsum=Dsum+A[i][j];
  return Dsum;
}
```

DELHI 2003:

3.a) Assume a array E containing elements of structure Employee is required to be arranged in descending order of Salary. Write a C++ function to arrange same with the help of bubble sort, the array and its size is required to be passed as parameters to the function. Definition of structure Employee is as follows:

```
Struct Employee
{ int Eno;
  char name[25];
  float Salary;
};
```

Solution:

```
void bubble(Employee E[ ],int n)
{ int i,j;
  Employee Etemp;
  for(i=0;i<n;+i)
    for(j=0;j<(n-1)-i ;j++)
      if(E[j].salary<E[j+1].salary)
        { Etemp=E[j];
          E[j]=E[j+1];
          E[j+1]=temp;
        }
  cout<<"The details of the employee in
  ascending order of salary ";
  for(i=0;i<n;i++)
    cout<<E[i].Eno<<"\t"<<E[i].name<<"\t"<<
    E[i].Salary<<endl;
}
```

3.b) An array X[30][10] is stored in the memory with each element requiring 4 bytes storage. Find out the Base address of X is 4500, find out memory locations of X[12][8] and X[2][14], if the content is stored along the row.

Solution: Children, Try this answer as an assignment.

3.c) Write a user-defined function in C++ to display those elements of 2D array T[4][4] which are divisible by 100. Assume the content of the array is already present and the function prototype is as follows: void showhundred(int T[4][4]);

```
void showhundred(int T[4][4])
{ int i,j;
  cout<<"\nThe elements in the array
  which are divisible by 100 .....";
  for(i=0;i<4;i++)
    for(j=0;j<4;j++)
      if(T[i][j]%100== =0)
        cout<<T[i][j]<<"\t";
}
```

DELHI 2002:

3.a) Define array and pointer.

Solution: An array refer to a named list of a finite number n of similar data elements. Each of the data elements can be referenced respectively by a set of consecutive numbers. Arrays can be one dimensional, two dimensional or multi dimensional.

An array can be declared as :

```
Syntax: data_type Array_name[size];
Eg: int A[10]; //Then location of the
//array are A[0], A[1],.....A[9].
int B[5][4];
//This array can holds 5 X 4 = 20 elements.
```


3.d) The array A[20][10] is stored in the memory with each element requiring one byte of storage if the base address of a is 0, determine the location of A[10][5] when the array A is stored by column major.

Solution: Children, Try this answer as an assignment.

3.c) Considering the following key set: 42,29,74,11,65,58, use insertion sort to sort the data in ascending order and indicate the sequences of steps required.

Solution:

In this, Suppose an array A with n elements A[1],A[2],...A[N] is in memory. The insertion sort algorithm scans A from A[1] to A[N], insertion each element A[K] into its proper position in the previously sorted subarray A[1],A[2],...,A[K-1].

This sorting algorithm is frequently used when n is small.

The array contains 6 elements as follows:

42,29,74,11,65,58

Pass	A[0]	A[1]	A[2]	A[3]	A[4]	A[5]	A[6]
K=1	-32768	42	29	74	11	65	58
K=2	-32768	42	29	74	11	65	58
K=3	-32768	29	42	74	11	65	58
K=4	-32768	29	42	74	11	65	58
K=5	-32768	11	29	42	74	65	58
K=6	-32768	11	29	42	65	74	58
Sorted	-32768	11	29	42	58	65	74

DELHI 2001

3.a) Given two arrays of integers X and Y of sizes m and n respectively. Write a function named MERGE() which will third array named Z, such that the following sequence is followed.

- All odd numbers of X from left to right are copied into Z from left to right.
- All even numbers of X from left to right are copied into Z from right to left.
- All odd numbers of Y from left to right are copied into Z from left to right.
- All even numbers of Y from left to right are copied into Z from right to left.

X, Y and Z are passed as arguments to MERGE().

Eg. X is {3, 2, 1, 7, 6, 3} and {9, 3, 5, 6, 2, 8, 10}

the resultant array Z is

{3, 1, 7, 3, 9, 3, 5, 10, 8, 2, 6, 6, 2}

```
void MERGE(int X[ ], int m,int Y[ ],int
n,int Z[ ])
{ int mn,i,,left=0,right=mn-1;
mn=m+n;
for(i=0;i<m;i++)
if (X[i]%2= = 1)
Z[left++]=X[i]; /
```

```
//For copying odd numbers of
//X into Z from left to right
else
Z[right- ]=X[i];
//For copying even number of
//X into Z from right to left
for(i=0;i<n;i++)
if (X[i]%2= = 1)
Z[left++]=Y[i];
//For copying odd numbers of
//Y into Z from left to right
else
Z[right- ]=Y[i];
//For copying even number of
// X into Z from right to left
}
```

3.b) An array X[10][20] is stored in the memory with each element requiring 4 bytes of storage. If the Base address of the array is 1000, calculate location of X[5][15] when the array X is stored using column major order.

NOTE: X[10][20] means valid row indices are 0 and 9 and valid column indices are 0 and 19

Solution: Children, Try this answer as an assignment.

3.c) Write a user-defined function named Lower_half() which takes 2D array A, with size N rows and N columns as argument and prints the lower half of the array.

Eg:

Input:

```
2 3 1 5 0
7 1 5 3 1
2 5 7 8 1
0 1 5 0 1
3 4 9 1 5
```

Output:

```
2
7 1
2 5 7
0 1 5 0
3 4 9 1 5
```

Solution:

```
void Lower_half( int A[ ][ ],int N)
{ int i,j;
for(i=0;i<N;i++)
for(j=0;j<N;j++)
{ if(i<j)
cout<<A[i][j]<<'\\t';
cout<<endl;
}
}
```

DELHI 2000:

3.a) Suppose A, B, C are arrays of integers of size M, N and M+N respectively. The numbers in array A appear in ascending order while numbers in array in descending order. Write user defined function in C++ to produce third array C by merging array A by B in ascending

order. Use A, B and C as arguments in the function.

```
void Merge(int A[ ],int M,int B[ ],int
N,int C[ ])
{ int a,b,c;
  for(a=0,b=N-1,c=0;a<M&& b>=0;)
  { if(A[a]<=B[b])
    C[c++]=A[a++];
    else
    C[c++]=B[b--];
  }
  if(a<M)
  { while(a<M)
    C[c++]=A[a++];
  }
  else
  { while(b>=0)
    C[c++]=B[b--];
  }
}
```

3.b) An array VAL[1...15][1...10] is stored in the memory with each element requiring 4 bytes of storage. If the base address of the array VAL is 1500, determine the location of VAL[12][9] when the array VAL is stored (i) Row wise (ii) Column wise.

Solution:

Given Data:

VAL[1...15][1...10]
 Word Length (W) = 4 Bytes
 Base Address of VAL(B) = 1500
 VAL[12][9] = ?
 C = Total No of Columns
 R = Total No of Rows
 L_r = Least Row=1
 L_c = Least Column=1

(i) Row Major:

Address of an element (I,J) in row

major = B + W (C (I - L_r) + (J - L_c))

VAL [12][9] = 1500 + 4 (10 * (12-1) + (9-1))
 = 1500 + 4 (10 * 11+8)
 = 1500 + 4 (118)
 = 1500 + 472
 = 1972.

(i) Column Major:

Address of an element (I,J) in column

major = B + W ((I - L_r) + R(J - L_c))

VAL [12][9] = 1500 + 4 ((12-1) + 15 * (9-1))
 = 1500 + 4 (11 + 15 * 8)
 = 1500 + 4 (11+ 120)
 = 1500 + 4 * 131
 = 1500 + 524
 = 2024.

3.c) Write a user-defined function in C++ to find and display the sum of diagonal elements from a 2D array MATRIX[6][6] containing integers.

```
void displaysum ( )
{ int i,j,D1=0,D2=0,MATRIX[6][6];
  cout<<"\nEnter any 36 values....";
  for(i=0;i<6;i++)
  for(j=0;j<6;j++)
```

```
{ cin>>MATRIX[i][j];
  if(i= = j)
  D1=D1+MATRIX[i][j];
  else if ((i+j)= =(size-1))
  D2=D2+MATRIX[i][j];
}
cout<<"\nThe sum of the elements
of the Main Diagonal = "<<D1;
cout<<"\nThe sum of the elements
of the Other Diagonal = "<<D2;
}
```

DELHI 1999:

3.a) Suppose a 1D array AR containing integers is arranged in ascending order. Write a user defined function in C++ to search for one integer from AR with the help of binary search method, to show presence of the number in the array. The function should have three parameters: (1) an array AR (2) the number to be searched and (3) the number of elements N in the array.

```
void BinSearch(int AR[ ], int Sno, int N)
{ int l=0,u=N-1,m,flag=0;
  while(l<=u)
  { m=(l+u)/2;
    if (Sno= = AR[m])
    { flag=1;
      break;
    }
    else if(Sno<AR[m])
    u=m-1;
    else
    l=m+1;
  }
  if( flag = = 0)
  cout<<"\nThe Search
Element "<<Sno<<" is not available";
  else
  cout<<"\nThe Search
Element "<<Sno<<" is available";
}
```

3.b) An array A[10][20] is stored in the memory with each element requiring 4 bytes of storage. If the base address of the array in the memory is 400, determine the location of A[8][13] when the array VAL is stored (i) Row major (ii) Column major.

Solution: Children, Try this answer.

3.c) Write a user-defined function in C++ to find and display the multiplication of row elements of two dimensional array A[4][6] containing integers.

```
void rowmul ( )
{ int A[4][6],i,j,rowmul;
  cout<<"\nEnter any 24 values...";
  for(i=0;i<4;i++)
  for(j=0;j<6;j++)
  cin>>A[i][j];
```

```

for(i=0;i<4;i++)
{
    rowmul=1;
    for(j=0;j<6;j++)
        rowmul=rowmul*A[i][j];
    cout<<"\nThe multiplication
of "<<i+1<<" row = "<<rowmul;
}
}

```

**" If WEALTH is lost, nothing is lost.
If HEALTH is lost, something is lost.
If CHARACTER is lost, everything is
lost."**

**"The fear of the Lord is the
beginning of wisdom"**

DELHI 1998:

3.a) Suppose an array P containing float is arranged in ascending order. Write a user defined function in C++ to search for one float from p with the help of binary search method. The function should return an integer 0 to show absence of the number in the array. The function should have the parameters as (1) an array P (2) the number DATA to be searched (3) number of elements N.

```

int BinSearch(float P[ ], float DATA, int N)
{
    int l=0,u=N-1,m;
    while(l<=u)
    {
        m=(l+u)/2;
        if (DATA== P[m])
            return 1;
        else if(DATA<P[m])
            u=m-1;
        else
            l=m+1;
    }
    return 0;
}

```

3.b) An array T[15][10] is stored in the memory with each element requiring 2 bytes of storage. If the base address of T is 2000, determine the location of T[7][8] when the array VAL is stored (i) Row major (ii) Column major.

Solution: Children, Try this as an assignment.

3.c) Write a user-defined function in C++ to find and display the sum of diagonal elements from a 2D array R[7][7] containing integers.

```

void displaysum( )
{
    int i,j,D1=0,D2=0,R[7][7];
    cout<<"\nEnter any 49 values....";
    for(i=0;i<7;i++)
        for(j=0;j<7;j++)
            {
                cin>>R[i][j];
                if(i= j)
                    D1=D1+R[i][j];
                else if ((i+j)= =(size-1))
                    D2=D2+R[i][j];
            }
    cout<<"\nThe sum of the elements
of the Main Diagonal = "<<D1;
    cout<<"\nThe sum of the elements
of the Other Diagonal = "<<D2;
}

```

```

{
    THENODE *front,*rear;
public:
    Queue()
    { front = rear = NULL; }
    void Insert( );
    void Delete( );
    void Display( );
};
void Queue::Insert( )
{
    THENODE *ptr;
    ptr=new THENODE;
    if(ptr= = NULL)
    {
        cout<<"\nNo memory to
create a new node....";
        exit(1);
    }
    cout<<"\nEnter the name....";
    gets(ptr->Name);
    ptr->Link=NULL;
    if(rear= = NULL)
        front=rear=ptr;
    else
    {
        rear->Link=ptr;
        rear=ptr;
    }
}
}

```

3.e) Evaluate the following postfix notation of expression (Show status of stack after execution of each operation):

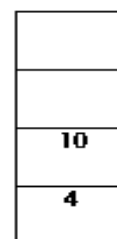
4, 10, 5, +, *, 15, 3, /, -

Step 1: Push 4

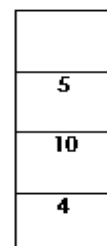


2

Step 2: Push 10



Step 3: Push 5



10. LINKED LISTS , STACKS AND QUEUES

DELHI 2008:

3.c) Write a function in C++ to **insert** an element into a **dynamically allocated Queue** where each node contains a name (of type string) as data.

Assume the following definition of THENODE for the same.

```

struct THENODE
{
    char Name[20];
    THENODE *Link;
};

```

Solution:

```

struct THENODE
{
    char Name[20];
    THENODE *Link;
};
class Queue

```

Step 4: +

	Pop		Pop Op1=10	
5	Op2=3		Then performs 10+5=15	
10		10		15
4		4	Then push the result.	4

Step 5: #

	Pop		Pop Op1=4	
	Op2=15		Then performs 4*15=60	
15				
4		4	Then push the result.	60

Step 6: Push 15

15
60

Step 7: Push 3

3
15
60

Step 8: - /

	Pop		Pop Op1=15	
3	Op2=3		Then performs 15/3=5	
15		15		5
60		60	Then push the result.	60

Step 9: -

	Pop		Pop Op1=60	
	Op2=5		Then performs 60-5=55	
5				
60		60	Then push the result.	55

OUTSIDE DELHI 2008:

3.c) Write a function in C++ to **Delete** an element into a **dynamically allocated Queue** where each node contains a real number as data. ⁴

Assume the following definition of MYNODE for the same:

```
struct MYNODE
{
    float NUM;
    MYNODE * Link;
};
```

Solution:

```
struct MYNODE
{
    float NUM;
    MYNODE *Link;
};
class Queue
{
    MYNODE *front,*rear;
public:
    Queue()
    { front=rear=NULL; }
    void Insert();
    void Delete();
    void Display();
};
void Queue::Delete()
{
    MYNODE *temp;
    if(front== NULL)
        cout<<"Queue Underflow";
    else
    {
        cout<<"\nThe content of the
        element to delete: "<<front->NUM;
```


Complete the class with all function definitions for a circular array Queue. Use another queue to transfer data temporarily.

Solution:

```

void queue::add( )
{ if((front= = 0 && rear = = 9) |
  | (front= =rear+1)
  cout<<"\nQueue
Overflow";
  else if (rear= = -1)
  {   front=rear=0;
    cout<<"\nEnter the
element to be inserted";
    cin>>data[rear];
  }
  else if(rear= =9)
  {   rear=0;
    cout<<"\nEnter the
element to be inserted";
    cin>>data[rear];
  }
  else
  {   rear++;
    cout<<"\nEnter the
element to be inserted";
    cin>>data[rear];
  }
}
void queue::remove( )
{   if(front= = -1)
    cout<<"\nQueue
Underflow...";
  else
  {   cout<<"\nThe element
to be deleted"<<data[front];
    if(front= =rear)
        front=rear=-1;
    else if (front= =9)
        front=0;
    else
        front++;
  }
}
void queue::Delete(int ITEM )
{
//Children, try to complete this
function.
}

```

3.d) Write a function in C++ to perform a PUSH operation on a dynamically allocated stack containing real number.

```

struct Node
{   float Number ;
    Node *Link ;
};
class STACK
{   Node *Top ;
public :
    STACK( ) {Top = NULL ;}

```

```

void PUSH( ) ;
void POP( ) ;
~STACK( ) ;
};

```

Solution:

```

struct Node
{   float Number ;
    Node *Link ;
};
class STACK
{   Node *Top ;
public :
    STACK( ) {Top = NULL ;}
    void PUSH( ) ;
    void POP( ) ;
    ~STACK( ) ;
};
void STACK::PUSH( )
{   Node *Temp;
    Temp=new Node;
    if(Temp= =NULL)
    {
        cout<<"\nNo memory
to create the node...";
        exit(1);
    }
    cout<<"\nEnter the
Number to be inserted: ";
    cin>>Temp->Number;
    Temp->Link=Top;
    Top=Temp;
}

```

3.e) Write the equivalent infix expression for a, b, AND, a, c, AND, OR.

Ans) a, b, AND, a, c, AND, OR
(a AND b), (a AND c), OR
(a AND b) OR (a AND c)

OUTSIDE DELHI : 2006

3.c) Introduction class stack

```

{   int data[10] ;
    int top ;
public :
    stack( )
    {   top = - 1; }
    void push( ) ;
//to push an element into the stack
    void pop( ) ;
//to pop an element from the stack
    void Delete(int ITEM) ;
//To delete all elements which are
//equal to ITEM.
};

```

Complete the class with all function definitions. Use another stack to transfer data temporarily.

Solution:

```

void stack::push( )
{   if(top>=9)

```

```

        cout<<"Stack Overflow...";
    else
    { top++;
      cout<<"\nEnter the element to
be inserted...";
      cin>>data[top];
    }
}
void stack::pop()
{ if(top== -1)
  cout<<"\nStack Underflow";
  else
  { cout<<"\nThe element to be
deleted = "<<data[top];
    top--;
  }
}
void stack::Delete(int ITEM)
{ //Dear children, try to complete this
function.

}

```

3.d) Write a function in C++ to perform **Insert** operation in **dynamically allocated Queue** containing names of students.

```

struct NODE
{ char Name[20];
  NODE *Link;
};

```

Solution: class Queue

```

{
  NODE *front,*rear;
public:
  Queue()
  { front = rear = NULL; }
  void Insert();
  void Delete();
  void Display();
};
void Queue::Insert()
{
  NODE *ptr;
  ptr=new NODE;
  if(ptr= = NULL)
  {
    cout<<"\nNo memory to
create a new node...";
    exit(1);
  }
  cout<<"\nEnter the name....";
  gets(ptr->Name);
  ptr->Link=NULL;
  if(rear= = NULL)
    front=rear=ptr;
  else
  {
    rear->Link=ptr;
    rear=ptr;
  }
}

```

3.e) Write the **equivalent infix** expression for 10, 3, *, 7, 1, --, *, 23, +

Solution:

10, 3, *, 7, 1, - , *, 23, + This is in Postfix form(ie Operator will come after the operand(s)).

Infix form means Operator must come in between the operands.

10, 3, *, 7, 1, - , *, 23, +

Prefix: 10 * 3, 7 - 1, *, 23, +
 (10 * 3) * (7 - 1), 23, +
 (10 * 3) * (7 - 1) + 23

(Infix form)

DELHI : 2005

3.c) Write a function in C++ to perform a **PUSH** operation in a **dynamically allocated stack** considering the following :

```

struct Node
{
  int X,Y ;
  Node *Link ;
};
class STACK
{
  Node *Top ;
public :
  STACK() {Top = Null ;}
  void PUSH() ;
  void POP() ;
  ~STACK() ;
};

```

Solution:

```

struct Node
{
  int X,Y ;
  Node *Link ;
};
class STACK
{
  Node *Top ;
public :
  STACK() {Top = NULL ;}
  void PUSH() ;
  void POP() ;
  ~STACK() ;
};
void STACK::PUSH()
{
  Node *Temp;
  Temp=new Node;
  if(Temp= =NULL)
  {
    cout<<"\nNo memory to
create the node...";
    exit(1);
  }
  cout<<"Enter the value of X
and Y";
  cin>>Temp->X>>Temp->Y;
  Temp->Link=Top;
  Top=Temp;
}

```



```

    }
}

```

3.e) Evaluate the following postfix notation of expression : 10 20 + 25 15 - * 30 /
 Ans) Children, Try this answer as an assignment.

OUTSIDE DELHI : 2005

3.c) Write a function in C++ to perform a **DELETE** operation in a **dynamically allocated queue** considering the following description :

```

struct Node
{
    float U, V ;
    Node *Link ;
};
class QUEUE
{
    Node *Rear, *Front ;
public :
    QUEUE() {Rear = NULL ;
Front = NULL ;}
    void INSERT() ;
    void DELETE() ;
    ~ QUEUE() ;
};

```

```

Solution: void Queue::DELETE()
{
    NODE *temp;
    if(front= = NULL)
        cout<<"\nQueue
Underflow";
    else
    {
        cout<<"\nThe value of
U of the element to delete:
"<<Front->U;
        cout<<"\nThe value of
V of the element to delete:
"<<Front->V;
        temp=Front;
        Front=Front->Link;
        delete temp;
    }
}

```

3.e) Evaluate the following **postfix** notation of expression : 20 10 + 5 2 * - 10 /
 Ans) Children, Try this answer as an assignment.

2004:

3.d) Obtain the postfix notation for the following infix notation of expression showing the contents of the stack and postfix expression formed after each step of conversion : (P—Q)/(R*(S—T)+U)
 (Ans).(P-Q)/((R*(S-T))+U)

S.No	Symbol Scanned	Stack	Expression Y
1	((
2	(((
3	P	((	P
4	-	((-	P
5	Q	((-	P Q
6	)	(	P Q -
7	/	(/	P Q -
8	(	(/(	P Q -
9	(	(/( (	P Q -
10	R	(/( (	P Q - R
11	*	(/((*	P Q - R
12	(	(/( ( * (	P Q - R
13	S	(/( ( * (	P Q - R S
14	-	(/((* (-	P Q - R S
15	T	(/((* (-	P Q - R S T
16	)	(/( ( *	P Q - R S T -
17	)	(/( (	P Q - R S T - *
18	+	(/((+	P Q - R S T - *
19	U	(/((+	P Q - R S T - * U
20	)	(/	P Q - R S T - * U +
21	)		P Q - R S T - * U + /

Postfix Form: PQ-RST-*U+ /

3.e) Define member functions **queins ()** to insert nodes and **quedel ()** to delete nodes of the **linked list implemented class queue**, where each node has the following structure:

```

struct node
{
    char name[20] ;
    int age ;
    node *Link ;
};
class queue
{
    node *rear, *front ;
public :
    queue() { rear = NULL;
front = NULL} ;
    void queins() ;
    void quedel() ;
};

```

Solution:

```

void queue::queins()
{
    node *ptr;
    ptr=new node;
    if(ptr= = NULL)
    {
        cout<<"\nNo memory to
create a new node....";
        exit(1);
    }
    cout<<"\nEnter the name....";
    gets(ptr->name);
    cout<<"\nEnter the age...";
    cin>>ptr->age;
    ptr->Link=NULL;
}

```

```

if(rear== NULL)
    front=rear=ptr;
else
    {
        rear->Link=ptr;
        rear=ptr;
    }
}
void queue::quedel( )
{
    node *temp;
    if(front== NULL)
        cout<<"Queue Underflow";
    else
        {
            cout<<"\nThe name of the
element to delete: "<<front->name;
            cout<<"\nThe age of the
element to delete: "<<front->age;
            temp=front;
            front=front->Link;
            delete temp;
        }
}

```

DELHI : 2003

3.c) Evaluate the following **postfix** expression using a stack and show the contents of stack after execution of each operation:
 20, 45, +, 20, 10, -, 15, +, *
 Ans) Children, Try this answer as an assignment.

3.e) Consider the following portion of a program, which implements passengers Queue for a train. Write the definition of function. **Insert** (whose prototype is shown below); to insert a new node in the queue with required information.

```

struct NODE
{
    long Ticketno;
    char
    PName[20]; //Passengers Name
    NODE * Next;
};
class Queueoftrain
{
    NODE * Rear, * Front;
public :
    Queueoftrain( ) { Rear =
    NULL; Front = NULL;}
    void Insert( );
    void Delete( );
    ~Queueoftrain( );
};

```

Solution:

```

void Queueoftrain::Insert( )
{
    NODE *ptr;
    ptr=new NODE;
    if(ptr== NULL)
    {
        cout<<"\nNo memory to
create a new node....";
        exit(1);
    }
}

```

```

        cout<<"\nEnter the Ticket
Number....";
        cin>>ptr->Ticketno;
        cout<<"\nEnter the Passenger
Name..";
        gets(ptr->PName);
        ptr->Next=NULL;
        if(rear== NULL)
            front=rear=ptr;
        else
        {
            rear->Next=ptr;
            rear=ptr;
        }
}

```

DELHI : 2002

3.b) Given the following class, 4
 char *msg[]={"over flow", "under flow"};
 class Stack
 {
 int top; //the stack pointer
 int stk[5]; //the elements
 void err_rep(int e_num)
 {
 cout<<msg[e_enum];
 //report error message
 }
 public:
 void init()
 {
 top=0;
 } //initialize the stack pointer
 void push(int); //put
 new value in stk
 void pop(); //get the
 top value.
 };

Define pop outside the Stack. In your definition take care of under flow condition. Function pop should invoke err_rep to report under flow.

Solution:

```

void Stack::pop( )
{
    //Dear children, try to complete this
    function.
}

```

3.c) Change the following **infix expression into postfix** expression.

$$(A+B)*C+D/E-F \quad 3$$

Ans) Children, Try this answer as an assignment.

DELHI : 2001

3.d) Write an **algorithm to convert an infix expression to postfix** expression.

Ans)

The following algorithm transforms the infix expression X into its equivalent postfix expression Y. The algorithm uses a stack to temporarily hold operators and left

parentheses. The postfix expression Y will be constructed from left to right using the operands from X and the operators which are removed from STACK. We begin by pushing a left parenthesis onto STACK and adding a right parenthesis at the end of X. The algorithm is completed when STACK is empty. Algorithm:

Suppose X is an arithmetic expression written in infix notation. This algorithm finds the equivalent postfix expression Y.

1. Push "(" onto STACK, and add ")" to the end of X.
2. Scan X from left to right and REPEAT Steps 3 to 6 for each element of X UNTIL the STACK is empty.
3. If an operand is encountered, add it to Y.
4. If a left parenthesis is encountered, push it onto STACK.
5. If an operator is encountered, then:
 - (a) Repeatedly pop from STACK and add to Y each operator (on the top of STACK) which has the same precedence as or higher precedence than operator.
 - (b) Add operator to STACK.
/* End of If structure */
6. If a right parenthesis is encountered, then:
 - (a) Repeatedly pop from STACK and add to Y each operator (on the top of STACK) until a left Parenthesis is encountered.
 - (b) Remove the left parenthesis. (Do not add the left parenthesis to Y).
/* End of If structure */
7. End.

3.e) Each node of a STACK contains the following information, in addition to pointer field:

(i). Pin code of city

(ii). Name of city

Give the structure of node for the linked STACK in question. TOP is a pointer that points to the topmost node of the STACK.

Write the following functions: 4

a) PUSH() – To push a node into the STACK, which is allocated dynamically.

b) POP() – To remove a node from the STACK, and release the memory.

Solution:

```
struct City
{ long Cpin ;
  char CName[20] ;
  City *Next ;
};

class Stack
{ City *Top;
public:
  Stack() { Top = NULL; }
  void Push( );
  void Pop( );
  void Display( );
};
```

```
void Stack::PUSH( )
{ City *Temp;
  Temp=new City;
  if(Temp= =NULL)
  {
    cout<<"\nNo memory to create the
node...";
    exit(1);
  }
  cout<<"\nEnter the City Pin Code to be
inserted: ";
  cin>>Temp→Cpin;
  cout<<"\nEnter the City Name to be
inserted: ";
  gets(Temp→CName);
  Temp→Next=Top;
  Top=Temp;
}

void Stack::POP( )
{ City *Temp;
  if( Top= = NULL)
    cout<<"Stack Underflow...";
  else
  { cout<<"\nThe City Pin Code for the
element to delete: "<<Top→Cpin;
    cout<<"\nThe City name of the
element to delete: "<<Top→CName;
    Temp=Top;
    Top=Top→Next;
    Delete Temp;
  }
}
```

DELHI : 2000

3.d) Evaluate the following **postfix** expression using a stack. Show the contents of stack after execution of each operation:

20, 8, 4, /, 2, 3, +, *, -

Ans) Children, Try this answer as an assignment.

3.e) Give necessary declarations for a queue containing float type numbers; also write a user defined function in C++ **to insert** a float type number in the queue. You should use **linked representation of queue**.

Solution:

```
struct NODE
{ float Number;
  NODE *Link;
};

class Queue
{ NODE *front,*rear;
public:
  Queue( )
  { front = rear = NULL; }
  void Insert( );
  void Delete( );
  void Display( );
};

void Queue::Insert( )
```

```

        {
            NODE *ptr;
            ptr=new NODE;
            if(ptr= = NULL)
            {
                cout<<"\nNo memory to
                create a new node....";
                exit(1);
            }
            cout<<"\nEnter the Number...";
            cin>>ptr->Number;
            ptr->Link=NULL;
            if(rear= = NULL)
                front=rear=ptr;
            else
            {
                rear->Link=ptr;
                rear=ptr;
            }
        }
        front=front->next;
        delete temp;
    }
}

```

1998:

3 (d) Evaluate the following **postfix** expression using a stack and show the contents of stack after execution of each operation: 50, 40, +, 18, 14, -, 4, *, +
Ans) Children, Try this answer as an assignment.

3 (e) Give the necessary declaration of a **linked implemented stack** containing integer type numbers; also write a user defined function in C++ to **pop** a number from this stack.

Solution:

```

struct Node
{ float Number;
  Node *Next ;
};
class Stack
{ Node *Top;
public:
  Stack( )
  { Top = NULL; }
  void Push( );
  void Pop( );
  void Display( );
};
void Stack::Pop( )
{ Node *Temp;
  If( Top= = NULL)
    cout<<"Stack Underflow...";
  else
  { cout<<"\nThe Number of the
  element to delete: "<<Top->Number;
    Temp=Top;
    Top=Top->Next;
    Delete Temp;
  } }

```

1999:

3 (d) Evaluate the following postfix expression using a stack and show the contents of the stack after execution of each operation 5,11,-,6,8,+,12,*,/

Ans) Children, Try this answer as an assignment.

3 (e) Give the necessary declaration of a **linked list implemented queue** containing float type elements. Also write a user defined function in C++ to **delete** a float type number from the queue.

```

struct MYNODE
{ float NUM;
  MYNODE * Link;
};

```

Solution:

```

struct MYNODE
{ float NUM;
  MYNODE *Link;
};
class Queue
{ MYNODE *front,*rear;
public:
  Queue( )
  { front=rear=NULL; }
  void Insert( );
  void Delete( );
  void Display( );
};
void Queue::Delete( )
{ MYNODE *temp;
  If(front= = NULL)
    cout<<"Queue Underflow";
  else
  { cout<<"\nThe content of the
  element to delete: "<<front->NUM;
    temp=front;

```

11. DATA BASE CONCEPTS

Delhi 2008:

5.a) Differentiate between Candidate key and Primary key in context of RDBMS.

Ans:

Candidate Key: All attribute combinations inside a relation that can serve primary key are Candidate Keys as they are candidates for the primary key position.

Primary Key: A primary key is a set of one or more attributes that can uniquely identify tuples within the relations.

Outside Delhi 2008:

5.a) Differentiate between Candidate Key and alternate Key in context of RDBMS.

Ans:

Candidate Key: All attribute combinations inside a relation that can serve as primary key are Candidate Keys as they are candidates for the primary key position.

Alternate Key: A candidate key that is not the primary key is called an Alternate Key. (Where Candidate Key: All attribute combinations inside a relation that can serve primary key (uniquely identifies a row in a relation) are Candidate Keys as they are candidates for the primary key position.)

Delhi 2007:

5.a) Differentiate between primary key and alternate key.

Ans:

Primary Key: A primary key is a set of one or more attributes that can uniquely identify tuples within the relations.

Alternate Key: A candidate key that is not the primary key is called an Alternate Key. (Where Candidate Key: All attribute combinations inside a relation that can serve primary key (uniquely identifies a row in a relation) are Candidate Keys as they are candidates for the primary key position.)

Outside Delhi 2007:

5.a) What is the importance of a primary key in a table? Explain with suitable example.

Ans:

Primary Key: A primary key is a set of one or more attributes that can uniquely identify tuples within the relations. A primary key comprises a single column or set of columns. No two distinct rows in a table can have the same value (or combination of values) in those columns. Depending on its designing, a table may have arbitrarily many candidate keys but at most one primary key. The primary key is non redundant. It does not have duplicate values in the same relation.

Eg: Consider a table consists the following attributes:

AdmnNo,FirstName,LastName,SirName,M1,M2,M3>Total,Avg,FName

Here we can uniquely identify the rows in the relation with following key combinations:

- a)AdmnNo
- b)FirstName,LastName,SirName
- c)FirstName,LastName,FName , etc.

We can set any one of the above candidate keys as primary key, others are called as alternate keys.

Delhi 2006:

5.a) What is an alternate key?

Ans:

Alternate Key: A candidate key that is not the primary key is called an Alternate Key. (Where Candidate Key: All attribute combinations inside a relation that can serve primary key(uniquely identifies a row in a relation) are Candidate Keys as they are candidates for the primary key position.)

Outside Delhi 2006:

5.a) What are DDL and DML?

Ans: DDL means Data Definition Language. DDL provides statements for the creation and deletion of tables and indexes. **DML** Means Data Manipulation Language. The DML provides statements to enter, update,delete data and perform complex queries on these tables. The SQL DDL(Data Definition Language) provides commands for defining relation schemas, deleting relations, creating indexes and modifying relation schemas. The SQL DML (Data Manipulation Language) includes a query language to insert, delete and modify tuples in the database. DML is used to put values and manipulate them in tables and other database objects and DDL is used to create tables and other database objects.

Delhi 2005:

5.a)What do you understand by the terms primary key and degree of a relation in relational data base?

Ans:

Primary Key: A primary key is a set of one or more attributes that can uniquely identify tuples within the relations.The number of attributes in a relation is called Degree of a relation in relational data base.

Outside Delhi 2005:

5.a) What do you understand by the candidate key and cardinality of a relation in relational data base?

Ans:

Candidate Key: All attribute combinations inside a relation that can serve as primary key(uniquely identifies a row in a relation) are Candidate Keys as they are candidates for the primary key position.The number of rows in a relation is known as **cardinality** of a relation.

2003:

5.a)What is primary key in a table? (Define first normal form.- This is out of syllabus)

Ans:

Primary Key: A primary key is a set of one or more attributes that can uniquely identify tuples within the relations.

2002:

5.a) Differentiate between data definition language and data manipulation language.

Ans: The SQL DDL(Data Definition Language) provides commands for defining relation schemas, deleting relations, creating indexes and modifying relation schemas. The SQL DML (Data Manipulation Language) includes a query language to insert, delete and modify tuples in the database. DML is used to put values and manipulate them in tables and other database objects and DDL is used to create tables and other database objects.

2001

5.c) Explain Cartesian product of two relations.

Ans: The Cartesian product is a binary operation and is denoted by a cross(x). The Cartesian product of two relations A and B is written as AXB. The Cartesian product yields a new relation which has a degree (number of attributes) equal to the sum of the degrees of the two relations operated upon. The number of tuples (cardinality) of the new relation is the product of the number of tuples of the two relations operated upon. The Cartesian product of two relations yields a relation with

all possible combinations of the tuples of the two relations operated upon. All tuples of first relation are concatenated with all the tuples of second relation to form the tuples of the new relation.

Eg: There are two relations as follows:

Relation 1: Student

Student Number	StudentName	Hosteler
1	Ravi	Y
2	Robert	N
3	Raheem	Y

Relation 2: Instructor

InstructorName	Subject
K.Suman	Computer Science
P.Pavan	Electronics

The Cartesian product of these two relations, Student X Instructor, will yield a relation that have a degree of 5(3+2:sum of degrees of Student and Instructor) and a cardinality 6 (3 X 2: Product of cardinalities of two relations). The resulting relation is as follows:

Student Number	Student Name	Hosteler	Instructor Name	Subject
1	Ravi	Y	K.Suman	Computer Science
1	Ravi	Y	P.Pavan	Electronics
2	Robert	N	K.Suman	Computer Science
2	Robert	N	P.Pavan	Electronics
3	Raheem	Y	K.Suman	Computer Science
3	Raheem	Y	P.Pavan	Electronics

The resulting relation contains all possible combinations of tuples of the two relations.

1998:

5.a) What is a relation? What is the difference between a tuple and an attribute?

Ans: In relational data model, the data is organized into table (rows and columns). These tables are called relations. A row in a table represents a relationship among a set of values. Rows of the relations are called as tuples and columns of the relations are called as attributes.

12.STRUCTURED QUERY LANGUAGE

Delhi 2008:

5.b) Consider the following tables Product and Client. Write SQL commands for the statement (i) to (iv) and give outputs for SQL queries (v) to (viii)

Table: **PRODUCT**

P_ID	Product Name	Manufacturer	Price
TP01	Talcom Powder	LAK	40
FW05	Face Wash	ABC	45
BS01	Bath Soap	ABC	55
SH06	Shampoo	XYZ	120
FW12	Face Wash	XYZ	95

Table: **CLIENT**

C_ID	Client Name	City	P_ID
01	Cosmetic Shop	Delhi	FW05
06	Total Health	Mumbai	BS01
12	Live Life	Delhi	SH06
15	Pretty Woman	Delhi	FW12
16	Dreams	Bangalore	TP01

(i) To display the details of those Clients whose city is Delhi.

Ans: Select all from Client where City="Delhi"

(ii) To display the details of Products whose Price is in the range of 50 to 100 (Both values included).

Ans: Select all from product where Price between 50 and 100

(iii) To display the ClientName, City from table Client, and ProductName and Price from table Product, with their corresponding matching P_ID.

Ans: Select ClientName, City, ProductName, Price from Product, Client where Product.P_ID=Client.P_ID.

(iv) To increase the Price of all Products by 10

Ans: Update Product Set Price=Price +10

(v) SELECT DISTINCT Address FROM Client.

Ans: (The above question may consist DISTINCT City. If it is DISTINCT City, the following is the answer)

City

Delhi

Mumbai

Bangalore

(vi)SELECT Manufacturer, MAX(Price), Min(Price), Count(*) FROM Product GROUP BY Manufacturer;

Ans:

Manufacturer	Max(Price)	Min(Price)	Count(*)
LAK	40	40	1
ABC	55	45	2
XYZ	120	95	2

(vii)SELECT ClientName, ManufacturerName FROM Product, Client WHERE Client.Prod_Id=Product.P_Id;

ClientName	ManufacturerName
Cosmetic Shop	ABC
Total Health	ABC
Live Life	XYZ
Pretty Woman	XYZ
Dreams	LAK

(viii)SELECT ProductName, Price * 4 FROM Product.

ProductName	Price*4
Talcom Powder	160
Face Wash	180
Bath Soap	220
Shampoo	480
Face Wash	380

Outside Delhi 2008:

5.b) Consider the following tables Item and Customer. Write SQL commands for the statement (i) to (iv) and give outputs for SQL queries (v) to (viii)

Table: **ITEM**

I_ID	Item Name	Manufacturer	Price
PC01	Personal Computer	ABC	35000
LC05	Laptop	ABC	55000
PC03	Personal Computer	XYZ	32000
PC06	Personal Computer	COMP	37000
LC03	Laptop	PQR	57000

Table: **CUSTOMER**

C_I D	Customer Name	City	I_ID
01	N.Roy	Delhi	LC03
06	H.Singh	Mumbai	PC03
12	R.Pandey	Delhi	PC06
15	C.Sharma	Delhi	LC03
16	K.Agarwal	Bangalore	PC01

(i) To display the details of those Customers whose city is Delhi. Ans: Select all from Customer Where City="Delhi"

(ii)To display the details of Item whose Price is in the range of 35000 to 55000 (Both values included).

Ans: Select all from Item Where Price>=35000 and Price <=55000

(iii)To display the CustomerName, City from table Customer, and ItemName and Price from table Item, with their corresponding matching I_ID.

Ans: Select CustomerName, City, ItemName, Price from Item, Customer where Item.I_ID=Customer.I_ID.

(iv) To increase the Price of all Items by 1000 in the table Item.

Ans: Update Item set Price=Price+1000

(v)SELECT DISTINCT City FROM Customer.

Ans: **City**

Delhi
Mumbai
Bangalore

(vi)SELECT ItemName, MAX(Price), Count(*) FROM Item GROUP BY ItemName;

Ans: **ItemName Max(Price) Count(*)**

Personal Computer	37000	3
Laptop	57000	2

(vii)SELECT CustomerName, Manufacturer FROM Item, Customer WHERE Item.Item_Id=Customer.Item_Id;

Ans: **CustomerName ManufacturerName**

N.Roy PQR
H.Singh XYZ
R.Pandey COMP
C.Sharma PQR
K.Agarwal ABC

(viii)SELECT ItemName, Price * 100 FROM Item WHERE Manufacturer = 'ABC';

Ans: **ItemName Price*100**

Personal Computer 3500000
Laptop 5500000

Outside Delhi 2007:

5.b) Consider the following tables Consignor and Consignee. Write SQL command for the statements(i)to(iv) And give outputs for the SQL queries (v) to (viii). 6

TABLE : **CONSIGNOR**

CnorI D	CnorName	CnorAddress	City
ND01	R singhal	24,ABC Enclave	New Delhi
ND02	Amit Kumar	123,Palm Avenue	New Delhi
MU15	R Kohil	5/A,South,Street	Mumbai
MU50	S Kaur	27-K,Westend	Mumbai

TABLE : **CONSIGNEE**

CneeI D	Cnor ID	CneeName	CneeAddress	CneeCity
MU05	ND01	Rahul Kishore	5,Park Avenue	Mumbai
ND08	ND02	P Dhingra	16/j,Moore Enclave	New Delhi
KO19	MU15	A P Roy	2A,Central/avenue	Kolkata

MU32	ND02	S mittal	P 245, AB Colony	Mumbai
ND48	MU50	B P jain	13,Block d,a,viha	New Delhi

(i)To display the names of all consignors from Mumbai.

Ans: Select CnorName from Consignor where city="Mumbai";

(ii)To display the cneeID, cnorName, cnorAddress, CneeName, CneeAddress for every Consignee.

Ans: Select CneeId, CnorName, CnorAddress, CneeName, CneeAddress from Consignor,Consignee where Consignor.CnorId=Consignee.CnorId;

(iii)To display the consignee details in ascending order of CneeName.

Ans: Select * from Consignee Orderby CneeName Asc;

(iv)To display number of consignors from each city.

Ans: Select city, count(*) from Consignors group by city;

(v)SELECT DISTINCT City FROM CONSIGNEE;

Ans: CneeCity
Mumbai
New Delhi
Kolkata

(vi) SELECT A.CnorName A, B.CneeName B FROM Consignor A, Consignee B WHERE A.CnorID=B.CnorID AND B.CneeCity='Mumbai';

(vii)SELECT CneeName,CneeAddress FROM Consignee WHERE CneeCity Not IN ('Mumbai', 'Kolkata');

Ans:

(viii) SELECT CneeID, CneeName FROM Consignee WHERE CnorID = 'MU15' OR CnorID = 'ND01';

Ans: CneeID

CneeName

MU05

Rahul Kishore

KO19

A P Roy

senderCity
New Delhi
Mumbai

Delhi 2007:

5.b)Consider the following tables. Write SQL command for the statements (i)to(iv)and give outputs for the SQL queries (v) to (viii). 6

TABLE : **SENDER**

SenderID	SenderName	SenderAddress	SenderCity
ND01	R jain	2,ABC Appts	New Delhi
MU02	H sinha	12, Newton	Mumbai
MU15	S haj	27/ A,Park Street	New Delhi

ND50	T Prasad	122-K,SDA	Mumbai
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TABLE : **RECIPIENT**

RecID	SenderID	RecName	RecAddress	RecCity
KO05	ND01	R Bajpayee	5,Central Avenue	Kolkata
ND08	MU02	S Mahajan	116, A Vihar	New Delhi
MU19	ND01	H sing	2A,Andheri East	Mumbai
MU32	MU15	P K swamy	B5, CS Terminus	Mumbai
ND48	ND50	S Tripathi	13, B1 D,Mayur Vihar	New Delhi

(i)To display the names of all senders from Mumbai.

Ans: Select * from Sender where SenderCity = 'Mumbai';

(ii)To display the recID, senderName, senderAddress, RecName, RecAddress for every receipt. **Ans:** Select recID, SenderName, SenderAddress, RecName, RecAddress from Sender, Recipient where

Sender.Senderid=Recipient.RenderId;

(iii)To display the sender details in ascending order of SenderName.

Ans: Select * from Sender order by SenderName;

(iv)To display number of Recipients from each city.

Ans: Select

CnorName	CneeName
R singhal	Rahul Kishore
Amit Kumar	S mittal

CneeName	CneeAddress
P Dhingra	16/j,Moore Enclave
B P jain	13,Block d,a,viha

RecCity,Count(*) from Recipient group by RecCity;

(v) SELECT DISTINCT SenderCity FROM Sender;

Ans:

(vi) SELECT A.SenderName A, B.RecName FROM Sender A, Recipient B WHERE A.SenderID=B. SenderID AND B.RecCity='Mumbai';

Ans: SenderName

R.Jain

S.Jha

RecName

H.Singh

P.K.Swamy

(vii)SELECT RecName,RecAddress FROM Recipient WHERE RecCity Not IN ('Mumbai', 'Kolkata');

Ans: RecName

RecAddressS

Mahajan 116, A Vihar
S Tripathi 13, B1 D, Mayur Vihar

(viii) SELECT RecID, RecName FROM Recipient WHERE SenderID = 'MU02' OR SenderID = 'ND50';

Ans: **RecID** **RecName**
 ND08 S Mahajan
 ND48 S Tripathi

OUTSIDE DELHI 2006:

5.b) Study the following tables FLIGHTS and FARES and write SQL commands for the questions (i) to (iv) and give outputs for SQL queries (v) to (vi).

TABLE: **FLIGHTS**

FL_NO	STARTING	ENDING	NO - FL IG HT S	NO - ST OP S
IC301	MUMBAI	DELHI	8	0
IC799	BANGALOR E	DELHI	2	1
MC101	INDORE	MUMBAI	3	0
IC302	DELHI	MUMBAI	8	0
AM812	KANPUR	BANGLORE	3	1
IC899	MUMBAI	KOCHI	1	4
AM501	DELHI	TRIVENDRUM	1	5
MU499	MUMBAI	MADRAS	3	3
IC701	DELHI	AHMEDABAD	4	0

TABLE: **FLIGHTS**

FL_NO	AIRLINES	FARE	TAX %
IC701	INDIAN AIRLINES	6500	10
MU499	SAHARA	9400	5
AM501	JET AIRWAYS	13450	8
IC899	INDIAN AIRLINES	8300	4
IC302	INDIAN AIRLINES	4300	10
IC799	INDIAN AIRLINES	1050	10
MC101	DECCAN AIRLINES	3500	4

(i) Display FL_NO and NO_FLIGHTS from "KANPUR" TO "BANGALORE" from the table FLIGHTS.

Ans: Select FL_NO, NO_FLIGHTS from FLIGHTS where Starting="KANPUR" AND ENDING="BANGALORE"

(ii) Arrange the contents of the table FLIGHTS in the ascending order of FL_NO.

Ans: (Children, Try this as an assignment)

(iii) Display the FL_NO and fare to be paid for the flights from DELHI to MUMBAI using the tables FLIGHTS and FARES, where the fare to be paid = FARE+FARE+TAX%/100.

Ans: Select FL_NO, FARE+FARE+(TAX%/100) from FLIGHTS, FARES where Starting="DELHI" AND Ending="MUMBAI"

(iv) Display the minimum fare "Indian Airlines" is offering from the tables FARES.

Ans: Select min(FARE) from FARES Where AIRLINES="Indian Airlines"

v) Select FL_NO, NO_FLIGHTS, AIRLINES from FLIGHTS, FARES Where STARTING = "DELHI" AND FLIGHTS.FL_NO = FARES.FL_NO

Ans: **FL_NO** **NO_FLIGHTS** **AIRLINES**
 IC799 2 Indian Airlines

(vi) SELECT count (distinct ENDING) from FLIGHTS.

Ans: (Children, Try this answer as an assignment)

DELHI 2006:

5.b) Study the following tables DOCTOR and SALARY and write SQL commands for the questions (i) to (iv) and give outputs for SQL queries (v) to (vi) :

TABLE: **DOCTOR**

ID	NAME	DEPT	SE X	EXP ERIE NCE
101	Johan	ENT	M	12
104	Smith	ORTHOPEdic	M	5
107	George	CARDIOLOGY	M	10
114	Lara	SKIN	F	3
109	K George	MEDICINE	F	9
105	Johnson	ORTHOPEdic	M	10
117	Lucy	ENT	F	3
111	Bill	MEDICINE	F	12
130	Murphy	ORTHOPEdic	M	15

TABLE: **SALARY**

ID	BASIC	ALLO WANC E	CONS ULTAI ON
101	12000	1000	300
104	23000	2300	500
107	32000	4000	500
114	12000	5200	100
109	42000	1700	200
105	18900	1690	300
130	21700	2600	300

(i) Display NAME of all doctors who are in "MEDICINE" having more than 10 years experience from the Table DOCTOR.

Ans: Select Name from Doctor where Dept="Medicine" and Experience>10

(ii) Display the average salary of all doctors working in "ENT" department using the tables DOCTORS and SALARY Salary =BASIC+ALLOWANCE.

Ans: Select avg(basic+allowance) from Doctor,Salary where Dept="Ent" and Doctor.Id=Salary.Id

(iii) Display the minimum ALLOWANCE of female doctors.

Ans: Select min(Allowance) from Doctro,Salary where Sex="F" and Doctor.Id=Salary.Id

(iv) Display the highest consultation fee among all male doctors.

Ans: Select max(Consulation) from Doctor,Salary where Sex="M" and Doctor.Id=Salary.Id

(v) SELECT count (*) from DOCTOR where SEX = "F"

Ans: 4

(vi) SELECT NAME, DEPT , BASIC from DOCTOR, SALRY Where DEPT = "ENT" AND DOCTOR.ID = SALARY.ID

Ans:

Name	Dept	Basic
Jonah	Ent	12000

DELHI 2005:

(5) Consider the following tables EMPLOYEES and EMP SALARY. write SQL commands for the Statements (i) to (iv) and give outputs for SQL quires (v) to (viii).

EMPLOYEES

EMPI D	FIRSTNAME	LASTNAME	ADDRESS	CITY
010	GEORGE	Smith	83 First Street	Howard
105	MARY	Jones	842VineAve	Losantiville
152	SAM	Tones	33 Elm st	Paris
215	SARAH	Ackerman	440 U.S.110	Upton
244	MANILA	Sengupta	24 Friends Street	New Delhi
300	ROBERT	Samuel	9 Fifth Cross	Washington
335	HENRY	Williams	12 Moore Street	Boston
400	RACHEL	Lee	121 Harrison	New York
441	PETER	Thompson	11 Red road	Paris

EMPSALRAY

EMPI D	SALARY	BENEFITS	DESIGNATION
010	75000	15000	Manager
105	65000	15000	Manager
152	80000	25000	Director
215	75000	12500	Manager
244	50000	12000	Clerk
300	45000	10000	Clerk
335	40000	10000	Clerk
400	32000	7500	Salesman
441	28000	7500	Salesman

(i) To display Firstname, Lastname, Address and City of all employees living in Paris from the table EMPLOYEES.

Ans: Select Firstname,Lastname,Address,City from Employees where City="Paris"

(ii) To display the content of EMPLOYEES table in descending order of FIRSTNAME.

Ans: Select * from Employees Order By Firstname Desc

(iii) To display the Firstname, Lastname, and Total Salary of all managers from the tables, where Total Salary is calculated as Salary+Benefits.

Ans: Select Firstname,Lastname,Salary+Benefits from Employees, Empsalary where

Designation="Manager" and Employees.EmpId=EmpSalary.EmpId

(iv) To display the Maximum salary among Managers and Clerks from the table EMP SALARY.

Ans: Select Designation,max(Salary) from EmpSalary where Designation="Manager" or Designation="Clerk"

(v) SELECT FIRSTNAME,SALARY FROM EMPLOYEES,EMPSALARY WHERE DESTINATION ='Salesman'AND EMPOLYEES.EMPID=EMPSALARY.EMPID ;

Ans:

Firstname	Salary
Rachel	32000
Peter	28000

(vi) SELECT COUNT (DISTINT DESIGNATION) FROM EMPSALARY **Ans:** 4

(vii) SELECT DESIGNATION , SUM(SALARY) FROM EMPSALARY GROUP BY DESIGNATION HAVING COUNT(*)>2;

Ans:

Designation	Sum(Salary)
Manager	215000
Clerk	135000

(viii)SELECT SUM (BENEFITS) FROM EMPSALARY WHERE DESIGNATION='Clerk';

Ans: 32000

OUTSIDE DELHI 2005:

5) Consider the following tables WORKERS and DESIG. Write SQL commands for the statements (i) to (iv) and give outputs for SQL queries (v) to (viii).

WORKERS

W_ID	FIRSTNAME	LASTNAME	ADDRESS	CITY
102	Sam	Tones	33 Elm St.	Paris
105	Sarah	Ackerman	44 U.S.110	New York
144	Manila	Sengupta	24 Friends Street	New Delhi
210	George	Smith	83 First Street	Howard
255	Mary	Jones	842 Vine Ave.	Losantiville
300	Robert	Samuel	9 Fifth Cross	Washington
335	Henry	Williams	12 Moore Street	Boston
403	Ronny	Lee	121 Harrison St.	New York
451	Pat	Thompson	11 Red Road	Paris

DESIG

W_ID	SALARY	BENEFITS	DESIGNATION
102	75000	15000	Manager

105	85000	25000	Director
144	70000	15000	Manager
210	75000	12500	Manager
255	50000	12000	Clerk
300	45000	10000	Clerk
335	40000	10000	Clerk
400	32000	7500	Salesman
451	28000	7500	Salesman

(i) To display W_ID, Firstname, address and City of all employees living in New York from the Table WORKERS

Ans: select W_ID,firstname,address,city from workers where city="New York"

(ii) To display the content of workers table in ascending order of LASTNAME.

Ans: Select * from Worker Order By lastname Asc

(iii) To display the FIRSTNAME, LASTNAME and Total Salary of all Clerks from the tables WORKERS And DESIG, where Total salary is calculated as Salary + benefits.

Ans: Select firstname, lastname, salary+benefits where worker.w_id=desg.w_id and Designation="Clerk"

(iv) To display the minimum salary among managers and Clerks from the tables DESIG.

Ans: (Try This Answer)

(v) SELECT FIRSTNAME, SALARY FROM WORKERS, DESIG WHERE DESIGNATION = "MANAGER" AND WORKERS.W_ID = DESIGN.W_ID

Ans:

FIRSTNAME	SALARY
Sam	75000
Manila	70000
George	75000

(vi) SELECT COUNT(DISTINCT DESIGNATION) FROM DESIGN ;

Ans: 4

(vii) SELECT DESIGNATION, SUM(SALARY) FROM DESIG GROUP BY DESIGNATION HAVING COUNT (*) < 3;

Ans:

Designation	Sum(Salary)
Director	85000
Salesman	60000

(viii) SELECT SUM(BENIFTS) FROM DESIG WHERE DESIGNATION ="salesman";

Ans: 15000

2004:

5. Give the following table for database a LIBRARY.

TABLE : BOOKS

BOOK_ID	BOOK_NAME	AUTHORNAME	PUBLISHER	PRICE	TYPE	QUANTITY
F0001	The Tears	William Hopkins	First Publ.	750	Fiction	10
F0002	Thunderbolts	Anna Roberts	First Publ.	700	Fiction	5
T0001	My	Brains &	EPB	250	Text	10

	first C++	Brooke				
T0002	C++ Brain works	A.W.Rossaine	TDH	325	Text	5
C001	Fast Cook	Lata Kapoor	EPB	350	Cookery	8

TABLE:ISSUED

BOOK_ID	QUANTITY_ISSUED
F0001	3
T0001	1
C0001	5

Write SQL queries from b to g.

(b) To show Book name, Author name and Price of books of EPB publisher.

Ans: select Book_name, Author_name, price from books where Publisher = "EPB"

(c) To list the names of the books of FICTIONS type.

Ans: Select Book_name from books where type="FICTION"

(d) To display the names and prices of the books in descending order of their price.

Ans: Select Book_name, price from books order by price desc;

(e) To increase the price of all books of First Pub. by 50.

Ans: update books set price= price+50 where publishers = "First Publ"

(f) To Display the Book_ID, Book_Name and Quantity Issued for all books Which have been issued.

Ans: Select Book_ID, Book_Name, Quantity_Issued from Books, Issued where Books.BookId=Issued.BookId;

(g) To insert a new row in the table Issued having the following data: "F0002", 4

Ans: insert into Issued values("F0002", 4)

(h) Give the output of the following queries on the above tables:

(i) Select Count(Distinct Publishers) From Books **Ans:** 3

(ii) Select Sum(Price) From Books Where Quantity > 5 **Ans:** 1350

(iii) Select Book_Name, Author_Name From Books Where Price < 500

Ans:

Book Name	Author Name
My First C++	Brian & Brooks
C++ Brainworks	A.W. Rossaine
Fast Cook	Lata Kapoor

(iv) Select Count(*) From Books **Ans:** 5

2003:

5.b Write SQL commands for (b) to (g) and write the outputs for

(h) on the basis of tables INTERIORS and NEWONES. **TABLE: INTERIORS**

N	ITEM	TYPE	DATE OF STOCK	PRICE	DISCOUNT
1	Red rose	Double Bed	23/02/02	32000	15
2	Soft touch	Baby cot	20/01/02	9000	10

3	Jerry's home	Baby cot	19/02/02	8500	10
4	Rough wood	Office Table	01/01/02	20000	20
5	Comfort zone	Double Bed	12/01/02	15000	20
6	Jerry look	Baby cot	24/02/02	7000	19
7	Lion king	Office Table	20/02/02	16000	20
8	Royal tiger	Sofa	22/02/02	30000	25
9	Park sitting	Sofa	13/12/01	9000	15
10	Dine paradise	Dinning Table	19/02/02	11000	15

TABLE:NEWONES

NO	ITEM NAME	TYPE	DATEOFSTOCK	PRICE	DISCOUNT
11	White wood	Double bed	23/03/03	20000	20
12	James 007	Sofa	20/02/03	15000	15
13	Tom look	Baby cot	21/02/03	7000	10

(b) To show all information about the sofas from the INTERIORS table.

Ans: Select * from INTERIORS where type="sofa"

(d) To list ITEMNAME and TYPE of those items, in which DATEOFSTOCK is before 22/01/02 from the INTERIORS table in descending order of ITEMNAME.

Ans: Select Itemname,Type From Interiors Where Dateofstock<{22/01/02} order by Itemname

(e) To display ITEMNAME and DATEOFSTOCK of those items in which the Discount percentage is more than 15 from INTERIORS.

Ans: Select Itemname,Dateofstock from Interiors Where Discount>15

(f) To count the number of items whose type is "Double bed";

Ans: Select Count(*) from Interiors Where Type="Double Bed"

(g) To insert new row in the NEWONES table with the following data:

14, "True Indian ", "Office Table ", {28/03/03},15000,20

Ans: Insert into Newones values(14,"True Indian","Office Table","{28/03/03},15000,20)

(h) Give the outputs for the following SQL statements.

(i) Select COUNT (distinct TYPE) from INTERIORS;

Ans: 5

(ii) Select AVG(DISCOUNT)from INTERIORS where TYPE ="Baby cot";

Ans: 13

(iii) Select SUM(price)from INTERIORS where DATEOFSTOCK<{12/02/02};

Ans: 53000

2002:

5. Given the following Teacher Relation.

Write SQL Commands fro (b) to (g)

No	Name	Department	DateofJoining	Salary	Sex
1	Raja	Computer	21/5/98	8000	M
2	Sangita	History	21/5/97	9000	F
3	Ritu	Sociology	29/8/98	8000	F
4	Kumar	Linguistics	13/6/96	10000	M
5	Venkat raman	History	31/10/99	8000	M
6	Sindhu	Computer	21/5/86	14000	M
7	Aishwarya	Sociology	11/1/1998	12000	F

(b) To select all the information of teacher in computer department

Ans: Select * from Teacher where Department="Computer"

(c) To list the name of female teachers in History Department.

Ans: Select Name from Teacher Where Sex="F" And Department="History"

(d) To list all names of teachers with date of admission in ascending order.

Ans: Select Name from Teacher Order By Dateofjoining Asc

(e) To display Teacher's Name, Department, and Salary of female teachers

Ans: Select Name,Department,Salary from Teacher Where Sex="F"

(f)To count the number of items whose salary is less than 10000

Ans: Select Count(*) from Teacher Where Salary<10000

(g) To insert a new record in the Teacher table with the following data:

8,"Mersha","Computer",

(1/1/2000),12000,"M".

Ans: Insert into

Teacher values ,"Mersha",

"Computer",{1/1/2000},12000,"M");

2001:

5.b) Write the SQL commands for (i) to (vii) on the basis of the table SPORTS

TABLE: SPORTS

St ud no	Clas s	Name	Game1	Gr ade 1	Game2	Gr ade 2
10	7	Smeer	Criquet	B	Swimmin g	A
11	8	Sujit	Tennis	A	Skating	C
12	7	Kamala	Swimm ing	B	Football	B
13	7	Veena	Tennis	C	Tennis	A
14	9	Archan a	Basket ball	A	Criquet	A
15	10	Arpit	Criquet	A	Athletics	C

(i) Display the names of the students who have grade 'C' in either Game1 or Game2 or both.

Ans: Select Name From Sports Where Grade1="C" OR Grade2="C"

(ii) Display the number of students getting grade 'A' in Cricket.

Ans: Select Count(*) from Sports Where (Game1="Cricket" and Grade1="A") or (Game2="Cricket" and Grade2="A")

(iii) Display the names of the students who have same game for both game1 and game2

Ans: Select Name From Sports Where Game1=Game2

(iv) Display the games taken up by the students, whose name starts with 'A'.

Ans: Select Game1,Game2 From Sports Where Name Like "A%"

(v) Add a new column named 'marks'.

Ans: Alter Table Sports Add Marks Number(5);

(vi) Assign a value 200 for marks for all those who are getting grade 'B' or 'A' in both Game1 and Game2.

Ans: (Children, Try This Answer as an assignment)

(vii) Arrange the whole table in the alphabetical order of name.

Ans: Select * from Sports Order By Name

2000 :

5. Write SQL commands for the (b) to (e) and write the outputs for (g) on the basis of table CLUB.

TABLE: CLUB

COACH ID	COACH NAME	AGE	SPORTS	DATEOF APP	PAY	SEX
1	KUKREJA	35	KARATE	27/03/96	1000	M
2	RAVINA	34	KARATE	20/01/98	1200	F
3	KARAN	34	SQUASH	19/01/98	2000	M
4	TARUN	33	BASKET BAL	01/01/98	1500	M
5	ZUBIN	36	SWIMMING	12/01/98	750	M
6	KETAKI	36	SWIMMING	24/02/98	800	F
7	ANKITA	39	SQUASH	20/02/98	2200	F
8	ZAREEN	37	KARATE	22/02/98	1100	F
9	KUSH	41	SWIMMING	13/01/98	900	M
10	SHAILYA	37	BASKET BALL	19/02/98	1700	M

(b) To show all information about the swimming coaches in the club.

Ans: Select * from Club

(c) To list names of all coaches with their date of appointment (DATEOFAPP) in descending order.

Ans: Select Coachname from Club order by Dateofapp desc

(d) To display a report, showing coachname, pay, age and bonus(15% of pay) for all coaches.

Ans: Select Coachname,Pay,Age,Pay*0.15 from Club

(e) To insert a new row in the CLUB table with following data: 11,"PRAKASH",37,"SQUASH",{25/02/98},2500,"M"

Ans: Insert into Club Values

(11,"PRAKASH",37,"SQUASH",{25/02/98},2500,"M")

(f) Give the output of the following SQL statements:

(i) select COUNT (distinct SPORTS)from CLUB;

Ans: 4

(ii) select MIN(AGE) from CLUB where SEX ="F";

Ans: 34

(iii) select AVG(PAY) from CLUB where SPORTS = "KARATE";

Ans: 1100

(iv) select SUM(PAY) from CLUB where DATAOFAPP>{31/01/98};

Ans: 7800

(G) Assuming that there is one more table COACHES in the database as shown below:

TABLE:COACHES

SPORTS PERSON	SEX	COACH_NO
AJAY	M	1
SEEMA	F	2
VINOD	M	1
TANEJA	F	3

What will be the output of the following query:

SELECT SPORTS PERSON, COACHNAME FROM CLUB,COACHES WHERE COACH_ID=COACH_NO

Ans:

SPORTS PERSON	COACHNAME
AJAY	KUKREJA
SEEMA	RAVINA
VINOD	KUKREJA
TANEJA	KARAN

1999:

5.) Given the following Teacher relation: Write SQL commands for questions (b) to (g).

TEACHER

N O	NAME	DEPARTMENT	DATEOF JOINING	SALARY	SEX
1	RAJA	COMPUTER	21/5/98	8000	M
2	SANGITA	History	21/5/97	9000	F
3	RITU	MATHS	29/8/98	8000	F
4	KUMAR	HISTORY	13/6/96	10000	M
5	VENKAT	MATHS	31/10/99	8000	M
6	SINDU	HISTORY	21/5/86	14000	F
7	ASHWARYA	MATHS	11/1/98	12000	F

(b)To show all information about the teachers of history department.

Ans:select *from teacher where department='history';

(c) To list names of female teacher who are in math department.

Ans: select name from teacher where sex='male' and department='maths';

d) To list names of all teacher with their date of joining in ascending order.

Ans:Select Name From Teacher order by dateofjoing;
 (f) To count the number of teachers with age >23.

Ans: Select count(number of teachers) from ,teacher where age>23;

(g) To insert a new row in the teacher table with the following data: 9, "raja", 26, "computer", {13/5/95}, 2300, "M".

Ans: Insert into Teacher values(9,"raja",26, "computer", {13/05/95},2300,"M");

1998:

5. Write SQL commands for (b) to (g) and write the outputs for (h) on the basis of table HOSPITAL.

N O	NAME	AGE	DEPART MENT	DATEOF ADM	CH AR GE S	S E X
1	Arpit	62	Surgery	21/1/98	300	M
2	Zareen a	22	Ent	12/12/97	250	F
3	Kareem	32	Arthopedi c	19/2/98	200	M
4	Arun	12	Surgery	11/1/98	300	M
5	Zubin	30	Ent	12/1/98	250	M
6	Karin	16	Ent	24/2/98	250	F
7	Ankita	29	cardiology	22/2/98	800	F
8	Zareen	45	Gynecolog y	22/2/98	300	F
9	Kush	19	Cardiolog y	13/1/98	800	M
10	Shilpa	23	Nuclear medicine	21/2/98	400	F

(b) To select all the information of patients of all cardiology department.

Ans: Select all from Hospital where department="Cardiology"

(c) To list the names of female patients who are in ent department.

Ans:select name from Hospital where Department="Ent" and Sex="F"

(d) To list names of all patients with their date of admission in ascending order.

Ans: Select name,dateofadm from Hospital dateofadm.

(e) To display patients name, charges, age, for only female patients.

Ans: Select Name,Charges,age from Hospital where sex="F"

(f) To count the number of patients with age <30.

Ans: Select count(*) from hospitals where age<30

(g) To insert the new row in the hospital table with the following data: 11, "aftab", 24, "surgery", {25/2/98}, 300, "M".

Ans: insert into Hospital values(11, "aftab", 24, "surgery", {25/02/98}, 300, "M")

(h) Give the output of the following SQL statements:

(i) Select count (distinct charges)from hospital;

Ans: 5

(ii) Select min(age) from hospital where sex = "F";

Ans: 16

(iii) Select sum(charges) from hospital where department = "ent";

Ans: 750

(iv) Select avg(charges) from hospital where date of admission is <{12/02/98};

Ans:380

13. Boolean Algebra Laws

(1) Properties of 0 and 1:

$$0 + X = X, 1 + X = 1, 0.X = 0, 1.X = X$$

(2) Idempotence Law:(a)X +X = X(b)X.X = X

(3) Involution Law: $\overline{\overline{A}} = A$

(4)Complementary Law:(a)X + \overline{X} =1(b)X. \overline{X} =0

(5)Commutative Law: (a) X+Y =Y+X

$$(b)X.Y=Y.X$$

(6) Associative Law: (a) X + (Y+Z)=(X+Y)+Z

$$(b)X.(Y.Z)=(X.Y).Z$$

(7)Distributive Law: (a) X(Y+Z)=XY+XZ

$$(b) X+YZ=(X+Y)(X+Z)$$

(8) Absorption Law: (a) X+XY=X

$$(b)X(X+Y)+X$$

(9) Third distributive Law: X+ \overline{X} Y=X+Y

(10)Demorgan's Theorems (1) $\overline{X+Y} = \overline{X}. \overline{Y}$

$$(2) \overline{X.Y} = \overline{X} + \overline{Y}$$

14.COMMUNICATION AND NETWORK CONCEPTS

DELHI 2008:

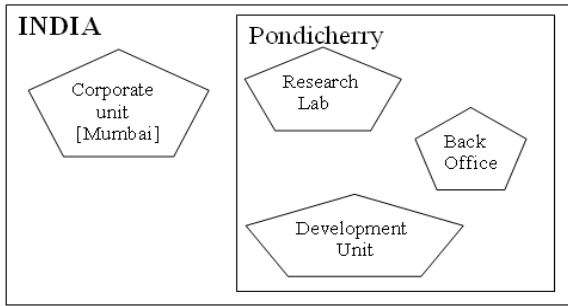
1) What is a Hub? 1m

2) Expand the following terms with respect to Networking: 2m

i) MODEM ii) WLL iii) FTP iv) TCP/IP

3) How is Coaxial cable different from Optical Fibre? 1m

4) "Bias methodologies" is planning to expand their network in India, starting with three cities in India to build infrastructure for research and development of their chemical products. The company has planned to setup their main office in Pondicherry - at three different locations and have named their offices as "Back Office", "Research Lab" and "Development Unit". The company has one more Research office namely "Corporate Office" in "Mumbai". A rough layout of the same is as follows:



Approximate distance between these offices is as follows:

From	To	Distance
Research Lab	Back Office	111 Mtr
Research Lab	Development Unit	16 KM
Research Lab	Corporate Unit	1800 KM
Back Office	Development Unit	13 KM

In continuation of the above, the company experts have planned to install the following number of computers in each of their offices:

Research Lab	158
Back Office	79
Development Unit	90
Corporate Unit	51

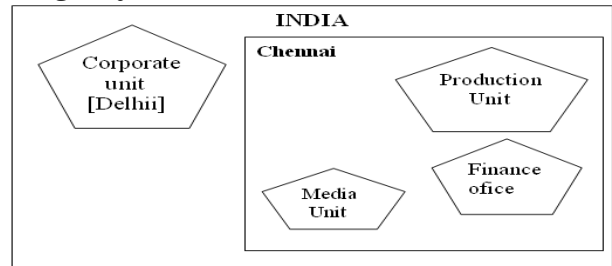
1) Suggest the kind of network required (out of LAN, MAN, WAN) for connecting each of the following office units:

- i) Research Lab and Back Office
 - ii) Research Lab and Development Unit
- 2) Which one of the following devices will you suggest for connecting all the computers with in each of their office units?
- i) Switch/Hub ii) Modem iii) Telephone
- 3) Which of the following communication media, you will suggest to be procured by the company for connecting their local office units in Pondicherry for very effective (High Speed) communication?
- i) Telephone cable ii) Optical Fibre
 - iii) Ethernet Cable
 - iv) Suggest a cable/wiring layout for connecting the company's local office units located in Pondicherry. Also, suggest an effective method/technology for connecting the company's office unit located in Mumbai.

OUTSIDE DELHI: 2008

- 1) What is a Modem? 1m
- 2) Expand the following terms with respect to Networking: 2m
 - i) PPP ii) GSM iii) XML iv) HTTP
- 3) How is a Hacker different from a Cracker? 1
- 4) "China Middleton Fashion" is planning to expand their network in India, starting with two cities in India to provide infrastructure for distribution of their product. The company has planned to setup their main office in Chennai at three different locations and have named their offices as "Production Unit", "Finance Unit" and "Media Unit". The

Company has its corporate unit in Delhi. A rough layout of the same is as follows:



Approximate distance between these Units is as follows:

From	To	Distance
Production Unit	Finance Unit	
Production Unit	Media Unit	
Production Unit	Corporate Unit	2112 KM
Finance Unit	Media Unit	15 KM

In continuation of the above, the company experts have planned to install the following number of computers in each of their offices:

Production Unit	158
Finance Unit	79
Media Unit	90
Corporate Unit	51

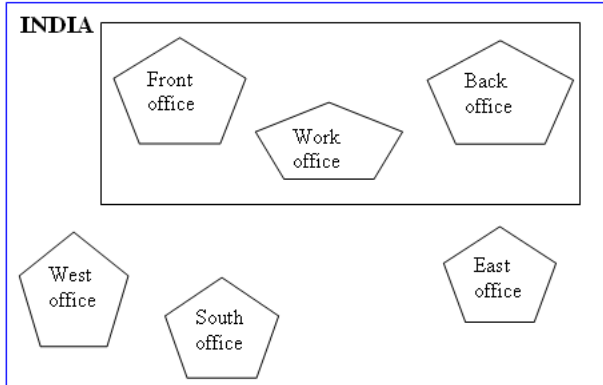
1) Suggest the kind of network required (out of LAN, MAN, WAN) for connecting each of the following office units:

- i) Production Unit and Media Unit ii) Production Unit and Finance Unit
- 2) Which one of the following devices will you suggest for connecting all the computers with in each of their office units?
- i) Switch/Hub ii) Modem iii) Telephone
- 3) Which of the following communication media, you will suggest to be procured by the company for connecting their local office units in Chennai for very effective (High Speed) communication?
- i) Telephone cable ii) Optical Fibre
 - iii) Ethernet Cable
- 4) Suggest a cable/wiring layout for connecting the company's local office units located in Chennai. Also, suggest an effective method/technology for connecting the company's office unit located in Delhi.

DELHI 2007:

- 1) What is the significance of Cyber law? 1m
- 2) Expand the following terms with respect to networking: 2m
 - i) CDMA ii) WLL iii) FTP iv) HTML
- 3) Which of the following unit measures the speed with which data can be transmitted from one node to another node of a network? Also, give the expansion of the suggested unit. 1m
 - i) Mbps ii) KMps iii) MGps
- 4) "Bhartiya Connectivity Association" is planning to spread their offices in four major cities in India to provide regional IT

infrastructure support in the field of Education & Culture. The company has planned to setup their head office in New Delhi in three locations and have named their New Delhi offices as “Front Office “,”Back Office “and “Work Office “.The company has three more regional offices as “South Office “,”East Office”and “West Office “ located in other three major cities of India. A rough layout of the same is as follows: 4m



Approximate distance between these offices as per network survey team is as follows

Plac e From	Plac e To	Distance
Back Office	Front Office	10 KM
Back Office	Work Office	70 KM
Back Office	East Office	1291KM
Back Office	West Office	790 KM
Back Office	South Office	1952KM

In continuation of the above, the company experts have planned to install the following number of computers in each of their offices:

Back Office	100
Front Office	20
Work Office	50
East Office	50
West Office	50
South Office	50

1) Suggest network type(out of LAN,MAN,WAN) for connecting each of the following set of their offices:

- Back Office and Work Office
- Back Office and south Office

2) Which device you will suggest to be produced by the company for connecting all the computers with in each of their offices out of the following devices?

- Switch/Hub
- Modem
- Telephone

3) Which of the following communication medium, you will suggest to be produced by the company for connecting their offices in New Delhi for very effective and fast communication?

- Telephone Cable
- Optical Fibre
- Ethernet Cable

4) Suggest a cable/writing layout for connecting the company’s local offices located in New Delhi. Also, suggest an effective method /technology for connecting the company’s regional offices –“East Office”, “West Office “and “South Office” with offices located in New Delhi.

OUT SIDE DELHI: 2007

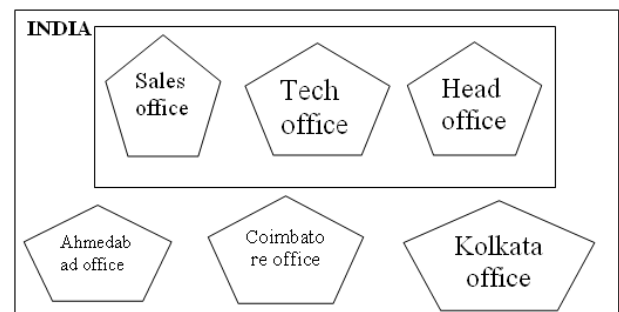
1) What is the significance of Cyber law?1m
2) Expand the following terms with respect to networking: 2m

i) XML ii) WWW iii) WLL iv) TCP/IP

3) Which of the following unit measures the speed with which data can be transmitted from one node to another node of a network? Also, give the expansion of the suggested unit 1m

i) Kmps ii) Mbps iii) MGps

4) “Hindustan Connecting World Association “is planning to start their offices in four major cities in India to provide regional IT infrastructure support in the field of Education & Culture. The company has planned to set up their head office in New Delhi in three locations and have named their New Delhi offices as “Sales Office “,”Head Office “and “Tech Office “.The company’s regional offices are located at “Coimbatore”,”Kolkata”and “Ahmadabad”. A rough layout of the same is as follows: 4m



Approximate distance between these offices as per network survey team is as follows

Plac e From	Place To	Distance
Head Office	Sales Office	10 KM
Head Office	Tech Office	70 KM
Head Office	Kolkata Office	1291KM
Head Office	Ahmadabad Office	790 KM
Head Office	Coimbatore Office	1952KM

In continuation of the above, the company experts have planned to install the following number of computers in each of their offices:

Head Office	100
Sales Office	20
Tech Office	50
Kolkata Office	50

Ahmadabad Office	50
Coimbatore Office	50

1) Suggest network type(out of LAN,MAN,WAN) for connecting each of the following set of their offices:

- Head Office and Tech Office
- Head Office and Coimbatore Office

2) Which device you will suggest to be produced by the company for connecting all the computers with in each of their offices out of the following devices?

- Modem
- Telephone
- Switch/Hub

3) Which of the following communication media, will suggest to be procured by the company for connecting their local offices in New Delhi for very effective and fast communication?

- Ethernet Cable
- Optical Fibre
- Telephone Cable

Wing A to Wing S	100 m
Wing A to Wing J	200 m
Wing A to Wing H	400 m
Wing S to Wing J	300 m
Wing S to Wing H	100 m
Wing J to Wing H	450 m

4) Suggest a cable/writing layout for connecting the company's local offices located in New Delhi. Also, suggest an effective method /technology for connecting the company's regional offices at "Kolkata","Coimbatore"and "Ahmadabad".

DELHI: 2006

1) Differentiate between Internet and Intranet

2) Expand the following terms: 2m
i) CDMA ii) URL iii) HTTP iv) WAN

3) Write one advantage of STAR topology as compared to BUS topology .1m

4) UNIVERSITY OF CORRESPONDENCE in Allahabad is setting up the network between its different wings. There are 4 wings named as Science (S), Journalism (J), ARTS (A) and Home Science (H).

Distances between various wings are given below:

Wing A to Wing S	100 m
Wing A to Wing J	200 m
Wing A to Wing H	400 m
Wing S to Wing J	300 m
Wing S to Wing H	100 m
Wing J to Wing H	450 m

Number of Computers

Wing A	150
Wing S	10
Wing J	05
Wing H	50

- i) Suggest a suitable Topology for networking the computer of all wings. 1m
- ii) Name the wing where the Server to be installed. Justify your answer. 1m
- iii) Suggest the placement of Hub/Switch in the network. 1m
- iv) Mention in economic technology to provide internet accessibility to all wings. 1m

OUTSIDE DELHI: 2006

- 1) Name two transmission media for networking. 1m
- 2) Expand the following terms: 2m
i) XML ii) GSM iii) SMS iv) MAN
- 3) Difference between Hackers and Crackers?1
- 4) INDIAN PUBLIC SCHOOL in Darjeeling is setting up the network between its different wings. There are 4 wings named as SENIOR(S), JUNIORS (J), ADMIN (A) and HOSTEL (H).

Distance between various wings is given below:

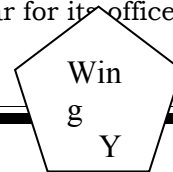
Number of Computers

Wing A	10
Wing S	200
Wing J	100
Wing H	50

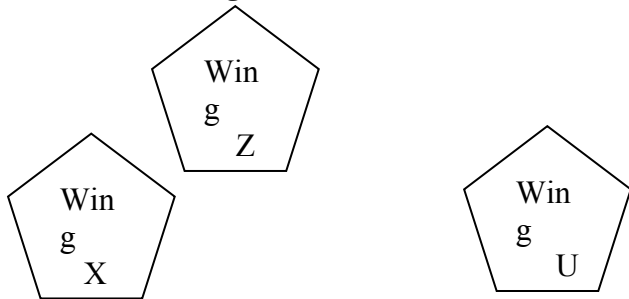
- i) Suggest a suitable Topology for networking the computer of all wings. 1m
- ii) Name the wing where the server to be installed. Justify your answer. 1m
- iii) Suggest the placement of Hub/Switch in the network. 1m
- iv) Mention in economic technology to provide internet accessibility to all wings. 1m

DELHI: 2005

- 1) What is the difference between Message Switching technique and Packet Switching technique? 1m
- 2) Expand the following terminologies: 2m
i) TCP/IP ii) XML iii) CDMA iv) WLL
- 3) Write two application of Cyber Law. 1m
- 4) The Great Brain Organization has set up its new Branch at Srinagar for its office and web



based activities .It has 4 Wings of buildings as shown in the diagram:



Center to center distances between various blocks

Wing X to Wing Z	50 m
Wing Z to Wing Y	70 m
Wing Y to Wing X	125 m
Wing Y to Wing U	80 m
Wing X to Wing U	175 m
Wing Z to Wing U	90 m

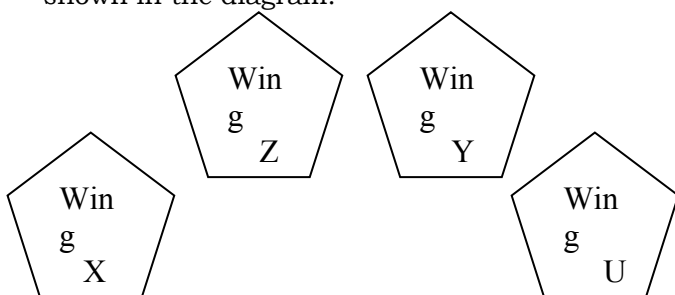
Number of computers

Wing X	50
Wing Z	30
Wing Y	150
Wing U	15

- 1) Suggest a most suitable cable layout of connections between the Wings, and topology 1m
- 2) Suggest the most suitable place (i.e., Wing) to house the server of this organization with a suitable reason, with justification. 1m
- 3) Suggest the placement of the following devices with justification: 1m
(i) Repeater (ii) Hub/Switch
- 4) The organization is planning to link its head office situated in Delhi with the offices at Srinagar. 1m Suggest an economic way to connect it; the company is ready to compromise on the speed of connectivity. Justify your answer. 2m

OUT SIDE DELHI: 2005

- 1) Compare Optical Fiber and Coaxial transmission media. 1m
- 2) Expand the following terminologies:
i) HTML ii) GSM
- 3) What is the difference between XML and HTML? Write two differences. 1m
- 4) What do you understand by the terms Cookies and Firewall? 1m
- 5) The Cyber Mind Organization has set up its new Branch at Mizoram for its office and web based activities. It has 4 Wings of buildings as shown in the diagram:



Center to center distances between various blocks

Wing X to Wing Z	40 m
Wing Z to Wing Y	60 m
Wing Y to Wing X	135 m
Wing Y to Wing U	70 m
Wing X to Wing U	165 m
Wing Z to Wing U	80 m

Number of computers

Wing X	50
Wing Z	130
Wing Y	40
Wing U	15

- 1) Suggest a most suitable cable layout of connections between the Wings, and topology 1m
- 2) Suggest the most suitable place (i.e., Wing) to house the server of this organization with a suitable reason, with justification. 1m
- 3) Suggest the placement of the following devices with justification: 1m
(i) Repeater (ii) Hub/Switch
- 4) The organization is planning to link its head office situated in Delhi with the offices at Srinagar. 1m Suggest an economic way to connect it; the company is ready to compromise on the speed of connectivity. Justify your answer. 2m

DELHI: 2004

- 1) Write two advantages and two disadvantages for STAR topology? 1m
- 2) Write one difference between Coaxial and optical cable? 1m
- 3) Explain the following terms in short. 2m
i) FTP ii) URL
- 4) Define Packet switching? 1m

DELHI: 2003

- 1) What is the purpose of using a repeater in the context of networking? 1m
- 2) Write an advantage and a disadvantage of using optical fibre cables? 1m
- 3) Write one advantage and one disadvantage of the following topologies in network: 2m
i) STAR Topology ii) BUS Topology
- 4) What is the difference between MAN and WAN? 1m

DELHI: 2002

- 1) What is a Modem? 1m
- 2) Write the following abbreviations in their full form. 1m
i) FTP ii) WAN iii) WWW
- 3) Mention one difference between circuit switching and packet switching. 2m

MHz – Mega Hertz
 GHz – Giga Hertz
 THz – Tera Hertz
 Bps – Bytes Per Second
 bps - Bits Per Second
 PDA – Personal Digital Assistants
 P-P - Point to Point
 AM – Amplitude Modulation
 FM - Frequency Modulation
 PM – Phase Modulation
 A/F – Audio Frequency
 (Txd – Transmit, Rxd – Receive, RTS – Request to Send
 CD – Carrier Detect, DSR – Data Set Ready, CTS – Clear to Send
 DTR – Data Terminal Ready)
 RJ45 – Registered Jack – 45
 BNC – Bayone – Neill – Concelman
 AUI – Attachment Unit Interface
 SNA – Systems Network Architecture
 VFIR – Very Fast Infrared
 URI – Uniform Resource Identifier
 URN – Uniform Resource Name
 MIME – Mail and Multipurpose Internet Mail Extensions
 POP – Post Office Protocol
 SMTP – Simple Mail Transfer Protocol
 NNTP – Network News Transfer Protocol
 HTTP – Hyper Text Transfer Protocol
 NTP – Network Time Protocol
 IMAP – Internet Mail Transfer Protocol
 SLIP – Serial Line Internet Protocol
 IPCP – IP Control Protocol
 NCP – Network Control Protocol
 LCP – Link Control Protocol
 PC – Personal Computer
 ISP – Internet Service Provider
 SIM – Subscriber Identity Module
 TDMA – Time Division Multiple Access
 TDM – Time Division Multiplexing
 IDEN – Integrated Digital Enhanced Network
 WCDMA – Wideband CDMA
 PSTN – Public Switched Telephone Network
 3G – Third Generation
 UMTS – Universal Mobile Telecommunications System /
 Universal Mobile Telephone System
 EDGE – Enhanced Data rates for Global Evolution
 SMSC – Short Message Service Center
 HLR – Home Location Register
 Email – Electronic Mail
 Fax – Fascimile
 VSNL – Videsh Sanchar Nigam Limited
 DNS – Domain Name Server
 DHTML – Dynamic Hyper Text Markup Language
 DECnet – Digital's family of communication protocols
 IE – Internet Explorer

5. CONSTRUCTORS AND DESTRUCTORS

Constructor: A member function with the same name as its class is called Constructor and it is used to initialize the objects of that class type with a legal initial value.

If a class has a constructor, each object of that class will be initialized before any use is made of the object.

Need for Constructors: A variable, an array or a structure in C++ can be initialized at the time of their declaration.

```

Eg: int a=10;
      int a[3]= {5,10,15};
      struct student
      {
          int rno;
          float m1,m2,m3;
      };
      student s1={1,55.0,90.5,80.0};
  
```

But this type of initialization does not work for a class because the class members have their associated access specifiers. They might not be available to the outside world (outside their class). A Constructor is used to initialize the objects of the class being created (automatically called by the compiler).

Difference between a constructor and an ordinary member function:

	Constructor	Member Function
Name	Name of the Class	Any Valid Identifier
Purpose	Initialize the object when it is	For any general purpose

	being created	
Call	Implicit	Explicit
Return type	Should not keep	Must be there at least void

Declaration and Definition:

A constructor is a member function of a class with the same name as that of its class name. A constructor is defined like other member functions of a class. It can be defined either inside the class definition or outside the class definition.

```
Eg: class X
    { int i;
    public:
      int j,k;
      X ( )           //Constructor
      {
        i = j = k = 0;
      }
      -----
      //Other members
      -----
    };
```

This simple constructor (X::X ()) is as an inline member function. Constructors can be written as outline functions also as it is shown below:

```
class X
{
  int i ;
  public:
  int j, k ;
  X ( ) ;           //Only
  constructor declaration.
  -----
  //Other
  members
  -----
};
X :: X ( )         //Constructor
defined outside
{
  i = j = k = 0;
}
```

Generally constructor will be defined under public section, which can be available to non members also. But it can also be defined under private or protected. A private or protected constructor is not available to the non-member functions. Ie With a private or protected constructor, you cannot create an object of the same class in a non-member function.

There are three types of constructors

- a) Non-parameterized or Default Constructor
- b) Parameterized Constructor
- c) Copy Constructors

a) Default constructor:

A constructor that accepts no parameter is called the default constructor. With a default constructor, objects are created just the same way as variables of other data types are created.

```
class X
{
  int i ;
  public:
  int j, k ;
  -----
  //Members Functions
  -----
};
```

Eg: X ob1;
Student s1;

If a class has no explicit constructor defined, the compiler will supply a default constructor. This implicitly declared default constructor is an **inline public** members of its class. Declaring a constructor with arguments hides the default constructor.

There can be a default constructor as well as another constructor with arguments for a class, having multiple constructors is called as constructor overloading.

A constructor can also have default arguments. A constructor with default arguments is equivalent to a default constructor.

Eg: class Rectangle

```
{
  float l,b,a;
  public:
  Rectangle ( float len = 5.0, float bre = 5.0)
  //Constructor with Default arguments
  {
    l = len;
    b = bre;
  }
  -----
  -----
};

void main()
{
  Rectangle first(7.0,9.5);
  Rectangle second;
  //Takes default argument values. Equivalent
  to second(5.0,5.0)
  ----
  ----
}
```

The default constructors are very useful when you want to create objects

without having to type the initial objects every time with pre specified initial values or if you want to create array of objects of your class type. You can't create an array of objects unless your class has a default constructor (implicitly or explicitly defined).

b) Parameterized Constructor:

A constructor that take arguments, is called as parameterized constructor. The parameterized constructor allow us to initialize the various data elements of different objects with different values when they are created. This is achieved by passing different values as arguments to the constructor function when the objects are created.

```
Eg: class Rectangle
{   float l,b,a;
    public:
        Rectangle ( float len , float bre )
            //Parameterized Constructor.
        {   l = len;
            b = bre;
        }
        ----
        ----
};

void main()
{
    Rectangle first(7.0,9.5);
    ----
    ----
}
```

With a parameterized constructor, the initial values must be passed at the time of object created. This can be done in two manners:

- (i)By calling the constructor implicitly (implicit call) Eg: Rectangle first(8.5,3.9);
- (ii)By calling the construct or explicitly (Explicit call)

Eg: Rectangle first = Rectangle (8.5,3.9);

Temporary Instances:

A temporary instance lives in the memory as long it is being used or referenced in an expression and after this it dies. A temporary instance will not have any name. The explicit call to a constructor also allows you to create a temporary instance or temporary object. The temporary instances are deleted when they are no longer referenced.

```
Eg: class Sample
{
    int i,j;
    public:
        sample (int a, int b)
        {
```

```
        i=a;
        j=b;
    }
    void print ()
    {
        cout<<i<<j<<"\n";
    }
    ----
    ----
};

void test ()
{
    Sample S1(2,5);
        //An object S1 created
    S1.print ();
        //Data values of S1 printed
    Sample (4,9).print ();
        //Data values of a temporary
        //sample instance printed
}
```

The primitive (fundamental) types also have their own constructors. When no values are provided, they use their default constructors but when you provide initial values, the newly created instance is initialized with the provided value.

```
Eg: int a,b,c;
//Default constructor used
int i(3), j(4), k(5); //i,j,k initialized
```

c) Copy Constructor:

A copy constructor is a constructor of the form **classname(classname &)**. The compiler will use the copy constructor whenever you initialize an instance using values of another instance of same type.

```
Eg: Sample S1; //Default constructor used
Sample S2=S1; //Copy constructor used.
Also Sample S2(S1);
```

In the above code, for the second statement, the compiler will copy the instance S1 to S2 member by member. If you have not defined a copy constructor, the compiler automatically, creates it and it is public.

A copy constructor takes a reference to an object of the same class an argument.

```
Eg: class Sample
{
    int i,j;
    public:
        Sample (int a, int b) //Constructor
        {
            i = a;
            j = b;
        }
}
```

```

Sample (Sample &s) //Copy Constructor
{
    i=s.i;
    j=s.j;
    cout<<"Copy constructor
        Working\n";
}

void print()
{
    cout<<i<<"\t"<<j<<"\n";
}
-----
-----
};

void main()
{
Sample S1(4,9);
//S1 initialized first constructor used
Sample S2(S1);
//S1 copied to S2. Copy constructor called.
Sample S3=S1;
//S1 copied to S3. Copy constructor called
//again.
-----
-----
}

```

Why the argument to a copy constructor is passed by reference:

If we try to pass the argument by value to a copy constructor (ie, for a class X, if we use an X(X) constructor in place of X(X&), the compiler complains out of memory. The reason is, when an argument is passed by value, a copy of it is constructed. To create a copy of the object, the copy constructor works. But the copy constructor is creating a copy of the object for itself, thus it calls itself. Again the called copy constructor requires another copy so again it is called. In fact it calls itself again until the compiler runs out of memory. So, in the copy constructor, the argument must be passed by reference, so that to make a copy of the passed object, original object is directly available.

Dynamic initialization of objects: The dynamic initialization means that the initial values may be provided during runtime. The benefit of dynamic initialization is that it provides the flexibility of assigning initial values at run time.

Initialization of Const & Reference Members:

If your class contains a constant and a reference as member field, then you need to specify that through **Member-Initialization List**.

A constructor can initialize the constituent data members of its class through a mem-initialization list that appears in the function header of the constructor.

Eg:

```

class Test
{
    int a ;
    char b;
public:
    Test(int i,char j):a(i), b(j);//a(i) initializes
member a with
//value i, b(j)....b
with j.
{
    ....
}

```

You can even have a combination of mem-initialization list and initialization within constructor body.

Eg:

```

class Test
{
    .....
public:
    Test(int i, char j):a(i)
    {
        b=j;
    }
    .....
};

```

And if your class contains a **const** and /or a **reference** member, then these members must be initialized through mem-initialization list as these cannot be initialized within constructor body.

Eg:

```

struct Sname
{
    char fname[25];
    char lname[25];
} S1;

class Test
{
    int a,b;
    const int max;           //const member
    Sname &name;             //reference
member
public:
    Test (:):max(300),name(S1)
    {
        a=0;
        b=10;
    }
    -----
};

```

Mem-initialization lists are especially used in the following four cases:

- (i) initialization of const members.
- (ii) initialization of reference members.
- (iii) Invoking base class constructor.
- (iv) Initialization of member objects.

Constructor Overloading:

The constructor of a class may also be overloaded so that even with different number and types of initial values, an object may still be initialized.

Default Arguments Versus Overloading:

Using default arguments gives the appearance of overloading, because the function may be called with an optional number of arguments.

Eg:

Prototype : float amount (float principal, int time=2, float rate=0.08);

Can be called as

Amount(2000.0,4,0.10);

Amount(3520.5,3);

Amount(5500.0);

Special Characteristics of Constructors:

1. Constructor functions are invoked automatically when the objects are created.
2. If a class has a constructor, each object of that class will be initialized before any use is made of the object.
3. Constructor functions obey the usual access rules. Ie private and protected constructors are available only for member and friend functions, however, public constructors are available for all the functions. Only the functions that have access to the constructor of a class, can create an object of the class.
4. No return type (not even void) can be specified for a constructor.
5. They cannot be inherited, though a derived class can call the base class constructor.
6. A constructor may not be static.
7. Default constructors and copy constructors are generated (by the compiler) where needed. Generated constructors are public.
8. Like other c++ functions, constructors can also have default arguments.
9. It is not possible to take the address of a constructor.
10. An object of a class with a constructor cannot be a member of a union.
11. Member functions may be called from within a constructor.
12. A constructor can be used explicitly to create new objects of its class type,

using the syntax class-name (expression-list)

Eg: Sample obj1=Sample(13,22.42);

DESTRUCTORS

Destructor:

A destructor is used to destroy the objects that have been created by a constructor. A destructor destroys the values of the object being destroyed.

A destructor is also a member function whose name is the same as the class name but is preceded by tilde (~). A destructor takes no arguments, and no return types can be specified for it (not even void). It is automatically called by the compiler when an object is destroyed. A local object, local to a block, is destroyed when the block gets over; a global or static object is destroyed when the program terminates. A destructor cleans up the storage (memory area of the object) that is no longer accessible.

Eg:

```
class Sample
{
    int i,j;
    Public:
        Sample(int a, int b) //Constructor
        {
            i=a; j=b;
        }
        ~Sample()
        {
            cout<<"Destructor at work\n";
        }
        -----
};
void main()
{
    Sample s1(3,4); //Local object s1
    constructed with values 3
    // & 4 using Sample ()
    -----
    ---/*Automatically s1 is destructed at the end
    of the block using destructor ~Sample()*/
}
```

Need for Destructors:

During construction of any object by the constructor, resources may be allocated for use. (for example, a constructor may have opened a file and a memory area may be allotted to it). These allocated resources must be de allocated before the object is destroyed. A destructor performs these types of tasks.

Some Characteristics of Destructors:

1. Destructor functions are invoked automatically when the objects are destroyed.
2. If a class has a destructor, each object of that class will be deinitialized before the object goes out of scope. (Local objects at the end of the block defining them and global and static objects at the end of the program).

3. Destructor functions also, obey the usual access rules as other member functions do.
- 4.No argument can be provided to a destructor, neither does it return any value.
5. They cannot be inherited.
6. A destructor may not be static.
7. It is not possible to take the address of a destructor.
8. Member functions may be called from within a destructor.
9. An object of a class with a destructor cannot be a member of a union.

CONSTRUCTORS AND DESTRUCTORS (PROGRAMS)

1. Program to find area of a circle using class, constructor functions and destructor.

```
#include<iostream.h>
#include<conio.h>

class Circle
{
    float r,a;    //r and a are private

public:
    Circle()
//Non parameterized or Default Constructor
    {
        r=0.0;
        a=0.0;
    }

    Circle(float rad)
//Parameterized Constructor
    {
        r = rad;
        a = 3.1415*r*r;
    }

    Circle(Circle &obj) //Copy Constructor
    {
        r = obj.r;
        a = obj.a;
    }

    ~Circle()
    {
        cout<<"\n\nThe object is being
destroyed....";
    }

    void take()
    {
        cout<<"Enter the value of Radius: ";
        cin>>r;
    }

    void calculate()
    {
        a = 3.1415*r*r;
    }
}
```

```
void display()
{
    cout<<"\n\nThe Radius of the Circle = "<<r;
    cout<<"\n\nThe Area of the Circle = "<<a;
}
};

void main()
{ clrscr();
    Circle c1; /*Default Constructor will be
called implicitly.
            ie c1.r = 0.0 and c1.a = 0.0 */
    Circle c2(10.3);
//Parameterized Constructor will be called
//implicitly
    Circle c3(c2);
//Copy Constructor will be called implicitly
    c1.take();
    c1.calculate();
    c1.display();
    c2.display();
    c3.display();
    getch();
}
```

2. Program to process student data using class concept, constructors and destructor.

```
#include<iostream.h>
#include<conio.h>

class Student
{
    float m1,m2,m3,total,avg;

public:
    Student()
    {
        m1=0.0;
        m2=0.0;
        m3=0.0;
        total=0.0;
        avg=0.0;
    }

    Student(float x,float y,float z)
    {
        m1=x;
        m2=y;
        m3=z;
        total=m1+m2+m3;
        avg=total/3;
    }

    Student(Student &Test)
    {
        m1=Test.m1;
        m2=Test.m2;
        m3=Test.m3;
        total=Test.total;
        avg=Test.avg;
    }
}
```

```

~Student()
{
    cout<<"The Object is being Destroyed....";
}

void readProcess()
{
    cout<<"\nEnter the 3 Subject marks of a
student: ";
    cin>>m1>>m2>>m3;
    total=m1+m2+m3;
    avg=total/3;
}

void display()
{
    cout<<"\nTotal Marks = "<<total;
    cout<<"\nAverage Marks = "<<avg;
}
};

void main()
{
    clrscr();
    Student S1;
    Student S2(50.5,90.0,75.5);
    Student S3=S2;
    S1.readProcess();
    S1.display();
    S2.readProcess();
    S2.display();
    S3.display();  getch();
}

```