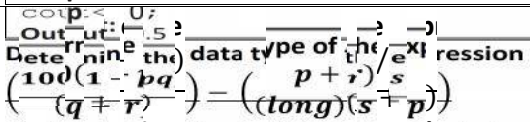


CHAPTER-1
C++ REVISION TOUR
VERY SHORT/ SHORT ANSWER QUESTIONS

1.	Find out the errors, if any, in the following C++ statement: (i) cout<<"="a; (ii) m=5, n=12; o=15 (iii) cout<<"x";<<x; (iv) cin>>y;>>j; (v) cin>>"\n">>y; (vi) cout>>"\n "abc"; (vii)a = b + c (viii) break = x*y;										
Ans.	(i) cout<<"="a; (ii) m=5, n=12; o=15 (iii) cout<<"x";<<x; (iv) cin>>y;>>j; (v) cin>>"\n">>y; (vi) cout>>"\n _abc"; (vii)a = b + c (viii) break = x*y;										
2.	What is the difference between fundamental data types and derived data types? Explain with examples.										
Ans.	<table><tr><th>Fundamental data types</th><th>Derived data types</th></tr><tr><td>These are the data types that are not composed of any other data type.</td><td>These are the data types that are composed of fundamental data types.</td></tr><tr><td>There are five fundamental data types: char, int, float, double and void.</td><td>These are: array, function, pointer, reference, constant, class, structure, union and enumeration.</td></tr><tr><td>Example: int a=10; float b;</td><td>Example: float marks[50]; Const int a=5;</td></tr></table>	Fundamental data types	Derived data types	These are the data types that are not composed of any other data type.	These are the data types that are composed of fundamental data types.	There are five fundamental data types: char, int, float, double and void.	These are: array, function, pointer, reference, constant, class, structure, union and enumeration.	Example: int a=10; float b;	Example: float marks[50]; Const int a=5;		
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Example: int a=10; float b;	Example: float marks[50]; Const int a=5;										
3.	What is the purpose of a header file in a program?										
Ans.	Header files provide function prototypes, definitions of library functions, declaration of data types and constants used with the library functions.										
4.	What main integer types are offered by C++?										
Ans.	C++ offered three types of integers : short, int and long. Each comes in both signed and unsigned versions.										
5.	Explain the usage of following with the help of an example: (i) constant (ii) reference (iii) variable (iv) union										
Ans.	<p>(i) constant: The keyword const can be added to the declaration of an object to make that object a constant rather than a variable. Thus, the value of the named constant cannot be altered during the program run. The general form of constant declaration is as follows: const type name = value. Example: const int a=10;</p> <p>(ii) reference: A reference is an alternative name for an object. A reference variable provides an alias for a previously defined variable. The general form of declaring a reference variable is: Type &ref-var = var-name; where <i>type</i> is any valid c++ data type, <i>ref-var</i> is the name of reference variable that will point to variable denoted by <i>var-name</i>.</p> <p>Example:</p> <pre>int total; int &sum=total; total=100; cout<<"Sum="<<sum<<"\n" ; cout<<"Total="<<total<<"\n" ;</pre> <p>In above code both the variables refer to the same data object in the memory, thus, print the same value.</p>										

	<p>(iii) variable: Variables represent named storage locations whose value can be manipulated during program run. Variables are generally declared as: type name; where <i>type</i> is any C++ data type and <i>name</i> is the variable name. A variable can be initialized either by a separate assignment statement following its declaration as shown below:</p> <pre>int age; age = 10;</pre> <p>(iv) union: A union is a memory location that is shared by two or more different variables, generally of different types at different times. Defining a union is similar to defining a structure. Following of declaration declares a <i>union share</i> having two variables and creates a union object <i>cnvt</i> of union type <i>share</i>:</p> <pre>union share{ int i; char ch; }; union share cnvt;</pre> <p>union can referred to the data stored in <i>cnvt</i> as either an integer or character. To assign the integer 20 to element <i>i</i> of <i>cnvt</i>, write - <code>cnvt.i = 20;</code> To print the value of element <i>ch</i> of <i>cnvt</i>, write - <code>cout<<cnvt.ch;</code></p>
6.	How many ways can a variable be initialized into? Give examples for each type of initialization.
Ans.	<p>A variable can be initialized into two ways as following:</p> <p>(i) By separate assignment statement: Example: <code>int age;</code> <code>age = 10;</code></p> <p>(ii) At the time of declaration: Example: <code>int age = 10;</code></p> <p>(iii) Dynamic initialization: Example: <code>float avg = sum/count;</code></p>
7.	How are the following two statements different? <code>char pcode = 75;</code> <code>char pcode = 'K';</code>
Ans.	The first statement treats 75 as ascii value and converts it into its relative character 'K' whereas second statement stores character 'K' and does not make any conversion.
8.	How are the following two statements different? <code>char pcode = 75;</code> <code>short pcode = 75;</code>
Ans.	The first statement treats 75 as ascii value and converts it into its relative character 'K' whereas second statement treats 75 as number.
9.	If value is an identifier of int type and is holding value 200, is the following statement correct? <code>char code = value</code>
Ans.	VALID Statement
10.	The data type double is another floating-point type. Then why is it treated as a distinct data type?
Ans.	The data type double is treated as a distinct data type because it occupies twice as much memory as type float, and stores floating-point numbers with much larger range and precision. It stands for double precision floating-point. It is used when type float is too small or insufficiently precise.
11.	Explain the impact of access modifier const over variables. Support your answer with examples.
Ans.	<p>The access modifier <code>const</code> can be added to the declaration of an object to make that object a constant rather than a variable. Thus, the value of the named constant cannot be altered during the program run whereas the value of the variable can be changed during the program run.</p> <p>Example:</p> <pre>void main(){ const int a=10; int b=20; a++; cout<<"a="<<a; b++; cout<<"b="<<b; }</pre>
12.	What are arithmetic operators in C++? Distinguish between unary and binary arithmetic operators. Give examples for each of them.

Ans.	Following are the arithmetic operators in C++: addition(+), subtraction(-), multiplication(*), division(/) and reminder(%).										
	<table><tr><th>Unary arithmetic operators</th><th>Binary arithmetic operators</th></tr><tr><td>Unary Operators has only one operand</td><td>Binary operators ("bi" as in "two") have two operands</td></tr><tr><td>The Unary Operators are ++,--,&*,+, - etc.</td><td>The +, -, &&, <<, ==, >> etc. are binary operators.</td></tr><tr><td>Example: short x = 987; x = -x;</td><td>Example: int x, y = 5, z; z = 10; x = y + z;</td></tr></table>			Unary arithmetic operators	Binary arithmetic operators	Unary Operators has only one operand	Binary operators ("bi" as in "two") have two operands	The Unary Operators are ++,--,&*,+, - etc.	The +, -, &&, <<, ==, >> etc. are binary operators.	Example: short x = 987; x = -x;	Example: int x, y = 5, z; z = 10; x = y + z;
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Example: short x = 987; x = -x;	Example: int x, y = 5, z; z = 10; x = y + z;										
13.	What is the function of increment/decrement operators? How many varieties do they come in? How are these two varieties different from one another?										
Ans.	The increment operator, ++ adds 1 to its operand and the decrement operator -- subtract 1 from its operands. The increment/decrement operator comes in two varieties as following: (i) Prefix version and (ii) Postfix version:										
	<table><tr><th>Prefix version</th><th>Postfix version</th></tr><tr><td>Performs the increment or decrement operation before using the value of the operand.</td><td>First uses the value of the operand in evaluating the expression before incrementing or decrementing the operand's value.</td></tr><tr><td>Example: sum = 10; ctr = 5; sum = sum + (++ctr);</td><td>Example: sum = 10; ctr = 5; sum = sum + (ctr++);</td></tr></table>			Prefix version	Postfix version	Performs the increment or decrement operation before using the value of the operand.	First uses the value of the operand in evaluating the expression before incrementing or decrementing the operand's value.	Example: sum = 10; ctr = 5; sum = sum + (++ctr);	Example: sum = 10; ctr = 5; sum = sum + (ctr++);		
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Example: sum = 10; ctr = 5; sum = sum + (++ctr);	Example: sum = 10; ctr = 5; sum = sum + (ctr++);										
14.	State why are following expression invalid? (i) asm = 5100 val < 35 (ii) age > 70 && < 90 (iii) income >= 500 && val < 500 (iv) res !> 20 ! X > 20										
Ans.	(i) In this expression single '=' operator is used for comparison which is not valid. (ii) In this expression variable's name is not mentioned after the '&&' operator which is not valid. (iii) In this expression both ' ' and '&&' operators are written together which is not valid. (iv) In this expression use of '!>' is invalid and !x>20 should be written in parenthesis like (!x>20).										
15.	What is the difference between Type Casting and Automatic Type conversion? Also, give a suitable C++ code to illustrate both.										
Ans.	<table><tr><th>Type Casting</th><th>Automatic Type conversion</th></tr><tr><td>It is an explicit process of conversion of a data from one type to another.</td><td>It is an implicit process of conversion of a data from one type to another.</td></tr><tr><td>It is performed with the help of casting operator().</td><td>It is performed by compiler its own.</td></tr><tr><td>Example: int A=1, B=2; float C = (float)A/B;//Type Casting cout<<C; Output: 0.5</td><td>Example: int N = 65; char C = N; //Automatic type conversion cout<<C; Output: A</td></tr></table>			Type Casting	Automatic Type conversion	It is an explicit process of conversion of a data from one type to another.	It is an implicit process of conversion of a data from one type to another.	It is performed with the help of casting operator().	It is performed by compiler its own.	Example: int A=1, B=2; float C = (float)A/B;//Type Casting cout<<C; Output: 0.5	Example: int N = 65; char C = N; //Automatic type conversion cout<<C; Output: A
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16.	 <p>Determine the data type of the expression $\frac{(100 - p * q)}{(s + r)}$If p is int, r is a float, q is a long and s is double.</p>										
Ans.	The data type of the expression is double as double is the larger data type.										
17.	What are the outputs of following two codes fragments? Justify your answer.										
	<table><tr><td>//version 1 int f = 1, i =2; while(++i < 5) f * = i;</td><td>//version 2 int f = 1, i = 2; do{ f * = i;</td></tr></table>			//version 1 int f = 1, i =2; while(++i < 5) f * = i;	//version 2 int f = 1, i = 2; do{ f * = i;						
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	<pre>cout<<f; : : }while (++i < 5); cout<< f; :</pre>		
Ans.	The output of the first code fragment is 12. The output of the first code fragment is 24.		
18	<p>Will the following program execute successfully? If not, state the reason(s):</p> <table><tr><td><pre>(i)#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; }</pre></td><td><pre>(ii) #include<stdio.h> void main(){ int x,sum=0; cin<<n; for(x=1;x<100;x+=2) if x%2==0 sum+=x; cout<<"SUM=">>sum; }</pre></td></tr></table>	<pre>(i)#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; }</pre>	<pre>(ii) #include<stdio.h> void main(){ int x,sum=0; cin<<n; for(x=1;x<100;x+=2) if x%2==0 sum+=x; cout<<"SUM=">>sum; }</pre>
<pre>(i)#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; }</pre>	<pre>(ii) #include<stdio.h> void main(){ int x,sum=0; cin<<n; for(x=1;x<100;x+=2) if x%2==0 sum+=x; cout<<"SUM=">>sum; }</pre>		
Ans.	<table><tr><td><p>(i) Will encounter a compile time error for following reasons:</p><ul style="list-style-type: none">• The variable 'x' is not declared.• With cin statement '<<' symbol is used instead of '>>'.• Invalid semicolon at the end of if statement.</td><td><p>(ii) Will encounter a compile time error for following reasons:</p><ul style="list-style-type: none">• The variable 'n' is not declared.• There should be a parenthesis in if statement.• '>>' is used with cout statement instead of '<<'.</td></tr></table>	<p>(i) Will encounter a compile time error for following reasons:</p> <ul style="list-style-type: none">• The variable 'x' is not declared.• With cin statement '<<' symbol is used instead of '>>'.• Invalid semicolon at the end of if statement.	<p>(ii) Will encounter a compile time error for following reasons:</p> <ul style="list-style-type: none">• The variable 'n' is not declared.• There should be a parenthesis in if statement.• '>>' is used with cout statement instead of '<<'.
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19	<p>Find the syntax error(s), if any, in the following program:</p>		
Ans.	<pre>(i) #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; } }</pre> <pre>(ii) #include<iostream.h> void main(){ int x,y; cin>>x; for(x=0;x<5;++x) cout y else cout<<x<<y; }</pre> <pre>(iii) #include<iostream.h> void main(){ int R;W=90; while W>60 { R=W-50; switch(W) { 20:cout<<"Lower Range"<<endl; 30:cout<<"Middel Range"<<endl; 20:cout<<"Higher Range"<<endl;</pre>		

```

    }
}
}

```

(iv) Rewrite the following program after removing all the syntax error(s), if any.

```

#include<iostream.h>
void main(){
    int X[]={60, 50, 30, 40},Y;Count=4;
    cin>>Y;
    for(I=Count-1;I>=0,I--)
        switch(I)
        { case 0:
          case 2:cout<<Y*X[I]<<endl;break;
          case1:
          case 3:cout>>Y+X[I];
        }
}

```

(v) Rewrite the following program after removing all the syntax error(s), if any.

```

#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 2:cout>>P[I]*Q<<endl;
            break;
          case1:
          case 3:cout<<P[I]+Q;
        }
}

```

Ans. (i) Will encounter a following syntax error(s):

- The variable 'i' is not declared.
- There should be semicolon after the declaration statement if int x[5].

(ii) There is a syntax error in cout statement.

(iii) Will encounter a following syntax error(s):

- There should be a ',' between R and W instead of ';' in declaration statement.
- There should be a parenthesis in 'while' statement.
- There is missing a use of 'case' keyword in switch statement.

(iv) #include<iostream.h>

```

void main(){
    int X[]={60, 50, 30, 40},Y,Count=4;
    cin>>Y;
    for(int I=Count-1;I>=0;I--)
        switch(I)
        { case 0:
          case 1:
          case 2:cout<<Y*X[I]<<endl;break;

          case 3:cout<<Y+X[I];break;
        }
}

```

(v) #include<iostream.h>

```

void main(){
    int P[]={90, 10, 24, 15},Q,Number=4;

```

	<pre> Q=9; for(int I=Number-1;I>=0;I--) switch(I) { case 0: case 1: case 2:cout<<P[I]*Q<<endl; break; case 3:cout<<P[I]+Q; break; } } </pre>
20	<p>Rewrite the following program after removing all the syntactical error(s), if any. Underline each correction.</p> <pre> #include<iostream.h> void main(){ Present=25,Past=35; Assign(Present,Past); Assign(Past); } void Assign(int Default1,Default2=30) { Default1=Default1+Default2; cout<<Default1>>Default2; } </pre>
Ans.	<pre> #include<iostream.h> void Assign(int Default1,int Default2=30); void main(){ clrscr(); int Present=25,Past=35; Assign(Present,Past); Assign(Present); getch(); } void Assign(int Default1,int Default2) { Default1=Default1+Default2; cout<<Default1<<Default2; } </pre>
21	<p>Given the following code fragment:</p> <pre> if(a==0) cout<<"Zero"; if(a==1) cout<<"One"; if(a==2) cout<<"Two"; if(a==3) cout<<"Three"; </pre> <p>Write an alternative code (using if) that saves on number on compressions.</p>
Ans.	<pre> #include<iostream.h> void main(){ int a; cout<<"enter a:"; cin>>a; if(a==0) cout<<"Zero"; else if(a==1) </pre>

	<pre> cout<<"One"; else if(a==2) cout<<"Two"; else if(a==3) cout<<"Three"; else cout<<"other than 0,1,2,3"; } </pre>
22	<p>Write the names of the header files, which is/are essentially required to run/execute the following C++ code:</p> <pre> #include<iostream.h> void main(){ char CH,Text[]="+ve Attitude"; for(int I=0;Text[I]!='\0';I++) if(Text[I]==' ') cout<<endl; else { CH=toupper(Text[I]); cout<<CH; } } </pre>
Ans.	1. ctype.h
23	<p>Find the output of the following program:</p> <pre> #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"<<A++B <<"&"<<A+3<<endl; } } </pre>
Ans.	<p><u>Output:</u> Line15&8 Line211&9 Line1679 Line212&10</p>
24	<p>Rewrite the following program after removing all the syntactical error(s), if any. Underline each correction.</p> <pre> #include<iostream.h> void main(){ One=10,Two=20; Callme(One;Two); Callme(Two); } void Callme(int Arg1,int Arg2=20) { Arg1=Arg1+Arg2 cout<<Arg1>>Arg2; } </pre>
Ans.	<pre> #include<iostream.h> void Callme(int Arg1,int Arg2=20); void main(){ </pre>

	<pre> int One=10,Two=20; Callme(One;Two); Callme(Two); } void Callme(int Arg1,int Arg2=20) { Arg1=Arg1+Arg2 cout<<Arg1<<Arg2; } </pre>
25	<p>Rewrite the following program after removing all the syntactical error(s), if any. Underline each correction.</p> <pre> #include<iostream.h> typedef char[80]; void main(){ String S="Peace"; int L=strlen(S); cout<<S<<'has'<<L <<'characters'<<endl; } </pre>
Ans.	<pre> #include<iostream.h> #include<string.h> typedef char <u>String</u>[80]; void main(){ String S="Peace"; int L=strlen(S); cout<<S<<"<u>has</u>"<<L <<"<u>characters</u>"<<endl; } </pre>
26	<p>Find the output of the following program:</p> <pre> #include<iostream.h> void SwitchOver(int A[],int N,int split) { for(int K=0;K<N;K++) if(K<Split) A[K]+=K; else A[K]*=K; } void Display(it A[],int N) { for(int K=0;K<N;K++) (K%2==0)?cout<<A[K] <<"%":cout<<A[K]<<endl; } void main(){ int H[]={30,40,50,20,10,5}; SwitchOver(H,6,3); Display(H,6); } </pre>
Ans.	<p>Output:</p> <pre> 30%41 52%60 40%25 </pre>
27(a)	<p>The following code is from a game, which generates a set of 4 random numbers. Praful is playing this game, help him to identify the correct option(s) out of the four choices given below as the possible set of such numbers generated from the program code so that he wins the game. Justify your answer.</p>


```
#include<iostream.h>
#include<stdlib.h>
const int LOW=25;
void main(){
    randomize();
    int POINT=5,Number;
    for(int I=1;I<=4;I--)
    {
        Number=LOW+random(POINT);
        cout<<Number<<" ";
        POINT--;
    }
}
```

(i) 29:26:25:28: (ii) 24:28:25:26: (iii) 29:26:24:28: (iv) 29:26:25:26:

Ans. (iv) 29: 26: 25: 26: is correct

Justification:

The only option that satisfied the values as per the code is option (iv) because when:

I	POINT	Number	
		Minimum	Maximum
1	5	25	29
2	4	25	28
3	3	25	27
4	2	25	26

27(b) Study the following program and select the possible output from it:

```
#include<iostream.h>
#include<stdlib.h>
const int LIMIT=4;
void main(){
    randomize();
    int Points;
    points=100+random(LIMIT);
    for(int P=Pints;P>=100;P--)
        cout<<P<<"#";
    cout<<endl;
}
```

(i) 103#102#101#100#

(ii) 100#101#102#103#

(iii) 100#101#102#103#104#

(iv) 104#103#102#101#100#

Ans. (i) 103#102#101#100# is correct answer.

28 Go through C++ code show below, and find out the possible output or outputs from the suggested Output Options (i) to (iv). Also, write the least value and highest value, which can be assigned to the variable MyNum.

```
#include<iostream.h>
#include<stdlib.h>
void main(){
    randomize();
    int MyNum,Max=5;
    MyNum=20+random(Max);
    for(int N=Mynum;N<=25;N++)
        cout<<N<<" ";
}
```

(i) 20*21*22*23*24*25

(ii) 22*23*24*25

(iii) 23*24*

(iv) 21*22*23*24*25

Ans. (ii) 22*23*24*25 is correct answer. Minimum possible value = 20, Maximum possible value = 24

29(a) Find the output of the following program:

)	<pre> #include<iostream.h> #include<ctype.h> void main(){ char Line[]="Good@LOGIC"; for(int I=0;Line(I]!='\0';I++) { if(!isalpha(Line[I])) Line[I]='\$'; else if(islower(Line[I])) Line[I]=Line[I]+1; else Line(I)=Line[I+1]; } cout<<Line; } </pre>
Ans.	Output: Oppe\$OGIC
29(b))	<p>Find the output of the following program:</p> <pre> #include<iostream.h> void main(){ int First=25,Sec=30; for(int I=1;I<=2;I++0 { cout<<"Output1="<<First++ <<"&"<<Sec+5<<endl; cout<<"Output2="<<-Sec <<"&"<<First-5<<endl; } } </pre>
Ans.	<p>Output:</p> <p>Output1=25&35</p> <p>Output2=-30&21</p> <p>Output1=26&35</p> <p>Output2=-30&22</p>
29(c))	<p>Find the output of the following program:</p> <pre> #include<iostream.h> #include<ctype.h> void Encode(char Info[],int N); void main(){ char Memo[]="Justnow"; Encode(Memo,2); cout<<Memo<<endl; } void Encode(char Info[],int N) { for(int I=0;Info[I]!='\0';I++) if(I%2==0) Info[I]=Info[I]-N; else if(islower(Info[I])) Info[I]=toupper(Info[I]); else Info[I]=Info[I]+N; } </pre>
Ans.	Output: HUqT10u
29(d))	<p>Find the output of the following program:</p> <pre> #include<iostream.h> </pre>

```

struct THREE_D
{
    int X,Y,Z; };
void MoveIn(THREE_D &T,int Step=1)
{
    T.X+=Step;
    T.Y-=Step;
    T.Z+=Step;
}
void MoveOut(THREE_D &T,int Step=1)
{
    T.X-=Step;
    T.Y+=Step;
    T.Z-=Step;
}
void main(){
    THREE_D T1={10,20,5}, T2={30,10,40};
    MoveIn(T1);
    MoveOut(T2,5);
    cout<<T1.X<<","<<T1.Y<<","<<T1.Z<<endl;
    cout<<T2.X<<","<<T2.Y<<","<<T2.Z<<endl;
    MoveIn(T2,10);
    cout<<T2.X<<","<<T2.Y<<","<<T2.Z<<endl;
}

```

Ans. Output:
11,19,6
25,15,35
35,5,45

30 Give the output of the following program:

```

(i) void main(){
    char *p="Difficult";
    char c;
    c=++*p++;
    printf("%c",c);
}

(ii) #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;
}

(iii) #include<iostream.h>
void Print(char *p)
{
    p="Pass";
}

```

	<pre> cout<<"Value is:"<<p<<endl; } void main(){ char *q="Best of Luck"; Printf(q); cout<<"New value is:"<<q; } </pre>		
Ans.	(i) <u>Output:</u> E	(ii) <u>Output:</u> first=8second=2	(iii) <u>Output:</u> Value is: Pass New value is: Best of Luck
31	Give the output of the following: <div style="display: flex; justify-content: space-between;"> <div style="width: 48%;"> <pre> (i) #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; Exwcute(B); cout<<a<<B<<endl; Exwcute(A,B); cout<<A<<B<<endl; } </pre> </div> <div style="width: 48%;"> <pre> (ii) #include<iostream.h> void Execute(int &B,int C=200) { int TEMP=B+C; B+=TEMP; if(C==100) cout<<TEMP<<B<<C<<endl; } void main(){ int M=90,N=10; Exwcute(M); cout<<M<<N<<endl; Exwcute(M,N); cout<<m<<N<<endl; } </pre> </div> </div>		
Ans.	(i) <u>Output:</u> 50240 290340240 340240	(ii) <u>Output:</u> 38010 77010	
32	Find the output of the following program: <pre> #include<iostream.h> #include<ctype.h> void MyCode(char Msg[],char CH) { for(int Cnt=0;Msg[cnt]!='\0';Cnt++) { if(Msg[Cnt]>='B' && Msg[Cnt]<='G') Msg[Cnt]=tolower(Msg[Cnt]); else if(Msg[Cnt]>='A' && Msg[Cnt]<='a') Msg[Cnt]=CH; else if(Cnt%2==0) Msg[Cnt]=toupper(Msg[Cnt]); else Msg[Cnt]=Msg[Cnt-1]; } } void main(){ char MyText[]="ApEACeDrIVE"; MyCode(MyText,'@'); cout<<"NEW TEXT:"<<MyText<<endl; } </pre>		

	<pre> } </pre>
Ans.	(i) <u>Output:</u> NEW TEXT:@@e@ccddl@e
33	<p>Find the output of the following program:</p> <pre> #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.Length; Occupies(P1); P3=P1; ++P3.Breadth; P3.Breadth++; Occupies(P3); P2=P3; P2.Breadth+=50; P2.Height--; Occupies(P2); } </pre>
Ans.	<p><u>Output:</u></p> <p>101x150x50 101x152x50 101x202x49</p>
34	<p>What values will be assigned to the variables ua, ub, uc and fail after the execution of the following program segment:</p> <pre> void main(){ int i=0,ua=0,ub=0,uc=0,fail=0; while(i<=5) { switch(i++) { case 1: case 2: ++ua; case 3: case 4: ++ub; case 5: ++uc; default: ++fai; } //switch } //while cout<<ua<<endl; cout<<ub<<endl; cout<<uc<<endl; cout<<fail<<endl; } </pre>
Ans.	<p>Values assigned to the variables ua, ub, uc and fail after the execution are as following:</p> <p>ua = 2</p>

	ub = 4 uc = 5 fail = 6
35	What is wrong with this code: <pre> cout<<" " Enter n:"; cin>>n; if(n<0) cout<<"That is negative." <<"Please enter again"<<endl; cin>>n; else cout<<"O.K. n="<<n<<endl; </pre>
Ans.	There are following errors in above code: (i) Imbalance Double quotes are in first statement. (ii) There are more than one statement in 'if' statement without braces which is not valid.
36	Identify the possible error(s) in the following code fragment. Discuss the reason(s) of error(s) and correct the code: <pre> cin>>i>>j; while(i<j) cout<,i*j; i++; </pre>
Ans.	Correct code: <pre> cin>>i>>j; while(i<j) { cout<<i*j; i++; } </pre> Reasons of errors: (i) There is a use of '<,' in cout statement instead of '<<' which is not valid. (ii) while statement should be in curly braces otherwise it will not work properly.
37	Given the following code fragment: <pre> i=2; start: cout<<i; i+=2; if(i<51) goto start; cout<<"\nThank You"; </pre> Rewrite the above code using a while loop.
Ans.	<pre> int i=2; while(i<51) { cout<<i; i+=2; } cout<<"\nThank You"; </pre>
38	Is it necessary to include a header file in a program? If it is not done, what happens?
Ans.	No, it is not necessary to include header file in a C++ program at all. A header file is included if only the program intends to use the functions or macros etc. defined in that particular header file.
39	Name the header files that shall be needed for the following code: <pre> void main(){ char Text[]="Computer"; cout<<setw(15)<<Text; </pre>

	}						
Ans.	(i) iomanip.h for setw() (ii) iostream.h for cout						
40	Briefly describe the importance of iostream.h file.						
Ans.	iostream.h is most important header file for basic input and output operations. iostream.h contain built-in functions cout and cin for input-output. So, every C++ program should include iostream.h header file for performing input and output operations.						
41	How do the following two statements differ in operation? cin>>ch; cin.get(ch);						
Ans.	The difference between cin>>ch and cin.get(ch) is that when >> operator is used, the white spaces (e.g., tabs), spaces etc. and new-line characters are ignored whereas it is not so with cin.get(ch).						
42	What is an array? What is the need for array?						
Ans.	<u>Array</u> : An array is a collection of variables of the same type that are referenced by a common name. <u>Need for array</u> : Arrays are very much useful in a case where many variables of the same (data) types need to be stored and processed. For example, suppose we have to write a program in which can accept salary of 50 employees. If we solve this problem by making use of variables, we need 50 variables to store employee's salary. Remembering and managing these 50 variables is not an easy task and it will make the program a complex and lengthy program. This problem can be solved by declaring 1 array having 50 elements; one for employee's salary. Now we only have to remember the name of that 1 array.						
43	What do you understand by two-dimensional arrays? State some situation that can be easily represented by two-dimensional arrays.						
Ans.	<u>Two-dimensional array</u> : A two-dimensional array is an array in which each element is itself an array. For instance, an array A[m][n] is an M by N table with M rows and N columns containing M x N elements. Two-dimensional arrays are used to represent tables, matrices, etc. For example, below marks table can be represented easily by 2D array :						
		Maths	Physics	Chemistry	CS	Englisg	Toal
Amit	60	64	64	82	79	349	
Chandar	84	70	82	79	69	349	
Lalit	79	68	86	87	85	698	
44	Can you think of a difference between an array of strings and other two-dimensional arrays? What is it? Support your answer with examples.						
Ans.	Array of strings				Two-dimensional array		
	Array of string is used to store string value.				Two-dimensional array is used to store numeric value.		
	The first index determines the number of strings and the second index determines maximum length of each string.				The first index determines the number of rows and the second index determines maximum columns of each string.		
	<u>Example</u> : int a[2][3]; int i,j; for(i=0;i<2;i++) { for(j=0;j<3;++j) { cout<<"Enter element:"; cin>>a[i][j]; } }				<u>Example</u> : char string[3][31]; int i; cout<<"Enter 3 strings:"; for(i=0;i<3;i++) cin.getline(string[i],31);		
45	If an array is initialized at the time of declaration, what thing one must bear in mind?						

Ans.	The general form of array initialization is as shown below: <code>type array-name[size N] = {value-list};</code> If an array is initialized at the time of declaration, following thing one must bear in mind: <ul style="list-style-type: none">✓ The element values in the <i>value-list</i> must have the same data type as that of <i>type</i>, the base type of the array.✓ In character array, you must make sure that the array you declare is long enough to include the null.											
46	What is meant by unsized array initialization in C++? What are its benefits?											
Ans.	Unsized array initialization means skip the size of the array in an initialization statement. The C++, then automatically creates an array big enough to hold all the initializers present and calculates the dimensions of unsized arrays. <u>Example:</u> <code>char S1[] = "First String";</code> <u>Advantages:</u> <ul style="list-style-type: none">✓ Less tedious.✓ Allow to change any of the values without fear of using incorrect array dimensions.✓ We may lengthen or shorten the value-list without changing the array dimensions.											
47	What do you mean by function prototyping? Write down the advantages of function prototypes in C++.											
Ans.	A function prototype is a declaration of the function that tells the program about the type of value return by the function the number and type of arguments. <u>Example:</u> <code>int sum(int a, int b);</code> <u>Advantages:</u> <ul style="list-style-type: none">✓ Enables a compiler to carefully compare each use of the function with the prototype to determine whether the function is invoked properly i.e., the number and type of arguments are compared and any wrong number or type of the arguments is reported.✓ Tells the program about the return type✓ Tells the program the number and type of arguments.											
48	What are actual and formal parameters of a function?											
Ans.	The arguments passed to the functions while the function is called is known as the actual arguments, whereas the arguments declared in the function header is called as formal arguments. Ex. Suppose <code>sum()</code> is a function. <code>int sum(int x, int y) /*Here x and y are called formal arguments*/</code> <code>{...}</code> <code>void main() {</code> <code>int ans;</code> <code>....</code> <code>ans = sum(3,5); /*Here the arguments 3 and 5 are called actual arguments*/</code> <code>...</code> <code>getch();</code> <code>}</code>											
49	Construct function prototype for descriptions given below: <table><tr><td>test()</td><td>takes no arguments and has no return value.</td></tr><tr><td>convert()</td><td>takes a float argument and returns an int.</td></tr><tr><td>promote()</td><td>takes two double arguments and returns a double.</td></tr><tr><td>sum()</td><td>takes an int array and an int value and returns a long result.</td></tr><tr><td>check()</td><td>takes a string argument and returns an int.</td></tr></table>		test()	takes no arguments and has no return value.	convert()	takes a float argument and returns an int .	promote()	takes two double arguments and returns a double .	sum()	takes an int array and an int value and returns a long result.	check()	takes a string argument and returns an int .
test()	takes no arguments and has no return value.											
convert()	takes a float argument and returns an int .											
promote()	takes two double arguments and returns a double .											
sum()	takes an int array and an int value and returns a long result.											
check()	takes a string argument and returns an int .											
Ans.	(i) <code>void test();</code> (ii) <code>int convert(float a);</code> (iii) <code>double promote(double a, double b);</code> (iv) <code>long sum(int a[], int b);</code> (v) <code>int check(string s);</code>											
50	What do you understand by default arguments and constant argument? Write a short note on their usefulness.											
Ans.	Default arguments: C++ allows us to assign default values to a function's parameters which are useful in case a matching argument is not passed in the function call statement. The default values are specified at the time of											

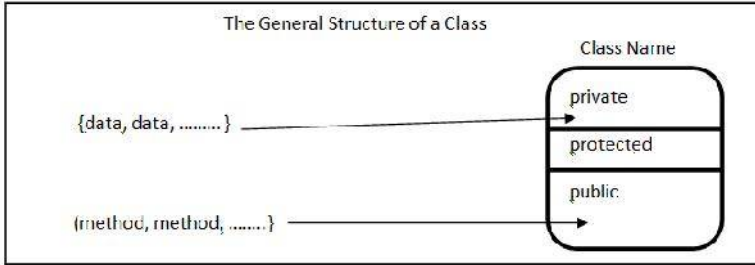
	<p>function declaration. <u>Example:</u> <i>float interest(float principal, int time, float rate=0.10);</i></p> <p>Constant argument: By constant argument, it is meant that the function cannot modify these arguments. In order to make an argument constant to a function, we can use the keyword const as shown : <i>int sum (const int a, const int b);</i> The qualifier <i>const</i> in function prototype tells the compiler that the function should not modify the argument. The constant arguments are useful when functions are called by reference.</p>	
51	<p>How is call-by-value method of function invoking different from call-by-reference method? Give appropriate examples supporting your answer.</p>	
Ans.	Call By Value	Call by reference
	✓ In call by value method, the called function creates its own copies of the original values send to it.	✓ In call by reference method, the called function accesses ad works with the original values using their references.
	✓ The changes done in the function in formal parameter are not reflected back in the calling environment.	✓ The changes done in the function are reflected back in the calling environment.
	✓ It does not use the '&' sign	✓ It use '&' sign as the reference operator.
	<p>Example:</p> <pre>#include <iostream.h> void change(int x, int y){ x = 10; /*change the value of x */ y = 20; /*change the value of y */ } void change(int x, int y); void main (){ // local variable declaration: int a = 100; int b = 200; cout<<"Before value of a "<<a <<endl; cout<<"Before value of b "<<b<< endl; change(a, b); cout<<"After value of a "<<a<<endl; cout<<"After value of b "<<b<<endl; }</pre>	<p>Example:</p> <pre>#include <iostream.h> void change(int *x, int *y){ *x = 10; /*change the value of x */ *y = 20; /*change the value of y */ } void change(int *x, int *y); void main (){ // local variable declaration: int a = 100; int b = 200; cout<<"Before value of a "<<a <<endl; cout<<"Before value of b "<<b<< endl; change(&a, &b); cout<<"After value of a "<<a<<endl; cout<<"After value of b "<<b<<endl; }</pre>
52	<p>Discuss the similarities and difference between global and local variables in terms of their lifetime and scope.</p>	
Ans.	Local variable	Global variable
	✓ It is a variable which is declared within a function or within a compound statement.	✓ It is a variable which is declared outside all the functions.
	✓ It is accessible only within a function/compound statement in which it is declared	✓ It is accessible throughout the program
	✓ A global variable comes into existence when the program execution starts and is destroyed when the program terminates.	✓ A local variable comes into existence when the function is entered and is destroyed upon exit.
	<p>Example:</p> <pre>#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;</pre>	

	<pre> } void main(){ LOCAL(45); } </pre>
53	What is structure? Declare a structure in C++ with name, roll number and total marks as components.
Ans.	<p>A structure is a collection of variables referenced under one name. A structure is declared using the keyword struct as in following syntax:</p> <pre> struct <structure tag> { [public:] [private:] [protected:] /* data members' declarations */ /* member functions' declarations */ }; </pre> <p><u>Example:</u></p> <pre> struct Student { char Name[30]; int Rollno; float Total_Marks; }; </pre>
54	What are Nested structures? Give an example.
Ans.	<p>A structure within a structure is called nested structures.</p> <p><u>Example:</u></p> <pre> struct addr //structure tag { int houseno; char area[26]; char city[26]; char state[26]; }; struct emp //structure tag { int empno; char name[26]; char desig[16]; addr address; float basic; }; emp worker; // create structure variable </pre> <p>The structure emp has been defined having several elements including a structure address also. The address is itself a structure of type addr. While defining such structures are defined before outer structures.</p> <p><i>See, address is a structure variable itself and it is member of another structure, the emp structure.</i></p>
55	Write a program that asks the user to enter two integers, obtains the two numbers from the user, and outputs the large number followed by the words "is larger by – units than smaller number" to the system console (e.g., if the larger number is 9 and smaller is 6, message should be "9 is larger by 3 units than smaller number"). If the numbers are equal print the message "These numbers are equal".
Ans.	<pre> #include<iostream.h> #include<conio.h> void main() { int a,b,dif; clrscr(); cout<<"Enter a:"; </pre>

	<pre> cin>>a; cout<<endl<<"Enter b:"; cin>>b; if(a>b) { dif=a-b; cout<<a<<"is larger by"<<dif<<"units than smaller number"<<endl; } else if(b>a) { dif=b-a; cout<<b<<"is larger by"<<dif<<"units than smaller number"<<endl; } else cout<<"These numbers are equal"<<endl; getch(); } </pre>
56	<p>Drivers are concerned with the mileage obtained by their automobiles. One driver has kept track of several tanks of CNG by recording the miles driven and the gallons used for each tank.</p> <p>Develop a C++ program that will input the kilometers driven and gallons used for each tank.</p> <p>The program should calculate and display the <i>kilometers per gallon</i> obtained for each tank of gasoline.</p> <p>After processing all input information, the program should calculate and print the average <i>kilometers per gallon</i> obtained for all tanks.</p> <ul style="list-style-type: none"> ▪ Formulate the algorithm as flowchart. ▪ Write a C++ program as instructed. ▪ Test, debug, and execute the C++ program.
Ans.	<pre> #include<iostream.h> #include<conio.h> void main(){ clrscr(); int tanks=0; float tot_km; float avg_k_p_g; cout<<"Enter how many tanks filled :"; cin>>tanks; float *kms=new float[tanks]; float *gallons_used=new float[tanks]; float *k_p_g=new float[tanks]; for(int i=0;i<tanks;i++) { cout<<"Enter how much kilometers covered for tank "<<i+1<<" "; cin>>kms[i]; cout<<"Enter how much gallon used from tank "<<i+1<<" "; cin>>gallons_used[i]; k_p_g[i]=kms[i]/gallons_used[i]; cout<<"KMS per Gallon obtained for tank No. "<<i+1<<" "<<k_p_g[i]<<endl; tot_km+=k_p_g[i]; cout<<endl; } avg_k_p_g=tot_km/tanks; cout<<"Average kilometers per gallon obtained for all tanks is "<<avg_k_p_g; getch(); } </pre>

CHAPTER-2
OBJECT ORIENTED PROGRAMMING
VERY SHORT/ SHORT ANSWER QUESTIONS

1.	Discuss major OOP concepts briefly.
Ans.	<p>Following are the general OOP concepts:</p> <p>1. Data Abstraction: Data abstraction means, providing only essential information to the outside world and hiding their background details i.e. to represent the needed information in program without presenting the details.</p> <p>2. Data Encapsulation: The wrapping up of data and operations/functions (that operate on the data) into a single unit (called class) is known as Encapsulation.</p> <p>3. Modularity: Modularity is the property of a system that has been decomposed into a set of cohesive and loosely coupled modules.</p> <p>4. Inheritance: Inheritance is the capability of one class of things to inherit capabilities or properties from another class.</p> <p>5. Polymorphism: Polymorphism is the ability for a message or data to be processed in more than one form.</p>
2.	What are programming paradigms? Give names of some popular programming paradigms.
Ans.	<p>Programming Paradigm: A Programming Paradigm defines the methodology of designing and implementing programs using the key features and building blocks of a programming language.</p> <p>Following are the different programming paradigms:</p> <p>(i) Procedural Programming</p> <p>(ii) Object Based Programming</p> <p>(iii) Object Oriented Programming</p>
3.	What are the shortcomings of procedural and modular programming approaches?
Ans.	<p>Following are the various shortcomings of procedural and modular programming approaches:</p> <ul style="list-style-type: none"> ✓ Procedural Programming is susceptible to design changes. ✓ Procedural Programming leads to increased time and cost overheads during design changes. ✓ Procedural and Modular programming both are unable to represent real world relationship that exists among objects. ✓ In modular programming, the arrangement of the data can't be changed without modifying all the functions that access it.
4.	Write a short note on OO programming.
Ans.	<p>OOP stands for Object Oriented Programming. In, Object-Oriented Programming (OOP), the program is organized around the data being operated upon rather than the operations performed. The basic idea behind OOP is to combine both, data and its functions that operate on the data into a single unit called object.</p> <p>Following are the basic OOP concepts:</p> <p>1. Data Abstraction 2. Data Encapsulation 3. Modularity</p> <p>4. Inheritance 5. Polymorphism</p>
5.	How does OOP overcome the shortcomings of traditional programming approaches?
Ans.	<p>OOP provides the following advantages to overcome the shortcomings of traditional programming approaches:</p> <ul style="list-style-type: none"> ✓ OOPs is closer to real world model. ✓ Hierarchical relationship among objects can be well-represented through inheritance. ✓ Data can be made hidden or public as per the need. Only the necessary data is exposed enhancing the data security. ✓ Increased modularity adds ease to program development. ✓ Private data is accessible only through designed interface in a way suited to the program.
6.	Write a short note on inheritance.
Ans.	<p>Inheritance enables us to create new classes that reuse, extend, and modify the behavior that is defined in other classes. The class whose members are inherited is called the base class, and the class that inherits those members is called the derived class. A derived class can have only one direct base class. Inheritance is transitive.</p> <p>When we define a class to derive from another class, the derived class implicitly gains all the members of the base class, except for its constructors and destructors.</p>
7.	What are the advantages offered by inheritance?

Ans.	<ul style="list-style-type: none"> ✓ Inheritance ensures the closeness with the real-world models. ✓ Allows the code to be reused as many times as needed. The base class once defined and once it is compiled, it need not be reworked. ✓ We can extend the already made classes by adding some new features. ✓ Inheritance is capable of simulating the transitive nature of real-world's inheritance, which in turn saves on modification time and efforts, if required.
8.	Do you think OOP is more closer to real world problems? Why? How?
Ans.	Yes, OOP is more closer to real world problems because object oriented programming implement inheritance by allowing one class to inherit from another. Thus a model developed by languages is much closer to the real world. By implementing inheritance, real-world relations among objects can be represented programmatically.
9.	How are classes and objects implemented in C++?
Ans.	<p>A class is a blueprint for object. A class is implementing with the help of an object. Suppose a class has a member function named display(). Now, to implement that member function display we have to use object of that class. The objects is implemented in software terms as follows:</p> <ul style="list-style-type: none"> (i) characteristics / attributes are implemented through member variables or data items of the object. (ii) behavior is implemented through member functions called methods. (iii) It is given a unique name to give it identify.
10.	What is the significance of private, protected and public specifiers in a class?
Ans.	<p>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 public members are accessible everywhere in a program.</p>  <p>The diagram illustrates the general structure of a class. It is a rounded rectangle divided into three horizontal sections labeled 'private', 'protected', and 'public'. Above the rectangle is the label 'Class Name'. To the left of the rectangle, there are two lines of code: '{data, data,}' and '{method, method,}'. An arrow points from the first line to the 'private' section, and another arrow points from the second line to the 'public' section.</p>
11.	While implementing encapsulation, abstraction is also implemented. Comment.
Ans.	Abstraction is the act of representing essential features without including the background details. Encapsulation is the way of combining both data and the functions that operate on the data under a single unit. Encapsulation is the way of implementing abstraction. Thus, it is true that while implementing encapsulation, abstraction is also implemented.
12.	Discuss the relation between abstract and concrete classes.
Ans.	In C++ an <i>Abstract Class</i> is the one, which defines an interface, but does not necessarily provide implementation for all its member functions. An abstract class is meant to be used as the base class from which other classes are derived. The derived class is expected to provide implementations for the member functions that are not implemented in the base class. A derived class that implements all the missing functionality is called a <i>Concrete Class</i> . A concrete class derives from its abstract class.
13.	Illustrate the concept of Inheritance with the help of an example.
Ans.	<p>Inheritance is the capability of one class to inherit properties from another class. For instance, <i>Student</i> is a class wherefrom class <i>GraduateStudent</i> inherits as given below:</p> <pre> class Student { protected: char name[25]; int rollno; public: void readStudent(); void showStudent(); }; </pre>

	<pre> class GraduateStudent:protected Student { protected: char subjects[50]; public: void readAradStud(); void showGradStud(); }; </pre>
14.	Encapsulation is one of the major properties of OOP. How is it implemented in C++?
Ans.	<p>A class binds together data and its associated functions under one unit thereby enforcing encapsulation as encapsulation means wrapping up data and associated functions together into a single unit. While implementing encapsulation, following things are taken care of:</p> <ul style="list-style-type: none"> (i) Anything that an object does not know or cannot do is excluded from the objects. (ii) Encapsulation is used to hide unimportant implementation details from other objects. (iii) The data and associated functions are wrapped up in one unit called class. <p>Through encapsulation, an interface is made available to world through which users can use the class.</p>
15.	Reusability of classes is one of the major properties of OOP. How is it implemented in C++?
Ans.	<p>Reusability of classes is implemented through inheritance in C++. Inheritance is implemented by specifying the name of the (base) class from which the class being defined (the derived class) has to inherit from. It is done with the following syntax:</p> <pre> class<derived class name> : <base class name> { <- derived class own features. } </pre>
16.	How is polymorphism implemented in C++?
Ans.	<p>C++ implements polymorphism through virtual functions, overloaded functions and overloaded operators. The term 'overloaded function' refers to a function having one name and more than one distinct meaning. For example,</p> <pre> float area(float a) { return a*a; } float area(float a,float b) { return a*b; } </pre>

TYPE C : LONG ANSWER QUESTIONS

1.	Write briefly about different programming paradigms.
Ans.	<p><u>Programming Paradigm:</u> A Programming Paradigm defines the methodology of designing and implementing programs using the key features and building blocks of a programming language. Following are the different programming paradigms:</p> <p><u>(i) Procedural Programming:</u> Procedural programming paradigm lays more emphasis on procedure or the algorithm. Data is considered secondary. Data is loosely available to many functions. This paradigm is: Decide which procedure we want; use the best algorithm we can find.</p> <p><u>(ii) Object Based Programming:</u> In object based programming, data and its associated meaningful functions are enclosed in one single entity a <i>class</i>. Classes enforce information hiding and abstraction thereby separating the implementation details and the user interface. It also supports user-defined types.</p> <p><u>(iii) Object Oriented Programming:</u> Object oriented programming offers all the features of object based programming and overcomes its limitation by implementing inheritance. The object oriented approach views a problem in terms of objects involved rather than procedure for doing it. We can define the object oriented programming (OOP) paradigm as following: Decide which classes and objects are needed; provide a full set of operations for each class.</p>
2.	Discuss OOP concepts. How are these implemented in software terms in C++?

Ans.	<p>Following are the general OOP concepts:</p> <p>1. Data Abstraction: Abstraction refers to the act of representing essential features without including the background details or explanations. Abstraction is implemented through public members of a class, as the outside world is given only the essential and necessary information through public members, rest of the things remain hidden.</p> <p>2. Data Encapsulation: The wrapping up of data and operations/functions (that operate on the data) into a single unit (called class) is known as Encapsulation. Encapsulation is implemented with the help of a class as a class binds together data and its associated function under one unit.</p> <p>3. Modularity: The act of partitioning a program into individual components is called modularity. C++ implements modularity through separately compiled files. The traditional practice in the C++ community is to place module interface in files named with a .h suffix; these are called header files which can be used through #include directive.</p> <p>4. Inheritance: Inheritance is the capability of one class of things to inherit capabilities or properties from another class. Inheritance is implemented in C++ by specifying the name of the (base) class from which the class being defined (the derived class) has to inherit from.</p> <p>5. Polymorphism: Polymorphism is the ability for a message or data to be processed in more than one form. C++ implements polymorphism through virtual functions, overloaded functions and overloaded operators.</p>
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CHAPTER-3
Function Overloading
SHORT ANSWER QUESTIONS

1.	How does the compiler interpret more than one definitions having same name? What steps does it follow to distinguish these?
Ans.	<p>The compiler will follow the following steps to interpret more than one definitions having same name:</p> <p>(i) if the signatures of subsequent functions match the previous function's, then the second is treated as a re-declaration of the first.</p> <p>(ii) if the signature of the two functions match exactly but the return type differ, the second declaration is treated as an erroneous re-declaration of the first and is flagged at compile time as an error.</p> <p>(iii) if the signature of the two functions differ in either the number or type of their arguments, the two functions are considered to be overloaded.</p>
2.	Discuss how the best match is found when a call to an overloaded function is encountered? Give example(s) to support your answer.
Ans.	<p>In order to find the best possible match, the compiler follows the following steps:</p> <ol style="list-style-type: none"> 1. Search for an exact match is performed. If an exact match is found, the function is invoked. For example, 2. If an exact match is not found, a match through promotion is searched for. Promotion means conversion of integer types char, short, enumeration and int into int or unsigned int and conversion of float into double. 3. If first two steps fail then a match through application of C++ standard conversion rules is searched for. 4. If all the above mentioned steps fail, a match through application of user-defined conversions and built-in conversion is searched for. <p>For example,</p> <pre>void afunc(int); void afunc(char); void afunc(double); afunc(471); //match through standard conversion. Matches afunc(int)</pre>
3.	Discuss the benefits of constructor overloading. Can other member function of a class be also overloaded? Can a destructor be overloaded? What is your opinion?
Ans.	<p>Constructor overloading are used to increase the flexibility of a class by having more number of constructors for a single class. By this we can initialize objects more than one way.</p> <p>Yes, Other member function of a class can also be overloaded.</p> <p>A destructor cannot be overloaded.</p>
4.	<p>Write the output of the following C++ code. Also, write the name of feature of Object Oriented Programming used in the following program jointly illustrated by the functions [I] to [IV]:</p> <pre>#include<iostream.h> void Line() //Fuction [I] { for(int L=1;L<=80;L++) cout<<"-"; cout<<endl; } void Line(int N) //Fuction [II] { for(int L=1;L<=N;L++) cout<<"*"; cout<<endl; } void Line(char C,A,int N) //Fuction [III] { for(int L=1;L<=N;L++) cout<<C; cout<<endl; } void Line(int M,int N) //Fuction [IV] { for(int L=1;L<=N;L++) cout<<M*L; cout<<endl; } void main()</pre>

	<pre> { int A=9,B=4,C=3; char K='#'; Line(K,B); Line(A,C); } </pre>
Ans.	<p><u>Output:</u> ### 9 18 27</p> <p>The name of feature of Object Oriented Programming used in the above program jointly illustrated by the functions [I] to [IV] is known as '<i>function overloading</i>'.</p>
5.	<p>Here are some desired effects. Indicate whether each can be accomplished with default arguments, with function overloading, with both, or which neither. Provide appropriate prototypes.</p> <p>(i) repeat (10, '-') displays the indicated character ('-' in this case) given number of times (10 here). While repeat() displays '*' character 12 times. Also repeat('#') displays the given character ('#' here) 12 times and repeat (7) displays '*' given no of times (7 here).</p> <p>(ii) average (4,7) returns int average of two int arguments, while average (4.0, 7.0) returns the double average of two double values.</p> <p>(iii) mass (density, volume) returns the mass of an object having a density of density and a volume of volume, while mass (density) returns the mass having a density of <i>density</i> and a volume of 1.0 cubic meters. All quantities are type double.</p> <p>(iv) average (4,7) returns an int average of the two int arguments when called is one file, and it returns a double average of the two int arguments when called in a second file in the same program.</p> <p>(v) handle (a-character) returns the reversed case of the passed character or prints it twice depending upon whether you assign the return value to it or not.</p>
Ans.	<p>(i) It can be accomplished with function overloading. <pre> void repeat(int n, char c); void repeat(); void repeat(char c); void repeat(int n); </pre></p> <p>(ii) It can be accomplished with function overloading. <pre> int average(int a,int b); double average(double a,double b); </pre></p> <p>(iii) It can be accomplished with default argument. <pre> double mass (density d, volume v); double mass(density d, volume v=1.0); </pre></p> <p>(iv) It can be accomplished with function overloading. <pre> int average(int a,int b); double average(int c,int d); </pre></p> <p>(v) It can be accomplished with function overloading. <pre> char handle(char a); void handle(char a); </pre></p>
6.	Write function definitions for question 7 on page 119.
Ans.	<pre> int themax(int a) { </pre>

	<pre> return a; } int themax(int a,int b) { if(a>b) return a; else return b; } int themax(int a[]) </pre>
7.	<p>Write function definitions for question 8 on page 119.</p> <p>Remember that cube's volume is side^3</p> <p>Cylinder's volume is $\pi r^2 h$</p> <p>Rectangular box's volume is length x breadth x height.</p>
Ans.	<pre> float volume(float side) { return side*side*side; } float volume(float radius, float height) { return 3.14*radius*radius*height; } float volume(float length, float breadth, float height); { return length*breadth*height; } </pre>
8.	<p>Write definitions for two versions of an overloaded function. This function's 1st version sum() takes an argument, int array, and returns the sum of all the elements of the passed array. The 2nd version of sum() takes two arguments, an int array and a character ('E' or 'O'). If the passed character is 'E', it returns the sum of even elements of the passed array and is the passed character is 'O', it returns the sum of odd elements. In case of any other character, it returns 0 (zero).</p>
Ans.	<pre> int sum(int a[]) { int n,sum=0; cout<<"Enter n:"; cin>>n; for(int i=0;i<n;i++) { sum=sum+a[i]; } return sum; } // int sum(int a[],char c) { int even=0,odd=0; switch(c) { case 'E': for(int i=0;i<5;i++) { if(a[i]%2==0) { even=even+a[i]; } } </pre>

	<pre> } return even; case 'O': for(int j=0;j<5;j++) { if(a[j]%2!=0) { odd=odd+a[j]; } } return odd; } } </pre>
9.	Compare the usefulness of default argument and function overloading, supporting your answer with appropriate examples.
Ans.	<p>Default values can be provided the function prototype itself and the function may be called even if an argument is missing. But there is one limitation with it, if you want to default a middle argument, then all the argument on its right must also be defaulted. For instance, consider the following function prototype: float amount(float p, int time=2, float rate=0.08);</p> <pre>cout<<amount(2000,0.13);</pre> <p>Here, C++ will take 0.13 to be the argument value for time and hence invoke amount() with values 2000, 0(0.13 converted to int) and 0.08</p> <p>Function overloading can handle all possible argument combinations. It overcomes the limitation of default argument but also compiler is saved from the trouble of testing the default value.</p> <p><u>Example:</u></p> <pre>float area(float a) { return a*a; } float area(float a,float b) { retur a*b; } </pre>
10.	Raising a number n to a power p is the same as multiplying n by itself p times. Write as overloaded function power() having two versions for it. The first version takes double n and int p and returns a double value. Another version takes int n and int p returning int value. Use a default value of 2 for p in case p is omitted in the function call.
Ans.	<pre>double power(double n,int p=2) { double res=pow(n,p); return res; } int power(int n,int p=2) { int res=pow(n,p); return res; } </pre>

LONG ANSWER QUESTIONS

1.	<p>Given below are incomplete definitions of two classes:</p> <pre> class Item { int itemno; char description[21]; int QOH; // Quantity-On-Hand </pre>
----	---

```

    int ROL; // Reorder-Level
    int ROQ; // Reorder-Quantity
public:
    :
    // Overloaded Constructor Definition
    void purchase(int n)
    {
        : // adds n to QOH
    }
    void sale(int n)
    {
        : // subtracting n from QOH
    }
    void display(void)
    {
        // display item details
    }
};

class store{
    Item itemlist[50];
        //List of 50 items
    :
public:
    : //constructor(s)
    new()
    {
        :
        //To add new item into itemlist
    }
    delete()
    {
        : //To delete new item into itemlist
    }
    order(itemno, qty)
    {
        : //To order qty pieces for itemno
    }
    order()
    {
        : //check which item's QOH is
        : // below their ROL, then order for
        : // ROQ pieces for all those itemnos
    }
    bill()
    {
        : //Ask itemno, qtysold and
        : // prepare the bill. Also update
        : // Item's information by
        : // calling purchase() of Item.
    }
};

```

Using above information, write a complete C++ program that lets you sell, purchase or order a specific item or items.

Ans. Code snippet of the above problem is given below use it and complete the program.

CHAPTER-4
Classes and Objects
SHORT ANSWER QUESTIONS

1.	What are the differences between a data type struct and data type class in C++?	
Ans.	struct	class
	In C++ struct all members are public by default.	Whereas in class all members are private by default.
	structures are declared using the keyword <i>struct</i>	classes are declared using the keyword <i>class</i>
	<u>Example:</u> <pre>struct S1 { int num; //default access //specifier is public void setNum(int n) { //code } };</pre>	<u>Example:</u> <pre>class C1{ int num; //default access //specifier is private public: void setNum(int n) { //code } };</pre>
2.	Can we use the same function name for a member function of a class and an outside i.e., a non-member function in the same program file? If yes, how are they distinguished? If no, give reasons. Support your answer with examples.	
Ans.	<p>Yes. Object of the class is used to distinguish between the member function of a class and a non-member function with same name. Ex-</p> <pre>class X{ public: void f() {.....} }; void f() {.....} void main(){ X x; x.f(); // member function of the class x f(); // non-member function }</pre>	
3.	When will you make a function inline and why?	
Ans.	<p>We will make a function inline when the functions are small that called often. Inline functions run a little faster than the normal functions as the compiler replaces the function call statement with the function code itself 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.</p>	
4.	Rewrite the following C++ code after removing the syntax error(s) (if any). Underline each correction. <pre>include<iostream.h> class FLIGHT{ long FlightCode; char Description[25]; public: void AddInfo() { cin>>FlightCode; gets(Description); } void ShowInfo() { cout<<FlightCode<<":" <<Description<<endl;</pre>	

	<pre> } }; void main(){ FLIGHT F; AddInfo.F(); ShowInfo.F(); } </pre>
Ans.	<pre> #include<iostream.h> #include<stdio.h> class FLIGHT{ long FlightCode; char Description[25]; public: void AddInfo() { cin>>FlightCode; gets(Description); } void ShowInfo() { cout<<FlightCode<<":" <<Description<<endl; } }; void main(){ FLIGHT F; F.AddInfo(); F.ShowInfo(); } </pre>
5.	<p>Rewrite the following program after removing the syntactical error(s) (if any). Underline each correction.</p> <pre> #include[iostream.h] #include[stdio.h] class Employee{ int EmpId=901; char EName[20]; public: Employee() {} void Joining() { cin>>EmpId; gets(EName); } void List() { cout<<EmpId<<":" <<EName<<endl; } } void main(){ Employee E; Joining.E(); E.List(); } </pre>
Ans.	<pre> #include<iostream.h> #include<stdio.h> class Employee{ int <u>EmpId</u>; char EName[20]; public: Employee() {} </pre>

```

void Joining()
{
    cin>>EmpId; gets(ENAME);
}
void List()
{
    cout<<EmpId<<": "
        <<ENAME<<endl;
}
};
void main(){
    Employee E;
    E.Joining();
    E.List();
}

```

6. Identify the error(s) in the following code fragment:

```

class X{
    int a b;
    void count(void)
    {
        a++;
    }
public:
    int x;
    void init(int,int,int);
    void print(void);
};
void X::init(int i,int j,int k){
    a=i;
    b=j;
    x=k;
}
void X::print(void){
    count();
    cout<<"a="<<a;<<"b="
        <<b<<"x="<<x<<"\ ";
}
void func(void);
    X Ob1;
int main(){
    X Ob2;
    Ob1.init(0,1,2);
    Ob2.init(2,3,4);
    Ob1.print();
    Ob2.print();
    Ob1.count();
    Ob2.count();
}
void func(void)
{
    X Ob3;
    Ob1.init(4,5,6);
    Ob2.init(7,8,9);
    Ob3.init(9,10,11);
    Ob3.a=Ob3.b=Ob3.x;
}

```

```

Ob1.count();
Ob2.count();
Ob3.count();
Ob1.print();
Ob2.print();
Ob3.print();
}

```

Ans.

```

#include<iostream.h>
#include<stdio.h>
class X {
    public:
        int a,b;
        void count(void)
        {
            a++;
        }
        int x;
        void init(int,int,int);
        void print(void);
};
void X::init(int i,int j,int k)
{
    a=i;
    b=j;
    x=k;
}
void X::print(void)
{
    count();
    cout<<"a="<<a<<"b="
        <<b<<"x="<<x<<" ";
}
void func(void);
    X Ob1;
    X Ob2;
int main(){
    Ob1.init(0,1,2);
    Ob2.init(2,3,4);
    Ob1.print();
    Ob2.print();
    Ob1.count();
    Ob2.count();
}
void func(void)
{
    X Ob3;
    Ob1.init(4,5,6);
    Ob2.init(7,8,9);
    Ob3.init(9,10,11);
    Ob3.a=Ob3.b=Ob3.x;
    Ob1.count();
    Ob2.count();
    Ob3.count();
    Ob1.print();
    Ob2.print();
    Ob3.print();
}

```



```

        Inner I1;
        void g(int i)
        {   x=i;
            y=i;
            a=i;
            s=i;
        }
    };
    int Outer::s;
    Outer Ob1;
    int main()
    {   Ob1.I1.f(3);    //statement1
        Ob1.g(8);      //statement2
        return 0;
    }

```

After statement 1 and statement 2 the values are as following:
::x = 5, ::y = 8, Outer::x = 8, Outer::a = 8, Outer::s = 8 , Inner::a = 3

- 8. Define a class to represent a book in a library. Include the following members:**
- Data Members**
Book Number, Book Name, Author, Publisher, Price, No. of copies issued, No. of copies
- Member Functions**
(i) To assign initial values
(ii) To issue a book after checking for its availability
(iii) To return a book
(iv) To display book information.

Ans.

```

#include<iostream.h>
#include<conio.h>
#include<stdio.h>
class Library
{
    int BookNo;
    char BName[25];
    char Author[25];
    char Publisher[25];
    float Price;
    int No_of_Copies;
    int No_of_Copies_Issued;
public:
    void initial()
    {
        cout<<endl<<"Enter Book Number: ";
        cin>>BookNo;
        cout<<endl<<"Enter Book Name: ";
        gets(BName);
        cout<<endl<<"Enter Author Name: ";
        gets(Author);
        cout<<endl<<"Enter Publisher Name: ";
        gets(Publisher);
        cout<<endl<<"Enter Price: ";
        cin>>Price;
        cout<<endl<<"Enter Number of copies: ";
        cin>>No_of_Copies;
    }
    void issue_book()
    {

```

```

cout<<"Enter book details....."<<endl;
initial();
if(No_of_Copies>0)
{
    cout<<"enter How many book you want to issue:";
    cin>>No_of_Copies_Issued;
    if(No_of_Copies>=No_of_Copies_Issued)
    {
        No_of_Copies=No_of_Copies-No_of_Copies_Issued;
        cout<<endl<<"    "<<No_of_Copies_Issued<<" book is issued..";
        display();
    }
    else
    {
        cout<<"Copies_Issued<<" books is not available in stock..";
    }
}
else
{
    cout<<"Book is not available";
}
}

void return_book()
{
    cout<<"enter book detail you want to return...";
    cout<<endl<<"Enter Book Number: ";
    cin>>BookNo;
    cout<<endl<<"Enter Book Name: ";
    gets(BName);
    No_of_Copies=No_of_Copies+No_of_Copies_Issued;
    cout<<endl<<BookNo<<": "<<BName<<"Book is returned.....";
}

void display()
{
    cout<<"Book Number: "<<BookNo<<endl;
    cout<<"Book Name: "<<BName<<endl;
    cout<<"Author Name: "<<Author<<endl;
    cout<<"publisher Name: "<<Publisher<<endl;
    cout<<"Price: "<<Price<<endl;
}

};

void main()
{
    clrscr();
    Library l1;
    int ch;
    cout<<"1->Issue book..."<<endl;
    cout<<"2->Return Book....."<<endl;
    cout<<"Enter your choice...";
    cin>>ch;
    switch(ch)
    {
        case 1:
            l1.issue_book();
            break;
        case 2:

```

	<pre> 11.return_book(); break; } getch(); } </pre>
9.	<p>Declare a class to represent fixed-deposit account of 10 customers with the following data members: <i>Name of the depositor, Account Number, Time Period (1 or 3 or 5 years), Amount.</i> The class also contains following member functions: (a) To initialize data members. (b) For withdrawal of money (after half of the time period has passed). (c) To display the data members.</p>
Ans.	Same as Question no. 14 in which Withdraw() function is defined for withdraw money.
10.	<p>Define a class to represent batsmen in a cricket team. Include the following members: <i>Data Members:</i> First name, Last name, Runs made, Number of fours, Number of sixes <i>Member Functions:</i> (i) To assign the initial values (ii) To update runs made (It should simultaneously update fours and sixes, if required). (iii) To display the batsman's information Make appropriate assumptions about access labels.</p>
Ans.	<pre> #include<iostream.h> #include<conio.h> #include<stdio.h> class Batsman{ char F_Name[30]; char L_Name[30]; int Runs_made,fours,sixes; public: void initial(){ cout<<endl<<"Enter First Name: "; gets(F_Name); cout<<endl<<"Enter Last Name: "; gets(L_Name); cout<<endl<<"Enter The Runs Made: "; cin>>Runs_made; cout<<endl<<"Enter how many fours: "; cin>>fours; cout<<endl<<"Enter how many sixes: "; cin>>sixes; } void update(){ int new_run,new_four,new_sixes,cal_four,cal_six; cout<<endl<<"Enter new runs Made: "; cin>>new_run; cout<<endl<<"Enter new fours Made: "; cin>>new_four; cout<<endl<<"Enter new sixes Made: "; cin>>new_sixes; fours=fours+new_four; sixes=sixes+new_sixes; cal_four=fours*4; cal_six=sixes*6; Runs_made=Runs_made+new_run+cal_four+cal_six; display(); cout<<"Total Runs Made: "<<Runs_made<<endl; } } </pre>

	<pre> cout<<"Number of fours: "<<fours<<endl; cout<<"Number of sixes: "<<sixes<<endl; } void display(){ cout<<".....Batsman's information....."<<endl; cout<<"Name: "<<F_Name<<" "<<L_Name<<endl; } }; void main(){ clrscr(); Batsman b1; b1.initial(); b1.update(); getch(); } </pre>
11.	<p>Define a class to represent bowlers in a cricket team. Include the following members:</p> <p>Data Members: First name, Last name, Overs bowled, Number of Maiden overs, Runs given, Wickets taken.</p> <p>Member Functions: (i) To assign the initial values, (ii) To update the information, (iii) To display the bowler's information Make appropriate assumptions about access specifiers.</p>
Ans.	<pre> #include<iostream.h> #include<conio.h> #include<stdio.h> class Bowlers{ char F_Name[30]; char L_Name[30]; int Overs_bowled,Maiden_overs,Runs_given,Wickets; public: void initial(){ cout<<endl<<"Enter First Name: "; gets(F_Name); cout<<endl<<"Enter Last Name: "; gets(L_Name); cout<<endl<<"Enter The Overs bowled: "; cin>>Overs_bowled; cout<<endl<<"Enter how many overs maden: "; cin>>Maiden_overs; cout<<endl<<"Enter how many runs given: "; cin>>Runs_given; cout<<endl<<"Enter how many wickets taken: "; cin>>Wickets; } void update(){ int new_over_bolwed,new_maiden_overs,new_runs_given,new_wickets; cout<<endl<<"Enter new overs bowled: "; cin>>new_over_bolwed; cout<<endl<<"Enter new madden overs: "; cin>>new_maden_overs; cout<<endl<<"Enter new runs given: "; cin>>new_runs_given; cout<<endl<<"Enter new wickets taken: "; cin>>new_wickets; Overs_bowled=Overs_bowled+new_over_bolwed; Maiden_overs=Maiden_overs+new_maiden_overs; } } </pre>

	<pre> Runs_given=Runs_given+new_runs_given; Wickets=Wickets+new_wickets; display(); cout<<"Total overs bowled: "<<Overs_bowled<<endl; cout<<"Total maiden overs: "<<Maiden_overs<<endl; cout<<"Total runs given: "<<Runs_given<<endl; cout<<"Total wickets taken: "<<Wickets<<endl; } void display(){ cout<<".....Bolwer's information....."<<endl; cout<<"Name: "<<F_Name<<" "<<L_Name<<endl; } }; void main(){ clrscr(); Bowlers bl; bl.initial(); bl.update(); getch(); } </pre>
12.	<p>Define a class student with the following specifications:</p> <p>private members of class student</p> <p>admno integer</p> <p>sname 20 characters</p> <p>eng, math, science float</p> <p>total float</p> <p>ctotal() A function to calculate eng + math + science with float return type</p> <p>public member functions of class student</p> <p>Takedata() function to accept values for admno, sname, eng, math, science and ivoke ctotal() to calculate total.</p> <p>Showdata() function to display all the data members on the screen.</p>
Ans.	<pre> class student{ private: int admno; char sname[20]; float eng,math,science; float total; float ctotal(){ return eng+math+science; } public: void Takedata(){ cout<<"Enter admission number: "; cin>> admno; cout<<endl<<"Enter student name: " ; gets(sname); cout<< "Enter marks in english:"; cin>>eng; cout<< "Enter marks in math:"; cin>>math; cout<< "Enter marks in science:"; cin>>science; total=ctotal(); </pre>

```

    }
    void Showdata(){
        cout<<endl<<".....Student information...."<<endl;
        cout<<"Admission number "<<admno;
        cout<<"\nStudent name "<<sname;
        cout<<"\nEnglish "<<eng;
        cout<<"\nMath "<<math;
        cout<<"\nScience "<<science;
        cout<<"\nTotal "<<total;
    }
};
int main(){
    clrscr();
    student obj ;
    obj.Takedata();
    obj.Showdata();
    getch();
    return 0;
}

```

13(a) Considering the following specifications:

<u>Structure name</u>	<u>Data</u>	<u>Type</u>	<u>Size</u>
Name	first	array of characters	60
	mid	array of characters	40
	last	array of characters	60
Phone	area	array of characters	4
	exch	array of characters	4
	numb	array of characters	6

<u>Class name</u>	<u>Data</u>	<u>Type</u>
P_rec	name	Name
	phone	Phone

with member functions constructors and display_rec.

(i) Declare structures in C++ for Name and Phone.

(ii) Declare a class for P_rec.

(iii) Define the constructor (outside the class P_rec) that gathers information from the user for the above two structures Name and Phone.

(iv) Define the display_rec (outside the class P_rec) that shows the current values.

Ans.

```

#include<iostream.h>
#include<stdio.h>
#include<conio.h>
struct Name
{
    char first[40];
    char mid[40];
    char last[60];
};
struct Phone
{
    char area[4];
    char exch[4];
    char numb[6];
};
class P_rec
{

```

	<pre> Name name; Phone phone; p_rec(); void display_rec(); }; P_rec() { first="abc"; mid="aaa"; last="jjj"; area=1234; exch=7546; numb=789456; } void display_rec() { cout<<first<<mid<<last<<area<<exch<<numb; } void main() { clrscr(); P_rec p; p.display_rec(); getch(); } </pre>
13(b)	<p>Consider the following class declaration and answer the questions below:</p> <pre> class SmallObj { private: int some,more; void err_1() {cout<<"error";} public: void Xdata(int d) {some=d;more=d++; } void Ydata() {cout<<some<<" "<<more; } }; </pre> <p>(i) Write the name that specifies the above class. (ii) Write the data of the class with their access scope. (iii) Write all member functions of the class along with their access scope. (iv) Indicate the member function of the SmallObj that sets data.</p>
Ans.	<p>(i) SmallObj (ii) private int some, more; (iii) private void err_1(){cout<<"error";} public void Xdata(int d) {some=d;more=d++; } public void Ydata() {cout<<some<<" "<<more; } (iv) public void Xdata(int d) {some=d;more=d++; }</p>
14.	<p>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 in Rs. 1000) (iv) To display the data members</p>
Ans.	<pre> #include<iostream.h> #include<conio.h> </pre>


```

#include<stdio.h>
class Account
{
    char D_Name[30];
    float Amount;
    char acc_type[2];
public:
    long Acc_No;
    void initial()
    {
        cout<<endl<<"Enter Depositors Name: ";
        gets(D_Name);
        cout<<endl<<"Enter Account Number: ";
        cin>>Acc_No;
        cout<<endl<<"Enter Type of account (S for Saving and C for
Current): ";
        gets(acc_type);
        cout<<endl<<"Enter Ammount: ";
        cin>>Amount;
    }
    void Deposit()
    {
        float dip;
        cout<<"Enter Money to deposit:";
        cin>>dip;
        display();
        Amount=Amount+dip;
        cout<<"After deposit total amount is: "<<Amount;
    }
    void Withdraw()
    {
        float wid;
        cout<<endl<<"Entre money to withdraw:";
        cin>>wid;
        if(Amount>=1000)
        {
            display();
            Amount=Amount-wid;
            cout<<"After withdraw the amount is:"<<Amount;
        }
        else
        {
            cout<<"....you can not withdraw money.....";
        }
    }
    void display()
    {
        cout<<"Depositors Name: "<<D_Name<<endl;
        cout<<"Account Number: "<<Acc_No<<endl;
        cout<<"Account Type: "<<acc_type<<endl;
        cout<<"Amount: "<<Amount<<endl;
    }
    long getaccno()
    {
        return Acc_No;
    }
}

```

```

};
void main()
{
    clrscr();
    Account A1[10];
    long a;
    int i,flag=0;
    int ch;
    for(i=0;i<10;i++)
    {
        cout<<endl<<"Enter information for Depositer "<<i+1<<":"<<endl;
        A1[i].initial();
    }
    for(i=0;i<10;i++)
    {
        cout<<endl<<"Depositer- "<<i+1<<":"<<endl;
        A1[i].display();
    }
    cout<<"*****"<<endl;
    cout<<" 1->deposit..."<<endl;
    cout<<" 2->withdraw.."<<endl;
    cout<<"Enter your choice:";
    cin>>ch;
    switch(ch)
    {
        case 1:
            cout<<endl<<"Enter account number for which diposit
money:";

            cin>>a;
            for(i=0;i<10;i++)
            {
                if(A1[i].getaccno()==a)
                {
                    flag=1;
                    break;
                }
                else
                {
                    flag=0;
                }
            }
            if(flag==0)
            {
                cout<<"Account number not found.....";
            }
            else
            {
                A1[i].Deposit();
            }
            break;
        case 2:
            cout<<endl<<"Enter account number for which withdraw
money:";

            cin>>a;
            for(i=0;i<10;i++)
            {

```

	<pre> if(A1[i].getaccno()==a) { flag=1; break; } else { flag=0; } } if(flag==0) { cout<<"Account number not found....."; } else { A1[i].Withdraw(); } break; } } } } } } } getch(); } </pre>
15.	<p>Define a class worker with the following specification:</p> <p>Private members of class worker</p> <p>wname 25 characters</p> <p>hrwrk float (hors worked and wagerate per hour)</p> <p>totwage float(hrwrk*wgrate)</p> <p>calcwg A fuction to find hrerk* wgrate with float return type</p> <p>Public members of class worker</p> <p>in_data() a function to accept values for wno, wname, hrwrk, wgrate and invoke calcwg() to calculate totwage.</p> <p>out_data() a function to display all the data members on the screen you should give definations of functions.</p>
Ans.	<pre> #include<iostream.h> #include<stdio.h> #include<conio.h> class worker { int wno; char wname[25]; float hewrk,wgrate; float totwage; float calcwg() { totwage = hewrk*wgrate; } } </pre>

```

        return totwage;
    }

public:
    void in_data();
    void out_data();
};

void worker::in_data()
{
    cout<<"Enter worker number:";
    cin>>wno;
    cout<<"enter worker name:";
    gets(wname);
    cout<<"Enter hours worked: ";
    cin>>hewrk;
    cout<<"Enter wage rate per hour:";
    cin>>wgrate;
    calcwg();
}

void worker::out_data()
{
    cout<<".....Worker Information....."<<endl;
    cout<<"Worker number:"<<wno<<endl;
    cout<<" Worker name:"<<wname<<endl;
    cout<<" Hours worked:"<< hewrk<<endl;
    cout<<" Wage rate per hour:"<< wgrate<<endl;
    cout<<" Total wage:"<<totwage<<endl;
}

int main()
{
    worker obj;
    obj.in_data();
    obj.out_data();

    getch();
    return 0;
}

```

16. Define a class Teacher with the following 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.

Ans.

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

class Teacher
{
    char name[20];
    char subject[10];
    float Basic,DA,HRA;
    float salary;
    float Calculate()
    {
        salary=Basic+DA+HRA;
        return salary;
    }
public:
    void Readdata();
    void Displaydata();
};

void Teacher::Readdata()
{
    cout<<endl<<"Enter name:";
    gets(name);
    cout<<"Enter subject:";
    gets(subject);
    cout<<"Enter Basic :";
    cin>>Basic;
    cout<<"Enter DA :";
    cin>>DA;
    cout<<"Enter HRA :";
    cin>>HRA;
    Calculate();
}

void Teacher::Displaydata()
{
    cout<<".....Teacher Details....."<<endl;
    cout<<"Name:"<<name<<endl;
    cout<<" Subject:"<<subject<<endl;
    cout<<" Basic:"<<Basic<<endl;
    cout<<" DA:"<<DA<<endl;
    cout<<" HRA:"<<HRA<<endl;
    cout<<" Salary:"<<salary<<endl;
}

int main()
{
    Teacher obj;
    obj.Readdata();
    obj.Displaydata();
}
```

	<pre> getch(); return 0; } </pre>
17.	<p>Define a class Student with the following specification:</p> <p>private members:</p> <p>roll_no integer name 20 characters class 8 characters marks[5] integer percentage float</p> <p>Calculate() function that calculates overall percentage of marks and returns the percentage of marks.</p> <p>public members:</p> <p>Readmarks() a function that reads marks and invokes the calculate functio Displaymarks() a function that prints the marks.</p>
Ans.	<pre> #include<iostream.h> #include<stdio.h> #include<conio.h> class Student{ int roll_no; char name[20]; char Class[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(); void Displaymarks(); }; void Student::Readmarks(){ cout<<endl<<"Enter roll number: "; cin>>roll_no; cout<<endl<<"Enter name:"; gets(name); cout<<"Enter marks in "; for(int i=0;i<5;i++) { cout<<endl<<"Subject "<<i+1<<":"; cin>>marks[i]; }; Calculate(); } void Student::Displaymarks(){ cout<<".....Student Marksheet....."; cout<<endl<<"Roll number:"<<roll_no<<endl; cout<<" Name:"<<name<<endl; cout<<" Marks in subject-1:"<< marks[0]<<endl; </pre>

```

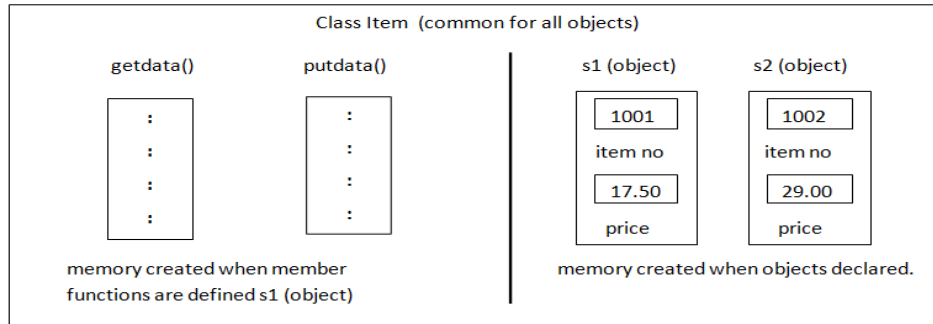
        cout<<" Marks in subject-2:"<< marks[1]<<endl;
        cout<<" Marks in subject-3:"<<marks[2]<<endl;
        cout<<" Marks in subject-4:"<<marks[3]<<endl;
        cout<<" Marks in subject-5:"<< marks[4]<<endl;
        cout<<" Percentage:"<<percentage<<endl;
    }
    int main(){
        Student obj;
        obj.Readmarks();
        obj.Displaymarks();

        getch();
        return 0;
    }

```

18. Write a short note on memory allocation of class and its objects.

Ans. When a class is defined, memory is allocated for its member functions and they are stored in the memory. When an object is created, separate memory space is allocated for its data members. All objects work with the one copy of member function shared by all.



19. Write a program that invokes a function newdate() to return a object of date type. The function newdate() takes two parameters: an object olddate of date type and number of days (int) to calculate the newdate as olddate + number of days and returns the newdate.

Ans.

```

#include<iostream.h>
#include<conio.h>
#include<stdio.h>

static int days_in_month[] = { 0, 31, 28, 31, 30, 31, 30, 31, 31, 30, 31,
30, 31 };
int day, month, year;

unsigned short day_counter;

int is_leap(int y){
    return ((y % 4 == 0 && y % 100 != 0) || y % 400 == 0);
}

class date{
public:
    //int d,m,y;

    void olddate(int d, int m, int y);
    void next_day();
    void newdate(date set_date,int days);
};

```

```

void date::olddate(int d, int m, int y){
    m < 1 ? m = 1 : 0;
    m > 12 ? m = 12 : 0;
    d < 1 ? d = 1 : 0;
    d > days_in_month[m] ? d = days_in_month[m] : 0;
    if (is_leap(y)){
        days_in_month[2] = 29;
    }
    else {
        days_in_month[2] = 28;
    }
    day = d;
    month = m;
    year = y;
}
void date::next_day(){
    day += 1; day_counter++;
    if (day > days_in_month[month]) {
        day = 1;
        month += 1;
    }
    if (month > 12) {
        month = 1;
        year += 1;
        if (is_leap(year)) {
            days_in_month[2] = 29;
        } else {
            days_in_month[2] = 28;
        }
    }
}
}

void date::newdate(date olddate,int x){
    int i;
    for (i=0;i<x;i++) next_day();
}
int main(){
    clrscr();
    date d1;
    d1.olddate(22,2,1980);
    d1.newdate(d1,62);
    day_counter = 0;
    cout<<"day:"<<day<<" month:"<<month<<" year:"<<year;
    getch();
}

```

20. What are static members of a class? When and how are they useful?

Ans. A class can have static data members as well as static member functions. The static data members are the class variables that are common for all the objects of the class. Only one copy of static data members is maintained which is shared by all the objects of the class. They are visible only within the class but their lifetime is the entire program. They can be accessed by all the member functions. A member function that accesses only static data members of a class is static member functions. It cannot access other data members but static members. The static data members are useful when some data values are to be shared across objects of the same class.

CHAPTER-5
Constructors and Destructors
SHORT ANSWER QUESTIONS

1.	Differentiate between Constructor and Destructor function with respect to Object Oriented Programming.	
Ans.	<u>Constructor</u>	<u>Destructor</u>
	Constructor is used to initialize the object.	Destructor is used to destroy the objects that are created in memory previously.
	Constructor can takes arguments.	Destructor cannot take any arguments.
	Constructor overloading can be possible means more than one constructor can be defined in same class.	Destructor overloading cannot be possible.
	Syntax of constructor: <pre> class class_name { class_sname(){} class_name(argulist){} } ; </pre>	Syntax of destructor: <pre> class class_name { ~class-name(void){} }; </pre>
2.	When a compiler can automatically generate a constructor if it is not defined then why is it considered that writing constructor for a class is a good practice?	
Ans.	When an object of the class is created a compiler can automatically generates a constructor if it is not defined. It is considered that writing constructor for a class is a good practice because constructor takes over very important duty of initialization of an object being created and relieves us from this task.	
3.	'Accessibility of a constructor or a destructor greatly affects the scope and visibility of their class'. Elaborate this statement.	
Ans.	Generally, a constructor and destructor should be defined under the public section of a class, so that its objects can be created and destroyed in any function. A private or protected constructor/destructor is not available to the non-member functions. Thus, accessibility of a constructor or a destructor greatly affects the scope and visibility of their class.	
4.	Explain the role of a default constructor? When is it considered equivalent to a parameterized constructor? Support your answer with examples.	
Ans.	<p>A default constructor is the one that takes no argument. It is automatically invoked when an object is created without providing any initial values. In case, the programmer has not defined a default constructor, the compiler automatically generates it. For example,</p> <pre> class A {.....}; A ob1; // uses default constructor for creating ob1. </pre> <p>A parameterized constructor with default argument is equivalent to a default constructor. For example,</p> <pre> class A { int i; float j; public: A(int a=0,float b=1000.0); //constructor with default argument }; A::A(int a,float b) //constructor definition { i=a; j=b; } int main() { A o1(23,27.50); // argument value passed for o1 A o2; // takes default argument to o2(0,1000.0) } </pre>	
5.	List some of the special properties of the constructor functions.	
Ans.	<ul style="list-style-type: none"> ✓ Constructor functions are invoked automatically when the objects are created. ✓ No return type can be specified for a constructor. 	

	<ul style="list-style-type: none">✓ A constructor may not be static.✓ They cannot be inherited, though a derived class can call the base class constructor.✓ It is not possible to take the address of a constructors.								
6.	What is a parameterized constructor? How is it useful?								
Ans.	<p>A constructor that accepts parameters for its invocation is known as parameterized constructor. This helps you to assign initial value to an object at the time of its creation. For example,</p> <pre>class Test { int ant; public: Test(int i) // constructor with argument { ant=i; } }; int main() { Test obl(45); //argument value provided }</pre>								
7.	What is a copy constructor? What is its significance? Which situation is it invoked in? Support your answer with examples.								
Ans.	<p>The copy constructor is a constructor which creates an object by initializing it with an object of the same class, which has been created previously. The copy constructor is used to:</p> <p>Initialize one object from another of the same type.</p> <p>Copy an object to pass it as an argument to a function.</p> <p>Copy an object to return it from a function.</p> <pre>#include<iostream> #include<conio.h> class Example{ int a,b; public: Example(int x,int y){ //Constructor with Argument a=x; b=y; cout<<"\nParameterized Constructor"; } void Display(){ cout<<"\nValues : "<<a<<"\t"<<b; } }; void main(){ Example Object(10,20); Example Object2=Object; //Copy Constructor Object.Display(); // Constructor invoked. Object2.Display(); getch(); }</pre>								
8.	Differentiate between a default constructor and copy constructor, giving suitable examples of each.								
Ans.	<table><tr><th><u>Default Constructor</u></th><th><u>Copy Constructor</u></th></tr><tr><td>A constructor that accepts no parameter is called the default constructor.</td><td>A constructor that initializes a object with the data values of another object is called copy constructor.</td></tr><tr><td>A default constructor takes no parameter.</td><td>Copy constructor takes one parameter of its class& type.</td></tr><tr><td><u>Example:</u> class Defal { public: Defal() { cout<<" Default constructor"; }</td><td><u>Example:</u> class A { int i; public: A(int a) //constructor { i=a; } A(A &s)//copy constructor</td></tr></table>	<u>Default Constructor</u>	<u>Copy Constructor</u>	A constructor that accepts no parameter is called the default constructor.	A constructor that initializes a object with the data values of another object is called copy constructor.	A default constructor takes no parameter.	Copy constructor takes one parameter of its class& type.	<u>Example:</u> class Defal { public: Defal() { cout<<" Default constructor"; }	<u>Example:</u> class A { int i; public: A(int a) //constructor { i=a; } A(A &s)//copy constructor
<u>Default Constructor</u>	<u>Copy Constructor</u>								
A constructor that accepts no parameter is called the default constructor.	A constructor that initializes a object with the data values of another object is called copy constructor.								
A default constructor takes no parameter.	Copy constructor takes one parameter of its class& type.								
<u>Example:</u> class Defal { public: Defal() { cout<<" Default constructor"; }	<u>Example:</u> class A { int i; public: A(int a) //constructor { i=a; } A(A &s)//copy constructor								

	};	{ i=s.i; }
		};
9.	Describe the importance of destructor. List some of the special properties of destructor.	
Ans.	<p>A object that is existing must be scrapped off when it is o more needed. The task of scrapping off an object is carried out by a destructor. A destructor deinitializes an object and deallocates all allocated resources.</p> <p>Properties of destructor:</p> <ul style="list-style-type: none"> ✓ Destructor functions are invoked automatically when the objects are destroyed. ✓ There can be only one destructor for a class, means destructor can't be overloaded. ✓ No argument can be provided to a destructor, neither does it returns any value. 	
10.	<p>What will be the output of following program? Explain with reasons:</p> <pre> #include<iostream.h> class student{ int rollno; char grade; static int count; public: student() { rollno=0; grade=' '; cout<<"Creating object"<<++count<<"\n"; } void init(void) { cout<<"\n Enter rollo and grade :"; cin>>rollno>>grade; cout<<"\n"; } ~student() { cout<<"Destroying object"<<--count<<"\n"; } }; int student::count=0; int main() { student classes[5]; for(int i=0;i<5;i++) { cout<<"\n Enter details for student"<<i+1<<"\n"; classes[i].init(); } return 0; } </pre>	
Ans.	<p>First of all the program executes default constructor as constructor is invoked automatically as soon as object is created and prints following:</p> <p>Creating object 1 Creating object 2 Creating object 3 Creating object 4 Creating object 5</p>	

	<p>After that it executes init() method and asks for Entering details for 5 students as following: Enter rollno and grade: 55 A Enter rollno and grade: 24 D Enter rollno and grade: 44 A Enter rollno and grade: 67 B Enter rollno and grade: 89 B</p> <p>After that it executes destructor in reverse order as destructors are invoked in the reverse order in which the constructor were called and print following: Destroying object 4 Destroying object 3 Destroying object 2 Destroying object 1 Destroying object 0</p>
11.	<p>Consider the following code:</p> <pre>class ci { int l; public: ci(int j) { l=j; } ci(ci &rv) { l=rv.l; } void initialize() { l=0; } }; main() { ci original(1); ci X1(original); ci X2=original; }</pre> <p>Referring to the sample code above, what initializes the object X1?</p> <ol style="list-style-type: none"> Initialize() function The default constructor The copy constructor The default copy constructor <p>Justify your answer.</p>
Ans.	The default constructor initializes the object X1 as constructor is invoked as soon as the object is created.
12.	<p>Which of the following is used to identify the copy constructor class type X?</p> <p>(i) X& (ii) X(&X) (iii) X(X&) (iv) X(X)</p> <p>Justify your answer.</p>
Ans.	X(X&) is used to identify the copy constructor class type X as copy constructor is a constructor of the form <i>classname (classname &)</i> .
13.	<p>In the case of copy constructor, which of the following is true?</p> <p>(i) Used to instantiate an object from another existing object. (ii) To copy one object to another existing object. (iii) Can be a substitute for a “=” operator for class objects. (iv) All of the above.</p>
Ans.	
14.	<p>What do you think is the advantage of declaring the constructor and destructor functions for public member access?</p>

	<p>(i) It allows the constructor and destructor access to the data members.</p> <p>(ii) It means that the constructor and destructor can be called directly by code in main() functions.</p> <p>(iii) It allows the constructor access to the other member functions.</p> <p>(iv) None of the above.</p>
Ans.	(ii) It means that the constructor and destructor can be called directly by code in main() functions.
15.	<p>Answer the question (i) and (ii) after going through the following class:</p> <pre> class WORK { int WorkId; char WorkType; public: ~WORK() //Function 1 { cout<<"Un-Allocated"<<endl; } void status() //Function 2 { cout<<WorkId<<": "<<WorkType<<endl; } WORK() //Function 3 { WorkId=10; WorkType='T'; } Work(WORK &W) //Function 4 { WorkId=W.WorkId+12; WorkType=W.WorkType+1; } }; </pre> <p>(i) Which member function out of Function 1, Function 2, Function 3 and Function 4 shown in the above definition of class WORK is called automatically, when the scope of a object gets over? Is it known as Constructor OR Destructor OR Overloaded Function OR Copy Constructor?</p> <p>(ii) WORK W; //Statement 1 WORK Y(W); //Statement 2</p> <p>Which member function out of Function 1, Function 2, Function 3 and Function 4 shown in the above definition of class WORK will be called an execution of statement written as statement 2? What is this function specifically known as out of Destructor or Copy Constructor or Default Constructor?</p>
Ans.	(i) Destructor (ii) Copy Constructor
16.	<p>Identify the error(s) in the following code and correct the code, explaining every change being introduced:</p> <pre> #include<iostream.h> class code { int no; char branch; static int count; code (it i=0,char b); public: code(code A) { no=A.no; branch=A.branch; } ~code() { cout<<"Destroying Object"<<--count<<"\n"; } }; code(int i,char b) { no=i; branch=b; } int main() { code X,Y; : return 0; } </pre>

<p>Ans.</p>	<pre> #include<iostream.h> class code { int no; char branch; static int count; public: <u>code(int i=0,char b);</u> code(code &A) { no=A.no; branch=A.branch; } ~code() { //count=0; cout<<"Destroying Object"<<--count<<"\n"; } }; <u>int code::count=0;</u> code::code(int i,char b) { no=i; branch=b; } int main() { code X,Y; return 0; } </pre> <p>Changes being introduced are as following:</p> <ol style="list-style-type: none"> Constructor definition should be public so that it can be accessed outside the class. There should be a use of '&' operator in copy constructor. There should be a definition of the static variable outside the class definition. There is a invalid use of ':' expression.
<p>17.</p>	<p>Identify the error(s) in the following code and correct the code, explaining every change being introduced in the program:</p> <pre> #include<iostream.h> class Sample { int i; float j; void Sample(void) { i=0; j=0.0; } init() { cin>>i>>j; } display() { cout<<"i="<<i<<"\n"; cout<<"j="<<j<<"\n"; } void Sample(void){} }; Sample s1,s2; </pre>
<p>Ans.</p>	<pre> #include<iostream.h> class Sample { int i; float j; </pre>

	<pre> public: Sample() { i=0; j=0.0; } void init() { cin>>i>>j; } void display() { cout<<"i="<<i<<"\n"; cout<<"j="<<j<<"\n"; } }; void main() { Sample s1,s2; s1.init(); s1.display(); } </pre> <p>Changes being introduced are as following:</p> <ol style="list-style-type: none"> Constructor definition should be public so that it can be accessed outside the class. Constructor should not have return type. init() and display() method should have return type. Object should be created in main() method and methods are called with the help of that object.
18.	<p>Answer the question (i) and (ii) after going through the following program:</p> <pre> #include<iostream.h> #include<string.h> class Retail { char Category[20]; char Item[20]; int Qty; float Price; Retail() //Fuction 1 { strcpy(Category,"Cereal"); 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 } </pre> <p>(i) Will Statement 1 initialize all the data members for object R 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.</p> <p>(ii) What shall be the possible output when the program gets executed? (Assuming, if required – the suggested correction(s) are made in the program)</p>
Ans.	<p>(i) No. Since the default constructor Retail() is declared inside private section, it cannot initialize the objects declared outside the class. Correction needed are:</p>

	<p>The constructor Retail() should be declared inside public section.</p> <p>(ii) Cereal-Rice:100@25</p>
19.	<p>Answer the question (i) and (ii) after going through the following class:</p> <pre> class Maths { char Chapter[20]; int Marks; public: Maths() //Member Function 1 { strcpy(Chapter,"Geometry"); Marks=10; cout<<"Chapter Initialized"; } ~Maths() //Member Function 2 { cout<<"Chapter Over"; } }; </pre> <p>(i) Name the specific features of class show by Member Function 1 and Member Function 2 in the above example.</p> <p>(ii) How would Member Function 1 and Member Function 2 gets executed?</p>
Ans.	<p>(i) Function 1 is Constructor. Function 2 is Destructor.</p> <p>(ii) Function 1 (the Constructor) will get executed every time an object of class <i>Maths</i> gets created. Function 2 (the Destructor) will get executed every time an object of class <i>Maths</i> goes out of scope i.e., its scope gets over.</p>
20.	<p>Answer the question (i) and (ii) after going through the following class:</p> <pre> class Interview { int Month; public: Interview(int y) { Month=y; } //Constructor 1 Interview(Interview &t); //Constructor 2 }; </pre> <p>(i) Create an object, such that it invokes constructor 1.</p> <p>(ii) Write complete definition for Constructor 2.</p>
Ans.	<p>(i) Interview obj1(3);</p> <p>(ii) Interview(Interview &t)</p> <pre> { Month=t.Month; } </pre>
21.	<p>Answer the question (i) and (ii) after going through the following class:</p> <pre> class Exam { int Rno,MaxMarks,MinMarks,Marks; public: Exam() //Module 1 { Rno=101; MaxMarks=100; MinMarks=40;Marks=75; } Exam(int Prno,int Pmarks) //Module 2 { Rno=Prno; MaxMarks=100; MinMarks=40;Marks=Pmarks; } ~Exam() //Module 3 { cout<<"Exam Over"<<endl; } void Show() //Module 4 { cout<<Rno<<": "<<MaxMarks<<": "<<MinMarks<<endl; cout<<"[MarksGot]"<<Marks<<endl; } }; </pre>

	<pre> } }; </pre> <p>(i) As per Object Oriented Programming, which concept is illustrated by Module 1 and Module 2 together? (ii) What is Module 3 referred as? When do you think, Module 3 will be invoked/called?</p>
Ans.	<p>(i) Constructor overloading. (ii) Destructor. It will be invoked when scope of an object gets over.</p>
22.	<p>Answer the question (i) and (ii) after going through the following program:</p> <pre> #include<iostream.h> #include<string.h> class Bazar { char Type[20]; char Product[20]; int Qty; float Price; Bazar() //Fuction 1 { strcpy(Type,"Electronic"); strcpy(Product,"Calculator"); Qty=10; Price=225; } public: voif Disp() //Function 2 { cout<<Type<<"-"<<Product<<": "<<Qty<<"@"<<Price<<endl; } }; void main() { Bazar B; //Statement 1 B.Disp(); //Statement 2 } </pre> <p>(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. (ii) What shall be the possible output when the program gets executed? (Assuming, if required – the suggested correction(s) are made in the program)</p>
Ans.	<p>(i) No. Since the default constructor Bazar() is declared inside private section, it cannot initialize the objects declared outside the class. Correction needed are: The constructor Bazar () should be declared inside public section. (ii) Electronic-Calculator:10@225</p>
23.	<p>Define a class Play in C++ with the following specifications:</p> <p>private members of class Play</p> <ul style="list-style-type: none"> ▪ Playcode integer ▪ PlayTitle 25 character ▪ Duration float ▪ Noofscenes integer <p>public member function of class Play</p> <ul style="list-style-type: none"> ▪ A constructor function to initialise Duration as 45 and Noofscence as 5. ▪ Newplay() unction to accept values for Playcode and PlayTitle. ▪ Moreinfo() function to assign the values of Duration and Noofscenes with the help of corresponding values passed as parameters to this function. ▪ Showplay() function to display all the data member on the screen.
Ans.	<pre> class Play </pre>

	<pre> { int Playcode; char Playtitle[25]; float Duration; int Noofscenes; public: Play() { Duration=45.0; Noofscenes=5; } void Newplay() { cout<<"enter playcode: "; cin>>Playcode; cout<<"enter playtitle: "; gets(Playtitle); } void Moreinfo(float d,int n) { Duration=d;Noofscenes=n; } void Showplay() { cout<<"Playcode: "<<Playcode<<endl; cout<<"Playtitle: "<<Playtitle<<endl; cout<<"Duration: "<<Duration<<endl; cout<<"Noofscenes: "<<Noofscenes<<endl; } }; </pre>
--	---

LONG ANSWER QUESTIONS

1.	<p>Rewrite the following program after removing the syntactical error(s), if any. Underline each correction.</p> <pre> #include<iostream.h> const int Dividor 5; void main() { Number=15; for(int Count=1;Count=<5;Count++,Number-=3) if(Number%Dividor==0) cout<<Number/Dividor; cout<<endl; else cout<<Number+Dividor<<endl; } </pre>
Ans.	<pre> #include<iostream.h> const int <u>Dividor=5</u>; void main() { <u>int</u> Number=15; for(int Count=1;Count<u><=5</u>;Count++,Number-=3) if(Number%Dividor==0) { cout<<Number/Dividor; cout<<endl; } <u>else</u> cout<<Number+Dividor<<endl; } </pre>

	}
2.	<p>A book shop maintains the inventory of books that are being sold at the shop. The list includes details such as author, title, price, publisher and stock position. Whenever a customer wants a book, the sales person inputs the title and author and the system searches the list and displays whether it is available or not. If it is not, an appropriate message is displayed. If it is, then the system displays the book details and requests for the number of copies required. If the requested copies are available, the total cost of the required copies is displayed, otherwise the message "Sorry! These many copies are not in stock" is displayed.</p> <p>Design a system using a class called stock with suitable member functions and constructors.</p>
Ans.	<pre> #include<iostream.h> #include<conio.h> #include<stdio.h> #include<string.h> class stock { char author[50]; char title[50]; char pub[50]; double price; int numcopies; public: stock(); int access_title(char a[]); int access_author(char b[]); void input(); void display(); void getdata(int); }; stock::stock() { char author[50]="abc"; char title[50]="efg"; char pub[50]="hij"; price=500; numcopies=50; } int stock::access_title(char a[]) { if(strcmp(title,a)) return 0; else return 1; } int stock::access_author(char b[]) { if(strcmp(author,b)) return 0; else return 1; } void stock::getdata(int num) { if(numcopies>=num) cout<<"\nCost of "<<num<<" books is Rs. "<<(price*num); else cout<<"\nSorry! These many copies are not in stock!"; } void stock::input() </pre>

	<pre> { cout<<"\nTitle: "; gets(title); cout<<"\nAuthor:"; gets(author); cout<<"\nPublisher:"; gets(pub); cout<<"\nPrices:"; cin>>price; cout<<"\ncopies available:"; cin>>numcopies; } void stock::display() { cout<<"Title: "<<title<<endl; cout<<"Author: "<<author<<endl; cout<<"Publisher: "<<pub<<endl; cout<<"Prices: "<<price<<endl; cout<<"copies available: "<<numcopies<<endl; } void main() { clrscr(); stock obj[2]; int n; char title[50]; char auth[50]; cout<<"Enter details of 3 books"; for(int i=0;i<2;++i) obj[i].input(); cout<<endl; cout<<"\n Enter title of required book\n"; gets(title); cout<<"\n Enter author of required book\n"; gets(auth); for(i=0;i<2;i++) { if((obj[i].access_title(title))&&(obj[i].access_author(auth))) { obj[i].display(); cout<<"\nHow many copies? "; cin>>n; obj[i].getdata(n); } else cout<<"\nBook unavailable"; } getch(); } </pre>
3.	<p>Write a program to print the score board of a cricket match in real time. The display should contain the batsman's name, runs scored, indication if out, mode by which out, bowler's score (overs played, maiden overs, runs given, wickets taken). As and when a ball is thrown, the score should be updated.</p> <p>(Hint: Use separate arrays to store batsmen's and bowlers' information)</p>
Ans.	<pre> #include<iostream.h> #include<conio.h> </pre>

```

#include<stdio.h>
class batsman
{
    public:
    char name[20];
    int run_score,indi_out;
    char modeout[20];
    void getdata()
    {
        cout<<".....Enter information for batsman....."<<endl;
        cout<<"Enter batsman's name: ";
        gets(name);
        cout<<"Enter runs scored: ";
        cin>>run_score;
        cout<<"Enter 0 if NOT-OUT or 1 if OUT: ";
        cin>>indi_out;
        if(indi_out==1)
        {
            cout<<"Enter mode by which out: ";
            gets(modeout);
        }
    }
    void putdata()
    {
        cout<<".....Batsman's Information....."<<endl;
        cout<<"Batsman's name: "<<name<<endl;
        cout<<"Runs scored: "<<run_score<<endl;
        if(indi_out==1)
        {
            cout<<"OUT: "<<"Yes"<<endl;
            cout<<"Mode by which out: "<<modeout<<endl;
        }
    }
    void update()
    {
        int new_run;
        cout<<".....Enter update for batsman....."<<endl;
        cout<<"Enter new run: ";
        cin>>new_run;
        putdata();
        run_score=run_score+new_run;
        cout<<"Updated run: "<<run_score;
    }
};

class bowler
{
    public:
    char bname[20];
    int over_play,maiden_over,run_given,wicket;
    void getinfo()
    {
        cout<<".....Enter information for bolwer....."<<endl;
        cout<<"Enter bowler's name: ";
        gets(bname);
        cout<<"Enter overs played: ";
    }
};

```

```

        cin>>over_play;
        cout<<"Enter maiden overs: ";
        cin>>maiden_over;
        cout<<"Enter runs given: ";
        cin>>run_given;
        cout<<"Enter wicket taken: ";
        cin>>wicket;
    }
    void disp_info()
    {
        cout<<".....Bowler's Information....."<<endl;
        cout<<"Bowler's name: "<<bname<<endl;
        cout<<"Overs played: "<<over_play<<endl;
        cout<<"Maiden overs: "<<maiden_over<<endl;
        cout<<"Runs given: "<<run_given<<endl;
        cout<<"Wicket taken: "<<wicket<<endl;
    }
    void upd()
    {
        int new_over,new_maidover,new_run,new_wicket;
        cout<<endl<<".....Enter update for bowler....."<<endl;
        cout<<"Enter new overs played: ";
        cin>>new_over;
        cout<<"Enter new maiden overs: ";
        cin>>new_maidover;
        cout<<"Enter new runs given: ";
        cin>>new_run;
        cout<<"Enter new wickets taken: ";
        cin>>new_wicket;
        disp_info();
        over_play=over_play+new_over;
        maiden_over=maiden_over+new_maidover;
        run_given=run_given+new_run;
        wicket=wicket+new_wicket;
        cout<<"After update....."<<endl;
        cout<<"Overs played: "<<over_play<<endl;
        cout<<"Maiden overs: "<<maiden_over<<endl;
        cout<<"Runs given: "<<run_given<<endl;
        cout<<"Wicket taken: "<<wicket<<endl;
    }
};

void main()
{
    clrscr();
    int ch;
    batsman b1;
    bowler b2;
    b1.getdata();
    b2.getinfo();
    b1.putdata();
    b2.disp_info();
    cout<<"Is ball thrown..?? (1-Yes or 0-NO) ";
    cin>>ch;
    if(ch==1)
    {

```

	<pre> b1.update(); b2.upd(); } clrscr(); } </pre>
4.	<p>Write a program to prepare the invoice from the following data: Customer number, customer name, customer address, date of sale, item no, item description, quantity sold, unit price of item, discount percentage, sales tax percentage. Note: Identify different classes possible here and make sure that the date of sale becomes equal to today's date as soon as object is created. Today's date should be accepted from user, over in beginning.</p>
Ans.	<pre> #include<iostream.h> #include<conio.h> #include<stdio.h> class date { public: int d,m,y; void getdate() { cout<<"Enter day,month and year:"; cin>>d;cin>>m;cin>>y; } void putdate() { cout<<"Date of sale: "<<d<<"/"<<m<<"/"<<y<<"/"<<endl; } }; class invo { public: int cno; char cname[30]; char add[50]; int ino,qty; char desc[30]; float price,disc_per,tax_per; void getinfo() { cout<<"Enter customer number: "; cin>>cno; cout<<"Enter customer Name: "; gets(cname); cout<<"Enter customer Address: "; gets(add); cout<<"Enter item number: "; cin>>ino; cout<<"Enter Quantity: "; cin>>qty; cout<<"Enter dscription: "; gets(desc); cout<<"Enter price: "; cin>>price; cout<<"Enter discount percentage: "; cin>>disc_per; cout<<"Enter tax percentage: "; } }; </pre>

```

        cin>>tax_per;
    }
    void disp_info()
    {
        float disc,final,tax,tot;
        cout<<"Customer number: "<<cno<<endl;
        cout<<"Customer name: "<<cname<<endl;
        cout<<"Customer address: "<<add<<endl;
        cout<<"Item number: "<<ino<<endl;
        cout<<"Quantity: "<<qty<<endl;
        cout<<"Dscription: "<<desc<<endl;
        cout<<"Price per unit: "<<price<<endl;
        cout<<"Discount percentage: "<<disc_per<<endl;
        cout<<"Tax percentage: "<<tax_per<<endl;
        tot=price*qty;
        cout<<"Total price:"<<tot<<endl;
        disc=((tot*disc_per)/100);
        tax=((tot*tax_per)/100);
        final=(tot+tax)-disc;
        cout<<"Final Price: "<<final<<endl;
    }
};

void main()
{
    clrscr();
    date d1;
    invo i1;
    d1.getdate();
    i1.getinfo();
    d1.putdate();
    i1.disp_info();
    getch();
}

```

- | | |
|----|---|
| 5. | 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, Plan ad Number_of_travellers. Also, assign the value of Number of buses as per the following conditions:

<u>Number of travellers</u>	<u>Number of buses</u>
Less than 20	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 content of all the data members on screen.

Ans.	class TravelPlan
------	------------------

	<pre> { long PlanCode; char *Place; int Number_of_travellers; int Number_of_buses; public: TravelPlan() { PlanCode=1001; strcpy(Place,"Agra"); Number_of_travellers=5; Number_of_buses=1; } void NewPlan() { cout<<"Enter Travel code, Place and Number of travellers \n"; cin>>PlanCode; gets(Place); cin>>Number_of_travellers; if(Number_of_travellers<20) Number_of_buses=1; else if(Number_of_travellers<40) Number_of_buses=2; else Number_of_buses=3; } void ShowPlan() { cout<<"Plan Code:"<<PlanCode<<endl; cout<<"Place:"<<Place<<endl; cout<<"Number of travellers:"<<Number_of_travellers<<endl; cout<<"Number of buses:"<<Number_of_buses<<endl; } }; </pre>
6.	<p>Define a class Serial in C++ with the following specifications:</p> <p>private members of class Serial</p> <ul style="list-style-type: none"> ▪ Serialcode integer ▪ Title 25 character ▪ Duration float ▪ Noofepisodes integer <p>public member function of class Play</p> <ul style="list-style-type: none"> ▪ A constructor function to initialise Duration as 30 and Noofepisodes as 10. ▪ Newserial() unction to accept values for Serialcode and Title. ▪ Otherentries() function to assign the values of Duration and Noofepisodes with the help of corresponding values passed as parameters to this function. ▪ Dispdata() function to display all the data member on the screen.
Ans.	<pre> class Serial { int Serialcode; char Title[20]; float Duration; int Noofepisodes; public: Serial() </pre>

	<pre> { Duration=30.0; Noofepisodes =10; } void Newserial() { cout<<"enter Serialcode: "; cin>> Serialcode; cout<<"enter Title: "; gets(Title); } void Otherentries(float d,int n) { Duration=d; Noofepisodes =n; } void Dispdata() { cout<<" Serialcode: "<< Serialcode <<endl; cout<<" Title: "<< Title <<endl; cout<<"Duration: "<<Duration<<endl; cout<<" No of episodes: "<< Noofepisodes <<endl; } }; </pre>						
7.	<p>Define a class Clothing in C++ with the following descriptions:</p> <p>Private Members:</p> <ul style="list-style-type: none"> ▪ Code of type string ▪ Type of type string ▪ Size of type integer ▪ Material of type string ▪ Price of type float <p>A function Calc_Price() which calculates and assign the values of GPrice as follows:</p> <p>For the value of Material as "COTTON":</p> <table style="margin-left: 40px;"> <thead> <tr> <th>Type</th><th>Price(Rs)</th></tr> </thead> <tbody> <tr> <td>TROUSER</td><td>1500</td></tr> <tr> <td>SHIRT</td><td>1200</td></tr> </tbody> </table> <p>For Material other than "COTTON" the above mentioned Price gets reduced by 25%.</p> <p>Public Members:</p> <p>A constructor to assign initial values of Code, Type and Material with word "NOT ASSIGNED" and Price with 0.</p> <p>A function Enter() to input the values of the data members Code, Type, Size and Material and invoke the Calc_Price() function.</p> <p>A function Show() to display the content of all the data members for a Clothing.</p>	Type	Price(Rs)	TROUSER	1500	SHIRT	1200
Type	Price(Rs)						
TROUSER	1500						
SHIRT	1200						
Ans.	<pre> class Clothing { char Code[15]; char Type[15]; int Size; char Meterial[15]; float Price; void Cal_Price() { if(strcmp(Material,"COTTON")==0) { if(strcmp(Type,"TROUSER")==0) Price=1500; else if(strcmp(Type,"SHIRT")==0) </pre>						

```

        Price=1200;
    }
    else
    {
        if(strcmp(Type,"TROUSER")==0)
            Price=1500-1500*0.25;
        else if(strcmp(Type,"SHIRT")==0)
            Price=1200-1200*0.25;
    }
}
public:
Clothing()
{
    strcpy(Code,"NOT ASSIGNED");
    strcpy(Type,"NOT ASSIGNED");
    strcpy(Material,"NOT ASSIGNED");
    Size=0;
    Price=0;
}
void Enter()
{
    cout<<"Enter code";
    gets(Code);
    cout<<"\nEnter type:";
    gets(Type);
    cout<<"\nEnter Size:";
    cin>>Size;
    cout<<"\nEnter Material";
    gets(Material);
    cout<<"\nEnter Price:";
    cin>>Price;
    Calc_Price();
}
void Show()
{
    cout<<"\nCode:"<<Code<<endl;
    cout<<"\nType:"<<Type<<endl;
    cout<<"\nSize:"<<Size<<endl;
    cout<<"\nMaterial:"<<Material<<endl;
    cout<<"\nPrice:"<<Price<<endl;
}
};

```

8. Define a class Tour C++ with the description given below:

Private Members:

TCode	of type string
NoofAdults	of type integer
NoofKids	of type integer
Kilometres	of type integer
TotalFare	of type float

Public Members:

- A constructor to assign initial values as follows:

TCode with the word "NULL"
NoofAdults as 0
NoofKids as 0
Kilometres as 0

TotalFare as 0

- A function AssignFare() which calculates and assign the value of the data member TotalFare as follows:
For each Adult

Fare(Rs)	For Kilometres
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 Distance is 850, NoofAdults=2 and NoofKids =3

Then TotalFare should be calculated as

$\text{NoofAdults} * 30 + \text{NoofKids} * 150$

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

- A function EnterTour() to input the values of the data members TCode, Noofadults, NoofKids and Kilometres; and invoke the AssignFare() function
- A Function ShowTour() which display the content of all the data members for a Tour.

Ans.

```
class Tour
{
    char TCode[5];
    int NoofAdults;
    int NoofKids;
    int Kilometres;
    float TotalFare;
public:
    Tour ()
    {
        strcpy(TCode, "NULL");
        NoofAdults=0;
        NoofKids =0;
        Kilometres =0;
        TotalFare=0;
    }
    void AssignFare()
    {
        int I,j;
        TotalFare=0;
        for(i=0;i<NoofAdults;i++)
        {
            if(Kilometeres>=1000)
                TotalFare+=500;
            else if(Kilometeres>=500)
                TotalFare+=300;
            else
                TotalFare+=200;
        }
        for(j=0;j<NoofKids;j++)
        {
            if(Kilometeres>=1000)
                TotalFare+=500/2;
            else if(Kilometeres>=500)
                TotalFare+=300/2;
            else
                TotalFare+=200/2;
        }
    }
}
```

	<pre> } void EnterTour() { cout<<"Enter value of travel code:"; cin>>TCode; cout<<"Enter No. of Adults:"; cin>>NoofAdults; cout<<"Enter No. of Children:"; cin>> NoofKids; cout<<"Enter Distance:"; cin>> Kilometres; AssignFare(); } void ShowTour() { cout<<"Travel code:"<<TCode<<endl; cout<<"No of Adults:"<<NoofAdults<<endl; cout<<"No of Children:"<< NoofKids <<endl; cout<<"Distance:"<< Kilometres <<endl; cout<<"Total Fare:"<<TotalFare<<endl; } }; </pre>						
9.	<p>Define a class Outfit in C++ with the following description:</p> <p>Private Members:</p> <ul style="list-style-type: none"> ▪ OCode of type string ▪ OType of type string ▪ OSize of type integer ▪ OFabric of type string ▪ OPrice of type float <p>A function litPrice() which calculates and assigns the value of OPrice as follows:</p> <p>For the value of OFabric "DENIM",</p> <table> <tr> <td>OType</td><td>OPrice (Rs)</td></tr> <tr> <td>TROUSER</td><td>1500</td></tr> <tr> <td>JACKET</td><td>2500</td></tr> </table> <p>For OFabric other than "DENIM" the above mentioned OPrice gets reduced by 25%</p> <p>Public Members:</p> <p>A constructor to assign initial values of OCode, OType and OFabric with the word "NOT INITIALISED" and OSize and OPrice with 0.</p> <p>A function Input() to input the values of the data members OCode, OType, OSize ad OFabric and invoke the InitPrice() function.</p> <p>A function Display() which displays the content of all the data members for an Outfit.</p>	OType	OPrice (Rs)	TROUSER	1500	JACKET	2500
OType	OPrice (Rs)						
TROUSER	1500						
JACKET	2500						
Ans.	<pre> class Outfit { char OCode[15]; char OType[15]; int OSize; char OFabric[15]; float OPrice; void InitPrice() { if(strcmp(OFabric,"DENIM")==0) { if(strcmp(OType,"TROUSER")==0) </pre>						

```

        OPrice=1500;
    else if(strcmp(OType,"JACKET")==0)
        OPrice=2500;
    }
    else
    {
        if(strcmp(OType,"TROUSER")==0)
            Price=1500-1500*0.25;
        else if(strcmp(OType,"JACKET")==0)
            Price=2500-2500*0.25;
    }
}
public:
Outfit()
{
    strcpy(OCode,"NOT ASSIGNED");
    strcpy(OType,"NOT ASSIGNED");
    strcpy(OFabric,"NOT ASSIGNED");
    OSize=0;
    OPrice=0;
}
void Input()
{
    cout<<"Enter code";
    gets(OCode);
    cout<<"\nEnter type:";
    gets(OType);
    cout<<"\nEnter Size:";
    cin>>OSize;
    cout<<"\nEnter Material";
    gets(OFabric);
    cout<<"\nEnter Price:";
    cin>>OPrice;
    InitPrice();
}
void Display()
{
    cout<<"\nCode:"<<OCode<<endl;
    cout<<"\nType:"<<OType<<endl;
    cout<<"\nSize:"<<OSize<<endl;
    cout<<"\nMaterial:"<<OFabric<<endl;
    cout<<"\nPrice:"<<OPrice<<endl;
}
};

```

CHAPTER-6

Inheritance: Extending Classes

VERY SHORT/SHORT ANSWER QUESTIONS

1.	What is inheritance? Discuss its various forms.																							
Ans.	Inheritance is the capability of one class to inherit properties from another class. Forms of Inheritance: 1. Single Inheritance: One base class and one super class. 2. Multiple Inheritance: Multiple base class and one sub class. 3. Hierarchical Inheritance: One base class and multiple sub class. 4. Multi-level Inheritance: A subclass inherits from a class that itself inherits from another class. 5. Hybrid Inheritance: A subclass inherits from multiple base classes and all of its base classes inherit from a single base class.																							
2.	Discuss various reasons that support the concept of inheritance in Object Oriented Languages.																							
Ans.	The reasons that support the existence of inheritance concept in OO Languages are: 1. 'Inheritance' is capable of expressing the inheritance relationship of real-world models. 2. 'Inheritance' facilitates the code reusability. 3. 'Inheritance' is capable of simulating the transitive nature of real-world's inheritance.																							
3.	Differentiate between public and protected visibility in context of Object Oriented Programming giving suitable examples for each.																							
Ans.	Public visibility		Protected visibility																					
	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.		The protected derivation means that the derived class can access the public and private members of the base class protectedly.																					
	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.		With protectedly derived class, the public and protected members of the base class become protected members of the derived class.																					
	<u>Example:</u> class super { private: int x; void get(); public: int y; void put(); protected: int z; void disp(); }; class sub:public super { private: int a; void init(); public: int b; void readit(); protected: int c; void writeit(); };		<u>Example:</u> class super { private: int x; void get(); public: int y; void put(); protected: int z; void disp(); }; class sub:protected super { private: int a; void init(); public: int b; void readit(); protected: int c; void writeit(); };																					
4.	How does the visibility mode control the access of members in the derived class? Explain with examples.																							
Ans.	Visibility mode controls the access of member in derived class by using access specifier. Below table shows different visibility modes.																							
	<table><tr><th colspan="4">Public inheritance</th></tr><tr><th>Base access specifier</th><th>Derived access specifier</th><th>Derived class access?</th><th>Public access?</th></tr><tr><td>Public</td><td>Public</td><td>Yes</td><td>Yes</td></tr><tr><td>Private</td><td>Private</td><td>No</td><td>No</td></tr><tr><td>Protected</td><td>Protected</td><td>Yes</td><td>No</td></tr></table>				Public inheritance				Base access specifier	Derived access specifier	Derived class access?	Public access?	Public	Public	Yes	Yes	Private	Private	No	No	Protected	Protected	Yes	No
Public inheritance																								
Base access specifier	Derived access specifier	Derived class access?	Public access?																					
Public	Public	Yes	Yes																					
Private	Private	No	No																					
Protected	Protected	Yes	No																					

Private inheritance				
Base access specifier	Derived access specifier	Derived class access?	Public access?	
Public	Private	Yes	No	
Private	Private	No	No	
Protected	Private	Yes	No	

Example:

```

class A{ private:
    int a; void init();
    public:
    int b; void get();
    protected:
    float c; void put();
};
class B:public A
{
    private:
    char arr[10];
    public:
    void enter();
};
class C:private A
{
    private:
    float f;
    public:
    void show();
};

```

5.	**What should be the structure of a class when it has to be a base class for other classes?**			
Ans.	``` class classname { private: //members not intended to be inherited public: //members intended to be inherited and available to every function protected: //members intended to be inherited but not intended to be public }; ```			
6.	**Discuss a situation in which the private derivation will be more appropriate as compared to public derivation.**			
Ans.	When we want that the derived class has the direct access privilege only to the non-private members of the base class, in that situation the private derivation will be more appropriate as compared to public derivation.			
7.	**From a base class A, two classes B and C are deriving. B is deriving publicly from A whereas C is deriving privately. The classes B and C, otherwise, are doing the similar tasks. Discuss the similarities and differences between the functioning of B and c.**			
Ans.	Similarities: Private members of the base class A are not inherited in derived class B and class C at all. Differences: In class B, the public and protected members of the base class A remain public and protected whereas in class C, the public and protected members of the base class A become private members.			
8.	**Identify the error(s) and the responsible reason(s) in the following code snippet:** ``` class X { public: int a; float b; char c; }; ```			

	<pre> class Y:public X { public: int d; private: X::a; }; </pre>
Ans.	<p>In above code X::a is not allowed as we cannot deny access to certain members of a base class when inheriting publicly. Above error can be solved by inheriting the class privately as following:</p> <pre> class Y:private X { public: int d; X::a; }; </pre>
9.	<p>Identify the errors in the following code fragment. Discuss the responsible reasons for them.</p> <pre> int glob; class F{ int glob; public: void readit() { cin>>glob; } }; class W:public F { public: void test() { glob--; } }; </pre>
Ans.	<p>The compiler will not allow the class W to access F::glob as well as global glob because F::glob being private to F cannot be accessed directly by the class W, and global glob cannot be accessed in W as it is hidden here because F::glob is visible here but inaccessible.</p> <p>Above error can be solved by writing following statement in test() method:</p> <pre> ::glob--; </pre>
10.	<p>Given the definition of following two classes. Write the constructor definition for both classes.</p> <pre> class Alpha { int a; float b; char c; public: //constructor definition // has to become here : }; class Beta:public Alpha { public: //constructor definition }; </pre>
Ans.	<pre> class Alpha { int a; float b; char c; public: Alpha(int i, float j, char k) { a=i; b=j; c=k; } }; class Beta:public Alpha { </pre>

	<pre> public: Beta(int p,float q,char r):Alpha(p,q,r) { cout<<"Beta constructor..."; } }; </pre>
11.	<p>Define constructors for the classes defined below:</p> <pre> class Alpha { int a; public: float b; //the constructor definition : }; class Beta { int P; public: float q; //the constructor definition : }; class Gamma { Alpha A; Beta B; char X; public: double y; //the constructor definition : }; </pre>
Ans.	<pre> class Alpha { int a; public: float b; Alpha(int x,float y) { a=x; b=y; } }; class Beta { int P; public: float q; Beta(int i,float j) { p=i; q=j; } }; class Gamma { //Alpha A; //Beta B; char X; public: double y; Gamma(char c,double d) { x=c; y=d; } }; </pre>
12.	<p>Consider the following code:</p> <pre> #include<iostream.h> class A { public: A() { cout<<"A";} ~A() { cout<<"~A"; } }; class B { public: </pre>

	<pre> B() { cout<<"B";} ~B() { cout<<"~B"; } }; class C { public: C() { cout<<"C";} ~C() { cout<<"~C"; } private: B c1; A c2; }; class D { public: D() { cout<<"D";} ~D() { cout<<"~D"; } }; class E:public C { public: E() { cout<<"E";} ~E() { cout<<"~E"; } private: D e1; C e2; }; int main() { E e; return 0; } </pre> <p>If the program compiles and runs correctly, what does it prints out?</p>
Ans.	<p><u>Output:</u> BACDBACE~E~C~A~B~D~C~A~B</p>
13.	How does the invocation of constructor differ in derivation of class and nesting of classes?
Ans.	In derivation of class first the base class constructor is invoked, followed by the derived class constructor, whereas in nested classes constructors of all the member objects are called before the constructors of the object enclosing other objects.
14.	<p>A class One with data members int a and char b inherits from another class Two with data members float f and int x. Write definitions for One and Two for the following situations:</p> <p>(i) Objects of both the classes are able to access all the data members of both the classes.</p> <p>(ii) Only the members of class One can access all the data members of both the classes.</p>
Ans.	<pre> (i) class Two { protected: float f; int x; }; class One:private Two { int a; char b; }; (ii) class Two { public: float f; int x; </pre>

	<pre> }; class One:public Two { public: int a; char b; }; </pre>
15.	<p>Assume a class Derv derived from a base class Base. Both classes contain a member function func() that takes no arguments. Write the definition for a member function of Derv that calls both the func()s.</p>
Ans.	<pre> class Base { public: void func() { cout<<"base class"; } }; class Derv:public Base { public: void func() { cout<<"derived class"; } void callAll() { Base::func(); func(); } }; </pre>
16.	<p>What will be the output of the following program?</p> <pre> #include<iostream.h> class Student { public: Student (char pname[]=" ") { strcpy(name,pname); average=semesterHours=0; } void addCourse(int hours,float grade) { average=(semesterHours*average+grade); semesterHours+=hours; average=semesterHours; } int hours() { return semesterHours; } float gpa() { return average; } protected: char name[40]; int semesterHours; </pre>

	<pre> float average; }; class GradStudent:public Student { public: GradStudent(char pname[]=" "):Student(pname) { qual_grade=0; } int qualifier() { return qual_grade; } protected: int qual_grade; }; int main() { Student commerce("Saurabh 7/."); GradStudent gs; commerce.addCourse(4,2.5); gs.addCourse(4,3.0); return 0; } </pre>
Ans.	<p>Above code will generate various compilation errors few of them are listed below–</p> <ol style="list-style-type: none"> <code>strcpy(name,pname);</code> gives error due to missing string.h file After adding the required header file code will execute but screen will appear blank due to missing output statements.
17.	<pre> #include<iostream.h> class a { public: void something() { cout<<"a"; } }; class b { public; void something() { cout<<"b"; } }; class c:public a,public b {}; int main() { c x; x.something(); return 0; } </pre> <p>(a) <code>a::something()</code> is called (b) <code>b:: something()</code> is called (c) Runtime Error (d) Syntax Error</p>
Ans.	(d) Syntax Error
18.	<pre> #include<iostream.h> class basex { int x; public: void setx(int y) { x=y; } } </pre>

	<pre>}; class derived:base { }; What is the access level for the member function "setx" in the class "derived" above? (a) protected (b) private (c) local (d) public</pre>
Ans.	(b) private
19.	<pre>class professor {}; class teacher:public virtual professor {}; class reasearcher:public virtual professor {}; class myprofessor:public teacher,public reasearcher {}; Referring to the same code above, if a object of class "myprofrrsor" were created, how many instances of professor will it contain? (a) 4 (b) 1 (c) 2 (d) 3</pre>
Ans.	(b) 1
20.	When does ambiguity arise in multiple inheritance? How can one resolve it? What are virtual base classes? What is their significance?
Ans.	<p>An ambiguity can arise when several paths exist to a class from the same base class. This means that a child class could have duplicate sets of members inherited from a single base class. This can be solved by using a virtual base class.</p> <p>When two or more objects are derived from a common base class, we can prevent multiple copies of the base class being present in an object derived from those objects by declaring the base class as virtual when it is being inherited. Such a base class is known as virtual base class.</p> <p>When a class is made virtual, necessary care is taken so that the duplication is avoided regardless of the number of paths that exist to the child class.</p>
21.	<p>Answer the questions (i) and (iv) based on the following:</p> <pre>class Student { int Rollno; char SName[20]; float Marks1; protected: void Result(); public: Student(); void Enroll(); void Display(); }; class Teacher { long TCode; char TName[20]; protected: float Salary; public: Teacher (); void Enter(); void Show(); }; class Course:public Student,private Teacher { long CCode[10] char CourseName[50]; char StartDate[8],EndDate[8]; public: Course();</pre>

	<pre>void Commence(); void CDetail(); };</pre> <p>(i) Write the names of member functions, which are accessible from objects of class Course.</p> <p>(ii) Write the names of all data members, which is/are accessible from member function Commence of class Course.</p> <p>(iii) Write the names of all the members, which are accessible from objects of class Teacher.</p> <p>(iv) Which type of inheritance is illustrated in the above C++ code?</p>
Ans.	<p>(i) void Commence(), void CDetail(), void Enroll (), void Display ();</p> <p>(ii) CCode, CourseName, StartDate, EndDate, Salary</p> <p>(iii) void Enter (), void Show ();</p> <p>(iv) Multiple inheritance</p>
22.	<p>Answer the questions (i) to (iv) based on the following:</p> <pre>class Ball { char Btype[10]; protected: float Rate; void CalcRate(float); public: Ball(); void BInput(); void BShow(); void TEntry(); void TDisplay(); }; class SoftToys:public Toys { char STName[20]; float Weight; public: SofToys(); void STEntry(); void STDisplay(); }; class ElectronicToys:public Toys { char ETName[20]; char No_of_Batteries; public: ElectronicToys(); void ETEntry(); void ETDisplay(); };</pre> <p>(i) Which type of Inheritance is shown in the above example?</p> <p>(ii) How many bytes will be required by an object of the class SoftToys?</p> <p>(iii) Write name of all the data members accessible from member functions of the class SoftToys.</p> <p>(iv) Write name of all the member functions accessible from an object of the class ElectronicToys.</p>
Ans.	<p>In above code Ball class is not mentioned in inheritance process, it should be Toys class</p> <p>(i) Hierarchical Inheritance</p> <p>(ii) 38 Bytes</p> <p>(iii) Rate, STName, Weight</p> <p>(iv) ETEntry, ETDisplay, BInput, BShow, TEntry, TDisplay</p>
23.	<p>Answer the question (i) to (iv) based on the following code:</p> <pre>class Trainer { char TNo[5], TName[20], Specialisation[10];</pre>

```

        int Days;
protected:
    float Remuneration;
    void AssignRem(float);
public:
    Trainer();
    void TEntry();
    void TDisplay();
};
class Learner
{
    char Regno[10], LName[20], Prpgram[10];
protected:
    int Attendance, Grade;
public:
    Learner();
    void LEntry();
    void LDisplay();
};
class Institute:public Learner, public Trainer
{
    char ICode[10], IName[20];
public:
    Institute();
    vod IEntry();
    void IDisplay();
};

```

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

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

```

    TEntry()
    LDisplay()
    IEntry()

```

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

(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. (i) Multiple Inheritance
(ii) None (Since all of these functions can be called from object of class Institute).
(iii) Data Members: Remuneration, Attendance, Grade, ICode, IName
Member Functions: AssignRem(), TEntry(), TDisplay(), LEntry(), LDisplay(), IEntry(), IDisplay()
(iv) IEntry(), IDisplay

24. Consider the following and answer the questions give below:

```

class MNC
{
    char Cname[25];        //Compay 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

```


	<pre> protected: void Association(); public: Branch(); void Add(); void Show(); }; class Outlet:public Branch { char State[25]; public: Outlet(); void Enter(); void Output(); }; </pre> <p>(i) Which class' constructor will be called first at the time of declaration of an object of class Outlet?</p> <p>(ii) How many bytes does a object belonging to class Outlet require?</p> <p>(iii) Name the member function(s), which are accessed from the object(s) of class Outlet.</p> <p>(iv) Name the data member(s), which are accessible from the object(s) of class Branch.</p>
Ans.	<p>(i) class MNC</p> <p>(ii) 129 Bytes</p> <p>(iii) Enter(), Output(), Add(), Show(), EnterData(), DisplayData()</p> <p>(iv) Country[25]</p>
25.	<p>Answer the questions (i) and (iv) based on the following:</p> <pre> class Director { long DID; //Director identification number char Name[20]; protected: char Description[40]; void Allocate(); public: Director(); void Assign(); void Show(); }; class Factory:public Director { int FID; //Factory ID char Address[20]; protected: int NOE // No Of Employees public: Factory(); void Input(); void Output(); }; class ShowRoom:private Factory { int SID; //ShowRoom ID char City[20]; public: ShowRoom(); void Enter(); void Display(); }; </pre>

	<p>(i) Which type of inheritance out of the following is illustrated in the above C++ code?</p> <ol style="list-style-type: none"> Single level inheritance Multi level inheritance Multiple inheritance <p>(ii) Write the names of data members, which are accessible by objects of class type ShowRoom.</p> <p>(iii) Write the names of all member functions which are accessible by objects of class type ShowRoom.</p> <p>(iv) Write the names of all members, which are accessible from member functions of class Factory.</p>
Ans.	<p>(i) Multi level inheritance</p> <p>(ii) None</p> <p>(iii) Enter(), Display(), Enter(), Display()</p> <p>(iv) Data Members: FID, Address, NOE Member Functions: Input(), Output()</p>
26.	<p>Answer the questions (i) to (iv) based on the following:</p> <pre> class FaceToFace { char CenterCode[10]; public: void Input();void Output(); }; class Online { char website[50]; public: void SiteIn(); void SiteOut(); }; class Training: public FaceToFace, private online { long Tcode; float charge; int period; public: void Register(); void show(); }; </pre> <p>(i) Which type of inheritance is shown in the above example?</p> <p>(ii) Write names of all the member functions accessible from Show() function of class Training.</p> <p>(iii) Write name of all the member accessible through an object of class Training.</p> <p>(iv) Is the function Output() accessible inside the function SiteOut()? Justify your answer?</p>
Ans.	<p>(i) Multiple Inheritance</p> <p>(ii) Register() SiteIn(), SiteOut(), Input(), Output()</p> <p>(iii) Register(), Show(), Input(), Output().</p> <p>(iv) No, function Output() is not directly accessible inside the function SiteOut(), because Output() is a member function of class FaceToFace and SiteOut() is a member function of class Online, and the classes FaceToFace and Online are two independent classes.</p>

LONG ANSWER QUESTIONS

1.	<p>Imagine a publishing company that markets both books and audio-cassette versions of its works. Create a class publication that stores the title (a string) ad price (type float) of a publication. From this class derive two classes: book, which adds a page count (type int); and tape, which adds a playing time in minutes (type float). Each of these three classes should have a getdata() function to get its data from the user at the keyboard, and a putdata()</p>
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	function to display its data. Write a main() program to test the book and tape classes by creating instances of them, asking the user to fill in their data with getdata(), and then displaying the data with putdata().
Ans.	<pre> #include<iostream.h> #include<conio.h> #include<stdio.h> class publication { char title[20]; float price; public: void getdata() { cout<<"Enter title: "; gets(title); cout<<"Enter price: "; cin>>price; } void putdata() { cout<<"Title: "<<title<<endl; cout<<"Price: "<<price<<endl; } }; class book:public publication { int page_count; public: void getdata() { publication::getdata(); cout<<"Enter page count: "; cin>>page_count; } void putdata() { publication::putdata(); cout<<"Page count: "<<page_count<<endl; } }; class tape:public publication { float play_time; public: void getdata() { publication::getdata(); cout<<"Enter Play time: "; cin>>play_time; } void putdata() { publication::putdata(); cout<<"Play time: "<<play_time<<endl; } }; void main() { clrscr(); book b; tape t; b.getdata(); </pre>

	<pre> b.putdata(); t.getdata(); t.putdata(); getch(); } </pre>
2.	<p>Assume that a bank maintains two kinds of accounts for customers, one called as savings account and the other as current account. The saving account provides compound interest and withdrawal facilities but not cheque book facility. The current account provides cheque book facility but no interest. Current account holders should also maintain a minimum balance and if the balance falls below this level, a service charge is imposed. Create a class Account that stores customer name, account number and opening balance. From this derive the classes Current and Saving to make them more specific to their requirements. Include necessary member functions in order to achieve the following tasks:</p> <p>(i) deposit an amount for a customer and update the balance (ii) display the account details (iii) compute and deposit interest (iv) withdraw amount for a customer after checking the balance and update the balance. (v) check for the minimum balance (for current account holders), impose penalty, if necessary, and update the balance.</p> <p>Implement these without using any constructor.</p>
Ans.	<pre> #include<iostream.h> #include<conio.h> #include<stdio.h> #include<process.h> int const min=500; class Account { char name[20]; long ano; public: void getdata() { cout<<"Enter customer name: "; gets(name); cout<<"Enter account no.: "; cin>>ano; cout<<"Enter opening balance: "; cin>>balance; } void display() { cout<<"Customer name: "<<name<<endl; cout<<"Account no: "<<ano<<endl; cout<<"Balance : "<<balance; } }; class Current:public Account { float depo,with,pen; public: void deposit() { cout<<endl<<"Enter money to deposit: "; cin>>depo; display(); balance=balance+depo; cout<<endl<<"After deposit main balance is: "<<balance<<endl; } void withdraw() </pre>

```

        {
            cout<<endl<<"Enter money to withdraw: ";
            cin>>with;
            if(with<balance)
            {
                display();
                balance=balance-with;
                cout<<endl<<"After withdraw main balance is: "<<balance<<endl;
            }
            else
            {
                cout<<endl<<"You cannot withdraw money....."<<endl;
            }
        }
    void check_bal()
    {
        if(balance<min)
        {
            cout<<"Opening balance should not be less than 500....."<<endl;
            balance=balance-150;
            cout<<endl<<"After penalty main balance is: "<<balance<<endl;
        }
    }
};
class Savings:public Account
{
    float depo,with,intr;
public:
    void deposit()
    {
        cout<<endl<<"Enter money to deposit: ";
        cin>>depo;
        display();
        balance=balance+depo;
        cout<<endl<<"After deposit main balance is: "<<balance<<endl;
    }
    void withdraw()
    {
        cout<<endl<<"Enter money to withdraw: ";
        cin>>with;
        if(with<balance)
        {
            display();
            balance=balance-with;
            cout<<endl<<"After withdraw main balance is: "<<balance<<endl;
        }
        else
        {
            cout<<"You cannot withdraw money....."<<endl;
        }
    }
    void cal_intr()
    {
        intr=(balance*2)/100;
        balance=balance+intr;
        cout<<endl<<"After calculating interest balance is: "<<balance;
    }
};
void main()
{
    clrscr();
    Current c;
    Savings s;
    char ch;
    int choice,ch2;
    cout<<"Enter 'S' for saving and 'C' for current: ";
    cin>>ch;
    if(ch=='C' || ch=='c')

```

	<pre> { c.getdata(); c.check_bal(); l2:cout<<"\n 1. Display \n 2.Deposit \n 3.Withdraw \n 4. Exit \n"; cout<<"Enter your choice: "; cin>>choice; switch(choice) { case 1: c.display(); goto l2; break; case 2: c.deposit(); goto l2; break; case 3: c.withdraw(); goto l2; break; case 4: exit(0); } } else if(ch=='S' ch=='s') { s.getdata(); l1:cout<<"\n 1. Display \n 2.Deposit \n 3.Withdraw \n 4.Calculate interest \n 5. Exit \n"; cout<<"Enter your choice: "; cin>>ch2; switch(ch2) { case 1: s.display(); goto l1; break; case 2: s.deposit(); goto l1; break; case 3: s.withdraw(); goto l1; break; case 4: s.cal_intr(); goto l1; break; case 5: exit(0); } } else cout<<"Wrong choice....."<<endl; getch(); } </pre>
3.	Modify the program 2 of Type C to include constructors for the three classes.
Ans.	<pre> class Account { public Account() { strcpy(name,"NULL"); ano=0; balance=0.0; } // same as above }; class Current:public Account { public Current() { depo=0.0;with=0.0;pen=0.0; } // same as above </pre>

	<pre> }; class Savings:public Account { public Savings() { depo=0.0;with=0.0;intr=0.0; } // same as above }; void main() { // same as above } </pre>
4.	<p>Write a declaration for a class Person which has the following:</p> <ul style="list-style-type: none"> ▪ data members name, phone ▪ set and get functions for every data member ▪ a display function ▪ a destructor <p>(i) For the Person class above, write each of the constructor, the assignment operator, and the getName member function. Use member initialization lists as often as possible.</p> <p>(ii) Given the Person class above, write the declaration for a class Spouse that inherits from Person and does the following:</p> <ul style="list-style-type: none"> ▪ has an extra data member spouseName ▪ redefines the display member function. <p>(iii) For the Spouse class above, write each of the constructors and the display member function. Use member initialization lists as often as possible.</p>
Ans.	<pre> class Person { char name[20]; long phone; public: void set() { strcpy(name, "NULL"); phone=7878963522; } void get() { cout<<"Enter name: "; gets(name); cout<<"Enter phone: "; cin>>phone; } void display() { cout<<"Name: "<<name<<endl; cout<<"Phone: "<<phone<<endl; } Person() { strcpy(name, "Rahul"); phone=9965869922; } Person(char na[20],long ph) { name=na; phone=ph; } void getName() { cout<<"Enter name:"; gets(name); } } </pre>

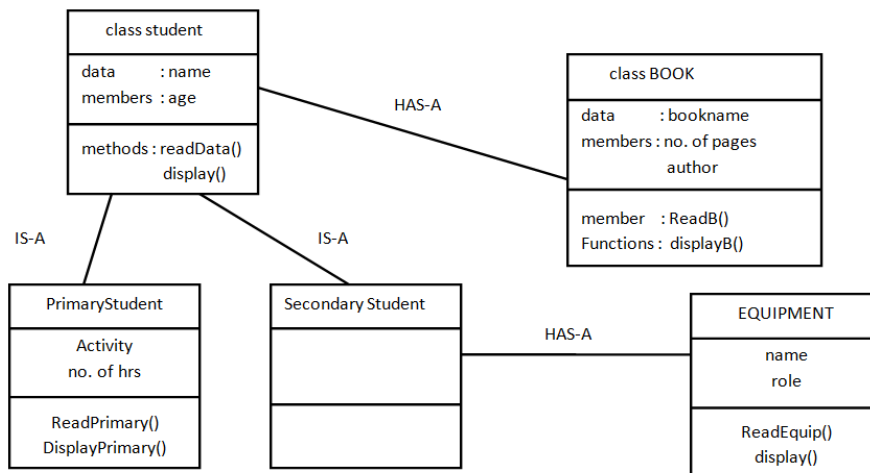
	<pre> }; class Spouse:public Person { char spouseName[20]; public: void getName() { cout<<"Enter name:"; gets(spousename); } void display() { cout<<"Name: "<<name<<endl; cout<<"Phone: "<<phone<<endl; cout<<"spouse name: "<<spousename<<endl; } Spouse() { strcpy(spouseName,"NULL"); } Spouse(char sn[20]) { spouseName=sn; } }; </pre>
5.	Modify the above program so that Clerk and Officer classes contain object of another class called Education that holds two pieces of educational information, namely qualification and experience. Incorporate the functions for handling this additional information.
Ans.	Question referring the class are not mentioned in any of the above question.
6.	Write a C++ to read and display information about employees and managers. Employee is a class that contains employee number, name, address ad department. Manager class contains all information of the employee class and a list of employees working under a manager.
Ans.	<pre> #include<iostream.h> #include<conio.h> class employee { public: int num,house ; char city[20], state[20], name[20],depart[20]; public: void input() { cout<<"Enter the employe's name"; cin>>name; cout<<"Enter the employe number"; cin>>num; cout<<"Enter the address including house number ,city ,state"; cin>>house>>city>>state; cout<<"enter the department"; cin>>depart; } void output() { cout<<"\nemploye's infomation:"; cout<<"\n"<<name<<"\n"<<num<<"\n"<<"address -:" <<"\n"<<house<<" "<<city<<"\n"<<state; cout<<"\n"<<depart; } } </pre>


```

};
class manager: public employee
{
    char name[20];
    int n ,i;
public:
    void getdata()
    {
        cout<<"Enter the manager's name";
        cin>>name;
        cout<<"enter the total number of employe's working under him";
        cin>>n;
    }
    void info();
};
void manager::info()
{
    getdata();
    for(i=1;i<=n;i++)
    {
        input();
    }
    cout<<name;
    cout<<"\nemploye's are-\n" ;
    for(i=1;i<=n;i++)
    {
        cout<<i<<" employe-:" ;
        output();
    }
}
void main()
{
    class manager M;
    clrscr();
    M.info();
    getch();
}

```

7. Create the following class hierarchy in C++.



Ans.

```

class student
{
    char name[20];
    int age;

```

```
    public:
        void readData();
        void display();
};
class Book
{
    student Enrollno;
    char bookname[20],author[20];
    int no_of_pages;
    public:
        void ReadB();
        void displayB();
};
class PrimaryStudet:public student
{
    char Activity[20];
    int no_of_hrs;
    public:
        void ReadPrimary();
        void DisplayPrimary();
};
class SecondaryStudet:public student
{};
class EQUIPMENT
{
    char name[20];
    int role;
    public:
        void ReadEquip();
        void Display();
};
```

CHAPTER-7

Data File Handling

VERY SHORT/SHORT ANSWER QUESTIONS

1.	What are input and output streams? What is the significance of fstream.h file?		
Ans.	<p><u>Input stream:</u> The stream that supplies data to the program is known as input stream.</p> <p><u>Output stream:</u> The stream that receives data from the program is known as output stream.</p> <p>fstream.h file includes the definitions for the stream classes ifstream, ofstream and fstream. In C++ file input output facilities implemented through fstream.h header file.</p>		
2.	Discuss the files stream classes defined inside fstream.h header file.		
Ans.	<p>ifstream: can be used for read operations.</p> <p>ofstream: can be used for write operations.</p> <p>fstream: can be used for both read & write operations.</p>		
3.	What are the steps involved in using a file in a C++ program?		
Ans.	<p>In order to process files, follow these steps:</p> <p>(i) Determine the type of link.</p> <p>(ii) Declare a stream accordingly.</p> <p>(iii) Link file with the stream</p> <p>(iv) Process as required, and</p> <p>(v) De-link the file with the stream.</p>		
4.	Describe the various classes available for file operations.		
Ans.	Class	Functions	
	filebuf	It sets the file buffers to read and write.	
	fstreambase	This is the base class for fstream, ifstream and ofstream classes.	
	ifstream	It provides input operations for file.	
	ofstream	It provides output operations.	
	fstream	It provides support for simultaneous input and output operations.	
5.	Discuss the two methods of opening a file within a C++ program. When is one method preferred over the other?		
Ans.	<p>A file can be opened in two ways :-</p> <p>a) Using the constructor of the stream class – This method is useful when only one file is used in the stream. Constructors of the stream classes ifstream, ofstream and fstream are used to initialize the file stream object with the file name. For example,</p> <pre>ifstream read_file("Names.Dat");</pre> <p>b) Using the function open() - This method is useful when we want to use different files in the stream. If two or more files are to be processed simultaneously, separate streams must be declared for each. For example,</p> <pre>ifstream ifl; //input stream ifl created ifl.open("Names.Dat"); // file Names.Dat linked with ifl</pre> <p>Second method is preferred over first method when there is a situation to open more than one file.</p>		
6.	<p>When a file is opened for output what happens when</p> <p>(i) the mentioned file does not exist.</p> <p>(ii) the mentioned file does exist.</p>		
Ans.	<p>(i) Creates a new file.</p> <p>(ii) the act of opening a file for output scraps it off so that output starts with a fresh file.</p>		
7.	Explain how while (filin) statement detects the eof for a file i.e., connected to filin stream.		
Ans.	<p>To detect end of file, without using EOF(), we may check whether the stream object has become NULL or not. For example,</p> <pre>while(filin){ }</pre>		

	The value in filin becomes zero when the end of file is reached, and the loop ends. Since reading occurs inside the loop, there will be no more attempts to read the file.																		
8.	What role is played by file modes in file operations? Describe the various file mode constants and their meanings.																		
Ans.	<p>A file mode describes how a file is to be used: read it, write to it, append it, and so on. Different file modes constants and their meanings are as following:</p> <table> <tr> <th>Constant</th><th>Meaning</th></tr> <tr> <td>ios::in</td><td>Opens file for reading.</td></tr> <tr> <td>ios::out</td><td>Opens file for writing.</td></tr> <tr> <td>ios::ate</td><td>This seeks to end-of-file upon opening of the file.</td></tr> <tr> <td>ios::app</td><td>This causes all output to that file to be appended to the end.</td></tr> <tr> <td>ios::trunc</td><td>The contents of a pre-existing file by the same name to be destroyed and truncates the file to zero length.</td></tr> <tr> <td>ios::nocreate</td><td>Causes open() function to fail if the file does not already exist.</td></tr> <tr> <td>ios::noreplace</td><td>Causes open() function to fail if the file already exist.</td></tr> <tr> <td>ios::binary</td><td>Causes a file to be opened in binary mode.</td></tr> </table>	Constant	Meaning	ios::in	Opens file for reading.	ios::out	Opens file for writing.	ios::ate	This seeks to end-of-file upon opening of the file.	ios::app	This causes all output to that file to be appended to the end.	ios::trunc	The contents of a pre-existing file by the same name to be destroyed and truncates the file to zero length.	ios::nocreate	Causes open() function to fail if the file does not already exist.	ios::noreplace	Causes open() function to fail if the file already exist.	ios::binary	Causes a file to be opened in binary mode.
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9.	Write a code snippet that will create an object called filout for writing, associate it with the filename STRS. The code should keep on writing strings to it as long as the user wants.																		
Ans.	<pre>#include<iostream.h> #include<stdio.h> #include<conio.h> #include<fstream.h> void main(){ char c,fname[10]; ofstream filout; filout.open("STRS"); cout<<"Enter contents to store in file (Enter # to stop):\n"; while((c=getchar())!='#') { filout<<c; } filout.close(); getch(); }</pre>																		
10.	How many file objects would you need to create to manage the following situations? Explain (i) to process three files sequentially (ii) to merge two sorted files into a third file																		
Ans.	i) 3 ii) 3																		
11.	Both ios::ate and ios::app place the file pointer at the end of the file when it is opened. What then, is the difference between them?																		
Ans.	Both ios::ate and ios::app place the file pointer at the end of the file when it is opened. The difference between the two is that ios::app lets you add data to the end of the file only, while the ios::ate mode when opened with ofstream allows you to write data anywhere in the file, even over old data.																		
12.	What are the advantages of saving data in: (i) binary form (ii) text form																		
Ans.	(i) binary form: <ul style="list-style-type: none"> ✓ Binary files are faster and easier for a program to read and write than are text files. ✓ As long as the file doesn't need to be read by people or need to be ported to a different type of system, binary files are the best way to store program information. (ii) text form: <ul style="list-style-type: none"> ✓ It can be read by people. 																		

	✓ It can be ported to a different type of system.
13.	When do you think text files should be preferred over binary files?
Ans.	When file does need to be read by people or need to be ported to a different type of system, text files should be preferred over binary files.
14.	Write a program that counts the number of characters up to the first \$ in input and that leaves the \$ in the input stream.
Ans.	<pre> #include<fstream.h> #include<stdio.h> #include<iostream.h> void main(){ char s[80],ch; int count=0; ifstream file("abc.txt"); while(!file.eof()) { file.getline(s,80); for(int i=0;i<80;i++) { if(s[i]=='\$') break; count++; } }; cout<<count; file.close(); } </pre>
15.	Write a program that reads a text file and creates another file that is identical expect that every sequence of consecutive blank space is replaced by a single space.
Ans.	<pre> #include <fstream.h> #include <iostream.h> #include <ctype.h> #include <conio.h> void main(){ char ch; int count=0; ifstream in_stream; ofstream out_stream; clrscr(); in_stream.open("A.txt"); out_stream.open("B.txt"); while (!in_stream.eof()) { ch = (char)in_stream.get(); if(isspace(ch)) count++; if(count >= 2) { ch=' '; count = 0; } else { out_stream <<ch; } } } </pre>

16.	Suggest the situation where write() and read() are preferred over get() and put() for file I/O operations. Support your answer with examples.										
Ans.	<p>The get() and put() functions perform I/O byte by byte. On the other hand, read() and write() functions let you read and write structures and objects in one go without creating need for I/O for individual constituent fields.</p> <p>Example:</p> <pre>file.get(ch); file.put(ch); file.read((char *)&obj, sizeof(obj)); file.write((char *)&obj, sizeof(obj));</pre>										
17.	Discuss the working of good() and bad() functions in file I/O error handling.										
Ans.	<p><u>good()</u>: Returns nonzero (true) if no error has occurred. For instance, if fin.good() is true, everything is okay with the stream named as fi and we can proceed to perform I/O operations. When it returns zero, no further operations can be carried out.</p> <p><u>bad()</u>: Returns true if a reading or writing operation fails. For example in the case that we try to write to a file that is not open for writing or if the device where we try to write has no space left.</p>										
18.	What are the similarities and differences between bad() and fail() functions.										
Ans.	<p><u>Similarities</u>: bad() and fail() both are error handling functions and return true if a reading or writing operation fails.</p> <p><u>Differences</u>: Both bad() and fail() return true if a reading or writing operation fails but fail() also returns true in the case that a format error happens, like when an alphabetical character is extracted when we are trying to read an integer number.</p>										
19.	How is the working of file I/O error handling functions associated with error-status flags?										
Ans	<p>The error-status flags store the information on the status of a file that is being currently used. The current state of the I/O system is held in an integer, in which the following flags are encoded:</p> <table border="1"> <thead> <tr> <th>Name</th><th>Meaning</th></tr> </thead> <tbody> <tr> <td>eofbit</td><td>1 when end-of-file is encountered, 0 otherwise.</td></tr> <tr> <td>failbit</td><td>1 when non-fatal I/O error has occurred, 0 otherwise.</td></tr> <tr> <td>badbit</td><td>1 when fatal I/O error has occurred, 0 otherwise.</td></tr> <tr> <td>goodbit</td><td>0 value</td></tr> </tbody> </table>	Name	Meaning	eofbit	1 when end-of-file is encountered, 0 otherwise.	failbit	1 when non-fatal I/O error has occurred, 0 otherwise.	badbit	1 when fatal I/O error has occurred, 0 otherwise.	goodbit	0 value
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20(a)	<p>Observe the program segment given below carefully, and answer the question that follows:</p> <pre>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) { fstream File; File.open("BOOK.DAT",ios::binary ios::in ios::out); Book OB; int Recordsread=0,Found=0; while(!Found&&File.read((char*)&OB,sizeof(OB))) { Recordsread++; if(NEW.RBook_no()==OB.RBook_OB()) { _____ //Missing Statement File.write((char*)&NEW,sizeof(NEW)); Found=1; } } else</pre>										

	<pre> File.write((char*)&OB,sizeof(OB)); } if(!Found) cout<<"Record for modification does not exist"; File.close(); } </pre> <p>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.</p>
Ans.	File.seekg(-1*sizeof(NEW),ios::cur);
20(b)	<pre> int main() { char ch='A'; fstream fileout("data.dat",ios::out); fileout<<ch; int p=fileour.tellg(); cout<<p; return 0; } </pre> <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).</p>
Ans.	1
20(c)	<p>(i) 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.</p> <p>(ii) 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.</p> <pre> 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 Showscreen() { cout<<Idno<<": "<<Type<<endl<<Desc<<endl; } }; </pre>
Ans.	<pre> (i) void countspace(){ ifstream fins; fins.open("NOTES.TXT"); char ch; int count=0; while(!fins.eof()) { fin.get(ch); if(ch==' ') count++; } cout<<"Number of blank spaces"<<count; fin.close(); } (ii) </pre>
21.	int main()

	<pre> { char ch='A'; fstream fileout("data.dat",ios::app); fileout<<ch; int p=fileout.tellg(); cout<<p; return 0; } </pre> <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).</p>
Ans.	4
22(a)	<p>Observe the program segment given below carefully, and answer the question that follows:</p> <pre> class Labrecord { int Expno; char Expriment[20]; char Checked; int Marks; public: //function to enter Expriment details void EnterExp(); //function to display Expriment details void ShowExp(); //fuction to retur Expno char RChecked() { return Checked; } //fuction to assign Marks void Assignmarks(int M) { 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); _____ //statement 1 _____ //statement 2 Rec++; } File.close(); } </pre> <p>If the function ModifyMarks() is supposed to modify Marks for the records in 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 statement 2 is to perform the write operation with the modified record.</p>
Ans.	<p>Statement 1:</p> <pre>File.seekp(-1*sizeof(L),ios::cur);</pre> <p>Statement 2:</p> <pre>File.write((char*)&L,sizeof(L));</pre>
22(b)	<p>Write a function in C++ to print the count of the word as an independent word in a text file STORY.TXT. For example, if the content of the file STORY.TXT is:</p>

	<p>There was a monkey in the zoo.</p> <p>The monkey was very naughty.</p> <p>Then the output of the program should be 2.</p>
Ans.	<pre>void wordcount(){ ifstream fil("STORY.TXT"); char word[30]; //assuming longest word can be 29 characters long int count=0; while(!fil.eof()) { cin>>word; if((strcmp("the",word)==0) && (strcmp("The",word)==0)); count++; } fil.close(); cout<<count; }</pre>
22(c)	<p>Given a binary file SPORTS.DAT, containing records of the following structure type:</p> <pre>struct Sports { char Event[20]; char Participant[10][30]; };</pre> <p>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".</p>
Ans.	<pre>void copyfile(){ ifstream fin; ofstream fout; fin.open("SPORTS.DAT",ios::in ios::binary); fout.open("ATHELETIC.DAT",ios::out ios::binary); Sports s1; while(!fin.eof()) { fin.read((char*)&s1,sizeof(s1)); if(strcmp(s1.Event,"Athletics")==0) fout.write((char*)&s1,sizeof(s1)); } fin.close(); fout.close(); }</pre>

LONG ANSWER QUESTIONS

1(a)	<p>Observe the program segment given below carefully and fill the blanks marked as statement 1 and Statement 2 using tellg() and seekp() functions for performing the required task.</p> <pre>#include<fstream.h> class Customer { long Cno; char Name[20],Mobile[12]; public: //function to allow user to enter the Cno, Name, Mobile void Enter(); //function to allow user to enter (modify) mobile number void Modify(); //function to return value of Cno long GetCno() { return Cno;} }; void ChangeMobile() {</pre>
-------------	---

	<pre> Customer C; fstream F; F.open("CONTACT.DAT",ios::binary ios::in ios::out); long Cnoc; //customer no. whose mobile number needs to be changed cin>>Cnoc; while(F.read((char*)&C,sizeof(c))) { If(Cnoc==C.GetCno()) { C.Modify(); //statement 1 Int Pos= _____ //to find the current position //of file pointer // statement 2 _____ //to move the file pointer to write the //modified the record back on to the file //for the desired Cnoc F.write((char*)&C,sizeof(c)); } } File.close(); } </pre>
Ans.	<p>Statement 1: F.tellg() ;</p> <p>Statement 2: F.seekp(Pos-sizeof(C)); OR F.seekp(-1*sizeof(C) ,ios::cur);</p>
1(b)	<p>Write a function in C++ to count the words to and the present in a text file "POEM.TXT". [Note. that the words "to' and "the" are complete words.]</p>
Ans.	<pre> void COUNT () { ifstream File; File. open (POEM.TXT); char Word[80] ; int C1 = 0, C2 = 0; while(!File.eof()) { File>>Word; if (strcmp (Word, to) ==0) C1++; else if (strcmp (Word, the) ==0) C2++; } cout<<"Count of -to- in file:" <<C1; cout<<"Count of -the- in file:"<<C2; File.close(); //Ignore } </pre>
1(c).	<p>Write a function in C++ to search and display details. of all trains, whose destination is "Delhi" from a binary file "TRAIN.DAT". Assuming the binary file is containing the objects of the following class.</p> <pre> class TRAIN { int Tno; // Train Number char From[20]; // Train Starting Point char To[20]; // Train Destination </pre>

	<pre> public: char* GetFrom () {return From;} char* GetTo () {return To;} void Input () {cin>>Tno;gets(From);gets(To);} void Show () {cout<<Tno<<:<<From<<:<<To<<endl;} }; </pre>
Ans.	<pre> void Read () { TRAIN T; ifstream fin; fin.open (TRAIN.DAT, ios::binary); while(fin.read((char*)&T, sizeof(T))) { if(strcmp(T.GetTo() ,Delhi)==0) T.Show() ; } fin.close(); //Ignore } </pre>
2.	<p>Observe the program segment given below carefully, and answer the question that follows:</p> <pre> 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(log 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.MarkChange(); _____ //Statement 1 _____ //statement 2 Found=1; } Record++; } if(found==1) cout<<"Recoed Updated"; File.close(); } </pre> <p>Write the statement 1 to position the File Pointer at the beginning of the Record for which the Candidate's Id matches with the argument passed, ad statement 2 to write the updated Recode at that position.</p>
Ans.	<p>Statement 1:</p> <pre>File.seekg()-1*sizeof(C),ios::cur);</pre> <p>Statement 2:</p> <pre>File.write((char*)&C,sizeof(C));</pre>
3.	Write a function in C++ to count the number of uppercase alphabets present in a text file "ARTICLE.TXT".

Ans.	<pre> int countupcase(){ ifstream fin("ARTICLE.TXT"); int count=0; char ch; while(!fin.eof()) { fin>>ch; if(isupper(ch)) count++; } fin.close(); return count; } </pre>
4.	<p>Given a binary file TELEPHON.DAT, containing records of the following class Directory:</p> <pre> 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); } }; </pre> <p>Write a function COPYABC() in C++, that would copy all those records having AreaCode as "123" from TELEPHONE.DAT to TELEBACK.DAT.</p>
Ans.	<pre> void COPYABC(){ ifstream fin("TELEPHON.DAT",ios::in ios::binary); ofstream fout("TELEBACK.DAT",ios::out ios::binary); Directory ph; while(!fin.eof()) { fin.read((char*)&ph,sizeof(ph)); if(ph.checkcode("123")==0) fout.write((char*)&ph,sizeof(ph)); } fin.close(); fout.close(); } </pre>
5.	<p>Observe the program segment given below carefully, and answer the question that follows:</p> <pre> class Team { long TId[10]; //Team's Id char TName[20]; //Team's Name float Points; //Team's Points public: void Accept(); void Show(); void PointChange(); //Function to change Points long R_TId() {return TId; } }; void ReplacePoints(long Id) { fstream File; File.open("TEAM.DAT",ios::binary ios::in ios::out); Team T; int Record=0;Found=0; while(!Found && File.read((char*)&T,sizeof(T))) </pre>

	<pre> { if(Id==T.R_TId()) { cout<<"Enter new Points"; T.PointsChange(); _____ //Statement 1 _____ //Statement 1 Found=1; } Record++; } if(found==1) cout<<"Record Updated"; File.close(); } </pre> <p>Write the statement 1 to position the File Pointer at the beginning of the Record for which the Team's Id matches with the argument passed, ad statement 2 to write the updated Recode at that position.</p>
Ans.	<p>Statement 1:</p> <pre>File.seekg()-1*sizeof(T),ios::cur);</pre> <p>Statement 2:</p> <pre>File.write((char*)&T,sizeof(T));</pre>
6.	Write a function in C++ to count the number of digits present in a text file "PARA.TXT".
Ans.	<pre> void countdigit(){ ifstream fil("PARA.TXT",ios::in); int count=0; char ch=fil.get(); while(!fil.eof()) { if(isdigit(ch)) count++; ch=fil.get(); } cout<<"no of digit: "<<count<<endl; } </pre>
7.	<p>Given a binary file CONSUMER.DAT, containing records of the following structure type</p> <pre> class Consumer { char C_Name[20]; char C_Address[30]; char Area[25]; char C_Phone_No[15]; public: void Ledger(); void Disp(); int checkCode(char AC[]) { return strcmp(Area,AC); } }; </pre> <p>Write a function COPYAREA() in C++, that would copy all those records having Area as "SOUTH" from CONSUMER.DAT to BACKUP.DAT.</p>
Ans.	<pre> void COPYAREA(){ ifstream fin("CONSUMER.DAT",ios::in ios::binary); ofstream fout("BACKUP.DAT",ios::out ios::binary); Consumer c; while(!fin.eof()) { fin.read((char*)&c,sizeof(c)); if(c.checkcode("SOUTH")==0) fout.write((char*)&c,sizeof(c)); } } </pre>

	<pre> fin.close(); fout.close(); } </pre>
8.	<p>Observe the program segment given below carefully, and answer the question that follows:</p> <pre> class PracFile { int Pracno; char PracName[20]; char TimeTaken; int Marks; public: //function to enter PracFile details void EnterPrac(); //function to display PracFile details void ShowPrac(); //function to return TimeTaken char RTime() { return TimeTaken; } //function to assign Marks void Assignmarks(int M) { Marks=M; }; }; void AllocateMarks() { fstream File; File.open("MARKS.DAT",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); _____ //statement 1 _____ //statement 2 Record++; } File.close(); } </pre> <p>If the function AllocateMarks() is supposed to Allocate Marks for the records in file MARKS.DAT based on their value of 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 statement 2 is to perform the write operation with the modified record.</p>
Ans.	<p>Statement 1: File.seekp((Record)*sizeof(P)); OR File.seekp(-1*sizeof(P),ios::cur); Statement 2: File.write((char*)&P,sizeof(P));</p>
9.	<p>Write a function in C++ to print the count of the word is an independent word in a text file DIALOGUE.TXT. For example, if the content of the file DIALOGUE.TXT is:</p> <p><i>This is his book. Is this good?</i></p> <p>Then the output of the program should be 2.</p>
Ans.	<pre> void wordcount { ifstream fin("DIALOGUE.TXT"); char word[10]; int wc=0; while(!fin.eof()) { fin>>word; } } </pre>

	<pre> if((strcmp(word,"Is")==0) (strcmp(word,"is")==0)) wc++; } cout<<wc; fin.close(); } </pre>
10.	<p>Given a binary file GAME.DAT, containing records of the following structure type</p> <pre> struct Game { char GameName[20]; char Participant[10][30]; }; </pre> <p>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 event name is "Basket Ball".</p>
Ans.	<pre> void CreateNewFile(){ Game gl; ifstream fin; ofstream fout; fin.open("GAME.DAT",ios::in ios::binary); fout.open("BASKET.DAT",ios::out ios::binary); while(!fin.eof()) { fin.read((char*)&gl,sizeof(gl)); if(strcmp(gl.GameName,"Basket Ball")==0) fout.write((char*)&gl,sizeof(gl)); } fin.close(); fout.close(); } </pre>
11.	<p>A file contains a list of telephone numbers in the following form:</p> <pre> Arvind 7258031 Sachin 7259197 Karma 5119812 </pre> <p>The names contain only one word the names and telephone numbers are separated by white spaces. Write program to read a file and display its contents in two columns.</p>
Ans.	<pre> #include<fstream.h> #include<conio.h> void main(){ ifstream fin; fin.open("telephone.txt"); char ch; while(!fin.eof()) { fin.get(ch); cout<<ch; } fin.close(); getch(); } </pre>
12.	<p>Write a program that will create a data file similar to the one mentioned in question 1 (type C). Use a class object to store each set of data.</p>
Ans.	<p>Try to solve this problem.</p>
13.	<p>Write a program that copies one file to another. Has the program to take the file names from the users? Has the program to refuse copy if there already is a file having the target name?</p>
Ans.	<pre> #include<iostream.h> #include<conio.h> </pre>

	<pre> #include<fstream.h> #include<stdlib.h> void main(){ ofstream outfile; ifstream infile; char fname1[10],fname2[20]; char ch,uch; clrscr(); cout<<"Enter a file name to be copied "; cin>> fname1; cout<<"Enter new file name"; cin>>fname2; infile.open(fname1); if(infile.fail()) { cout<< " No such a file Exit"; getch(); exit(1); } outfile.open(fname2,ios::noreplace); if(outfile.fail()) { cout<<"File Already Exist"; getch(); exit(1); } else { while(!infile.eof()) { ch = (char)infile.get(); outfile.put(ch); } } infile.close(); outfile.close(); getch(); } </pre>
14.	Write a program that appends the contents of one file to another. Have the program take the filenames from the user.
Ans.	<pre> #include<iostream.h> #include<conio.h> #include<fstream.h> #include<stdlib.h> void main(){ ofstream outfile; ifstream infile; char fname1[10],fname2[20]; char ch,uch; clrscr(); cout<<"Enter a file name from where to append "; cin>> fname1; cout<<"Enter the file name where to append"; cin>>fname2; infile.open(fname1); </pre>

	<pre> if(infile.fail()) { cout<< " No such a file Exit"; getch(); exit(1); } outfile.open(fname2,ios::app); while(!infile.eof()) { ch = (char)infile.get(); outfile.put(ch); } infile.close(); outfile.close(); getch(); } </pre>
15.	Write a program that reads character from the keyboard one by one. All lower case characters get store inside the file LOWER, all upper case characters get stored inside the file UPPER and all other characters get stored inside OTHERS.
Ans.	<pre> #include<iostream.h> #include <ctype.h> #include<conio.h> #include <stdio.h> #include<fstream.h> void main(){ char c,fname[10]; ofstream filout1,filout2,filout3; filout1.open("UPPER.txt"); filout2.open("LOWER.txt"); filout3.open("OTHER.txt"); cout<<"Enter contents to store in file (Enter # to stop):\n"; while((c=getchar())!='#') { if(isupper(c)) { filout1<<c; } else if(islower(c)) { filout2<<c; } else { filout3<<c; } } filout1.close(); filout2.close(); filout3.close(); getch(); } </pre>
16.	Write a program to search the name and address of person having age more than 30 in the data list of persons.
Ans.	<p>Assuming the file "employee.dat" is already existing in binary format.</p> <pre> #include<iostream.h> </pre>

	<pre> #include<conio.h> #include <stdio.h> #include<fstream.h> class employee{ char name[20]; char address[20]; int age; public: void showdata() { cout<<"\nEmployee Name : "; puts(name); cout<<"\nEmployee Address : "; puts(address); } int retage() { return age; } }; void search (){ employee emp; ifstream ifs; ifs.open("employee.dat",ios::binary); while(ifs.read((char*)&emp,sizeof(emp))) { if(emp.retage(>30) emp.showdata(); } ifs.close(); } void main(){ clrscr(); search(); getch(); } </pre>
17.	<p>Write a program to maintain bank account using two files: (i) Master (accno, ac-holder's name, balance) (ii) Transaction (accno, transactiondate, fromtype, amt) The trantype can either be 'd' for Deposit or 'w' for Withdraw, Amt stores the amount deposited or withdrawn. For each transaction the corresponding record in Master file should get updated.</p>
Ans.	Try to solve this problem.
18(i)	<p>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.</p>
Ans.	<pre> void countAlines(){ ifstream fin("LINES.TXT"); char str[80]; </pre>

	<pre> int c=0; while(!fin.eof()) { fin.getline(str,80); if(str[0]=='a' str[0]=='A') c++; } fin.close(); cout<<"Total lines starting with a/A are: "<<c<<endl; } </pre>
18(ii)	<p>Given a binary file STUDENT.DAT, containing records of the following class Student type</p> <pre> class Student { char S_Admno[10]; //Admissio 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; } }; </pre> <p>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.</p>
Ans.	<pre> void Dispmore75(){ ifstream fin; fin.open("STUDENT.DAT",ios::in ios::out ios::binary); Student A; while(!fin.eof()) { fin.read((char*)&A,sizeof(A)); if(A.ReturnPercentage(>75) A.DisplayData(); } fin.close(); } </pre>
19(a)	<p>Observe the program segment given below carefully and fill the blanks marked as Line 1 and Line 2 using fstream functions for performing the required task.</p> <pre> #include<fstream.h> class Stock{ long Ino; // Item Number char Item[20]; // Item Name int Qty; // Quantity public: void Get(int); Get(int); // Function to enter the content void Show(); // Function to display the content void Purchase(int Tqty) { Qty+ = Tqty; // Function to increment in Qty } long KnowIno() </pre>

	<pre> { return Ino;} }; void Purchaseitem(long PINo, int PQty) // PINo -> Info of the item purchased // PQty -> Number of items purchased { fstream File; File.open("ITEMS.DAT",ios::binary ios::in ios::cut); int Pos=-1; Stock S; while (Pos== -1 && File.read((char*)&S, sizeof(S))) if (S.KnowInc() == PINo) { S.Purchase(PQty); // To update the number of items Pos = File.tellg()- sizeof(S); //Line 1 : To place the file pointer to the required position _____; //Line 2 : To write the objects on the binary file _____; } if (Pos == -1) cout<<"No updation done as required Ino not found..."; File.close(); } } </pre>
Ans.	<p>Line 1:</p> <pre>File.seekp(Pos);</pre> <p>Line 2:</p> <pre>File.write((char*) &S, sizeof(S));</pre>
19(b)	<p>Write a function COUNT_DO() in C++ to count the presence of a word „do“ in a text file “MEMO.TXT”.</p> <p>Example : If the content of the file “MEMO.TXT” is as follows:</p> <p style="padding-left: 40px;">I will do it, if you request me to do it. It would have been done much earlier.</p> <p>The function COUNT_DO() will display the following message:</p> <p style="padding-left: 40px;">Count of -do- in file: 2</p>
Ans.	<pre> void COUNT_TO(){ ifstream Fil("MEMO.TXT"); char STR[10]; int c=0; while(Fil.getline(STR,10,' ')) { if (strcmpi(STR, "do") == 0) C++; } Fil.close(); cout<<"Count to -do- in file: "<<c<<endl; } </pre>
19(c)	<p>Write a function in C++ to read and display the detail of all the users whose status is ‘A’ (i.e. Active) from a binary file “USER.DAT”. Assuming the binary file “USER.DAT” is containing objects of class USER, which is defined as follows:</p> <pre> class USER{ int Uid; // User Id char Uname[20]; // User Name char Status; // User Type: A Active I Inactive public: </pre>

	<pre> public: void Register(); // Function to enter the content void show(); // Function to display all data members char Getstatus() { return Status; } }; </pre>
Ans.	<pre> void DisplayActive() { USER U; ifstream fin; fin.open("USER.DAT", ios:: binary); while (fin.read((char*) &U, sizeof(U))) { if (U.Getstatus() == 'A') U.show(); } fin.close(); // Ignore } </pre>
20(a)	<p>Observe the program segment given below carefully and fill the blanks marked as statement 1 and statement 2 using seekg(), seekp(), tellp(), and tellg() functions for performing the required task.</p> <pre> #include<fstream.h> class PRODUCT{ int Pno; char Pname[20]; int Qty; public: void ModifyQty(); //the function is to modify quantity of a PRODUCT }; void PRODUCT::ModifyQty() { fstream File; File.open("PRODUCT.DAT",ios::binary ios::in ios::out); int MPno; cout<<"product no to modify quantity:"; cin>>MPno; while(File.read((char*)this,sizeof(PRODUCT))) { if(MPno==Pno) { cout<<"present quantity:"<<Qty<<endl; cout<<"changed quantity:"; cin>>Qty; int Position= _____; //statement 1 _____; //statement 2 File.write((char*)this,sizeof(PRODUCT)); //Re-writing the record } } File.close(); } </pre>
Ans.	<p>Statement 1: int Position=File.tellg(); Statement 2: File.seekp(Position-sizeof(PRODUCT),ios::beg);</p>
20(b)	<p>Write a function in C++ to count the no of "Me" or "My" words present in a text file "DIARY.TXT". If the file "DIARY.TXT" content is as follows:</p>

	<p>My first book was Me and My family. It gave me chance to be known the world.</p> <p>The output of the function should be</p> <p>Count of Me/My in file : 4</p>
Ans.	<pre> void COUNT(){ ifstream Fil("DIARY. TXT"); char STR[10]; int count = 0; while(!Fil.eof()) { Fil>>STR; if(strcmp(STR,"Me")==0 strcmp(STR,"My")==0) count++; } Cout<<"Count of Me/My in file : "<<count<<endl; Fil.close(); //Ignore } </pre>
20(c)	<p>Write a function in C++ to search for a laptop from a binary file "LAPTOP.DAT" containing the objects of class LAPTOP (as defined below). The user should enter the Model No and the function should search and display the details of the laptop.</p> <pre> class LAPTOP{ long ModelNo; float RAM,HDD; char Details[120]; public: void StockEnter() { cin>>Modelno>>RAM>>HDD; gets(Details); } void StockDisplay() { cout<<ModelNo<<RAM<<HDD<<Details<<endl; } long ReturnModelNo() { return ModelNo; } }; </pre>
Ans.	<pre> void Search(){ LAPTOP L; long modelnum; cin>>modelnum; ifstream fin; fin.open("LAPTOP.DAT",ios::binary ios::in); while(fin.read((char*)&L,sizeof(L))) { if(L.ReturnModelNo()==modelnum) L.StockDisplay(); } fin.close(); //Ignore } </pre>

CHAPTER-8

POINTERS

VERY SHORT/SHORT ANSWER QUESTIONS

1.	Describe C++ memory map when a program is executing. Highlight the role and use of Heap area.
Ans.	When a program is executed, C++ creates four logically distinct regions of memory: (i) area to hold the compiled program code (ii) area to hold global variable (iii) the stack are to hold the return addresses of function calls, arguments passes to the functions, local variables for functions, and the current state of the CPU. (iv) the heap area from which the memory is dynamically allocated to the program.
2.	What is pointer arithmetic? How is it performed? Support your answer with example.
Ans.	Only two arithmetic operations, addition and subtraction, may be performed on pointers. In pointer arithmetic, all pointers increase and decrease by the length of the data type they point to. For example, <pre>int *p; p++;</pre> If address of p is 1000, then p++ statement will increase p to 1002, not 1001.
3.	Given the following definitions: <pre>int ival=2048; int *iptr; double *dptr;</pre> which of the following assignment, if any, are illegal? Explain why. (a) ival=*iptr (b) *iptr=ival; (c) *iptr=&ival (d) dptr=iptr; (e) ival=iptr; (f) iptr=ival;' (g) iptr=&ival; (h) dptr=*iptr;
Ans.	(a) legal assignment. (b) legal assignment. (c) illegal assignment, cannot assign an address of normal variable to pointer variable. (d) illegal assignment, cannot assign an integer pointer to a double pointer. (e) illegal assignment, cannot assign pointer variable to a normal variable. (f) illegal assignment, cannot assign normal variable to a pointer variable. (g) legal assignment. (h) illegal assignment, cannot assign an integer pointer to a double pointer.
4.	Given the following set of variable definitions: <pre>int *ip1, ip2; char ch, *cp;</pre> which of the following assignment are type violations? Explain why. (a) ip1="Smile Always"; (b) cp=0; (c) ip1=0; (d) cp=&'a'; (e) ip1=ip2; (f) cp='\0'; (g) ip1='\0'; (h) cp=&ch; (i) *ip=ip2;
Ans.	(a) Type violation, cannot assign string to integer pointer. (b) Correct (c) Correct (d) Type violation, cannot assign string with '&' operator. (e) Type violation, cannot assign normal variable to a pointer variable. (f) Correct (g) Correct (h) Correct (i) Type violation, variable '*ip' is undefined.
5.	What is the problem with the following code fragment? How might you fix it? <pre>char buf[]="Hi there"; int main()</pre>

	<pre> { char *ptr; for(int i=0;buf[i]!='\0';++i) ptr[i]=buf[i]; return 0; } </pre>
Ans.	There is no problem in above code.
6.	<p>What will be the output of the following program? Give proper explanation for this output.</p> <pre> #include<iostream.h> int main() { int a,*b,**c,***d; a=12; b=&a; c=&b; d=&c; cout<<a<<a+*b<<"\n"; cout<<**c+***d<<"\n"; return 0; } </pre>
Ans.	<p><u>Output:</u> 1224 24</p> <p><u>Explanation:</u> While executing the program, it prints value of variable 'a' which is 12. After that it prints a+*b which is 24 as 'b' stores the address of 'a', and at last it prints **c+***d which is again 24 as 'd' store the address of 'c' and 'c' store the address of 'b'.</p>
7.	<p>Predict and explain the output of the following program:</p> <pre> #include<iostream.h> void swap(int *,int *); void exchange(int **,int *); int main() { int a=5,b=15; cout<<"Before Swap, a="<<a<<"and b="<<b<<"\n"; swap(&a,&b); cout<<"\n After Swap, a="<<a<<"and b="<<b<<"\n"; return 0; } void swap(int *aa,int *bb) { exchange(&aa,bb); } void exchange(int **cc,int *dd) { int t; t=**cc; **cc=*dd; *dd=t; } </pre>
Ans.	<p><u>Output:</u> Before Swap, a=5 and b=15 After Swap, a=15 and b=5</p> <p><u>Explanation:</u> The program contains two functions namely exchange and swap which call the exchange function. In main function swap function is called, which actually call the exchange function. In call of exchange function first argument is a address of variable and second argument is value of the variable. In call of the swap function both argument contains the address of the variable. After the execution of program the value of 'a' is 15 and value of 'b' is 5.</p>
8.	<p>Predict and explain the output of the following program:</p> <pre> #include<iostream.h> </pre>

	<pre> void change(int *); int main() { int a[5]={4,5,6,7,8}; change(a); for(int i=4;i>=0;i--) cout<<a[i]; cout<<"\n"; return 0; } void change(int *b) { for(int i=0;i<=4;i++) { *b=*b+1; b++; } } </pre>
Ans.	<p><u>Output:</u> 98765</p> <p><u>Explanation:</u> This program contains one function called change() having one argument which is integer pointer. A change() function increment the pointer variable 'b' by 1. In main() function change() function is called and prints the array element from end which is incremented by 1 in change() function that is 98765.</p>
9.	<p>Predict and explain the output of the following program:</p> <pre> #include<iostream.h> int main() { int iarr[]={10,12,14,16,18}; int *ip; for(ip=&iarr[0];ip<=&iarr[4];ip++) cout<<*ip; cout<<"\n"; return 0; } </pre>
Ans.	<p><u>Output:</u> 1012141618</p> <p><u>Explanation:</u> This program contains integer pointer *ip which is initialized by address of first array element in for loop. A for is continued until variable 'ip' is less than or equal to address of last array element and prints actual value of array elements that is 1012141618.</p>
10.	<p>Predict and explain the output of the following program:</p> <pre> #include<iostream.h> int main() { int iarr[]={10,11,12,13,14}; int i,*p; for(p=iarr,i=0;p+i<=iarr+4;p++,i++) cout<<*(p+i); cout<<"\n"; return 0; } </pre>
Ans.	<p><u>Output:</u> 101214</p> <p><u>Explanation:</u> This program contains one integer variable 'i' and integer pointer '*p'. In for loop 'p' is initialized by integer array 'iarr' and 'i' is initialized with 0. A for loop is continued until 'p+i' is less than or equal to 'iarr+4' and prints addition of pointer variable 'p' and integer variable 'i' that is 10,12,14.</p>
11.	<p>Find the output of the following program:</p> <pre> #include<iostream.h> int main() { int *Queen,Moves[]={11,22,33,44}; </pre>

	<pre> Queen=Moves; Moves[2]+=22; cout<<"Queen @"<<*Queen<<endl; *Queen-=11; Queen+=2; cout<<"Next @"<<*Queen<<endl; Queen++; cout<<"Finally @"<<*Queen<<endl; cout<<"New Origin @"<<Moves[0]<<endl; } </pre>
Ans.	<p>Output:</p> <p>Queen @11</p> <p>Next @55</p> <p>Finally @44</p> <p>New Origin @0</p>
12.	<p>Find the output of the following program:</p> <pre> #include<iostream.h> int main() { int Numbers[]={2,4,8,10}; int *ptr=Numbers; for(int C=0;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; return 0; } </pre>
Ans.	<p>Output:</p> <p>2@4@8@</p> <p>4#8#16#20#</p>
13.	<p>Find the output of the following program:</p> <pre> #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; } } </pre>

	<pre> 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); strcpy(state_name,b.state_name); } }; int main() { char *temp="Delhi"; state statel(temp),state2("Mumbai"),state3("Nagpur"),S1,S2; S1.Replace(statel,state2); S2.Replace(S1,state3); S1.display(); S2.display(); return 0; } </pre>
Ans.	<p><u>Output:</u> Mumbai Nagpur</p>
14.	<p>Find the output of the following program:</p> <pre> #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); strcpy(name,b.name); } }; int 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(); return 0; } </pre>
Ans.	<p><u>Output:</u> Jill John</p>
15.	<p>Why is it said that it is faster to use an element pointer rather than an index when scanning arrays? Support your answer with an example.</p>

Ans.	<p>The index version would:</p> <pre>int i = 0; while(i < 100) { int* temp_ptr = number_seq + i; // equivalent to: *temp_ptr = i; // number_seq[i] = i; i += 1; // or ++i };</pre> <p>While the pointer version is:</p> <pre>int* p = number_seq; while(p != number_seq + 100) { *p = (p - number_seq); p += 1; // or ++p };</pre> <p>The index version adds one line of code, which is to compute the pointer to the element you are accessing before dereferencing that pointer. But most compilers will be able to see that the two lines (increment index, and add index to start-pointer) can be replace by just incrementing the pointer, which is why it ends up performing the same.</p>
16.	Write a function that takes one string argument and returns a reversed string.
Ans.	<pre>#include<iostream.h> int string_length(char*); void reverse(char*); void main() { char string[100]; cout<<"Enter a string\n"; gets(string); reverse(string); cout<<"Reverse of entered string is \n"<< string; return 0; } void reverse(char *string) { int length, c; char *begin, *end, temp; length = string_length(string); begin = string; end = string; for (c = 0 ; c < (length - 1) ; c++) end++; for (c = 0 ; c < length/2 ; c++) { temp = *end; *end = *begin; *begin = temp; begin++; end--; } } int string_length(char *pointer) { int c = 0; while(*(pointer+c) != '\0') c++; return c; }</pre>
17.	Write a function that takes one string argument and returns 1 if the given string is a palindrome otherwise returns 0. (Note: <i>Palindrome string reads the same from both sides. For example, madam, level, malayalam</i>

	are palindromes)
Ans.	<pre> #include<iostream.h> #include<process.h> #include<stdio.h> #include<string.h> void palindrome(char a[]) { int l=strlen(a); char *a1,*b1; for(a1=a,b1=&a[l-1];a1<=b1;a1++,b1--) { if(*a1!=*b1) { cout<<"No,it is not a Palindrome:"; exit(0); } } cout<<"Yes,it is a Palindrome:"; } void main() { char c[30]; cout<<"Enter the string:"; gets(c); cout<<endl; palindrome(c); } </pre>
18.	<p>What will be the output of the following program?</p> <pre> int main() { char a[]="able was I ere I saw elba"; char *t,*s,*b; s=a; b=a+strlen(a)-1; t=b; while(s!=t) { cout<<*s; s++; cout<<*t; t--; } return 0; } </pre>
Ans.	<p><u>Output:</u> aabblllee wwaass II ee</p>
19.	<p>Write a function to encode a string that is passed to it. The string should get converted into an unrecognizable form. [Hint: You may change the ASCII code of the constituent character by adding or subtraction a constant number from the original ASCII value of the constituent characters.]</p>
Ans.	<pre> #include<iostream.h> #include<conio.h> #include<string.h> #include<stdio.h> void encode(char str1[],int l); void main() { </pre>

	<pre> char str[30]; clrscr(); cout<<"Enter an string:"; gets(str); int len=strlen(str); encode(str,len); getch(); } void encode(char str1[],int l) { int i; for(i=0;i<l;i++) { str1[i]=str1[i]+10; } cout<<"\nThe encoded string is:"<<endl; for(i=0;i<l;i++) { cout<<str1[i]; } cout<<"\nThe proper string is:"<<endl; for(i=0;i<l;i++) str1[i]=str1[i]-10; for(i=0;i<l;i++) cout<<str1[i]; } </pre>
20.	<p>Predict and explain the output of the following program:</p> <pre> #include<iostream.h> int main() { float *retpt(float *r); float p=22.6,*q; q=&p; cout<<"q before call="<<q<<"\n"; q=retpt(&p); return 0; } float *retpt(float *r) { r+=1; return(r); } </pre> <p>(Assume that q before call is 4004.)</p>
Ans.	<p><u>Output:</u> q before call=0x8f64fff2 Explanation: This program contains one function namely 'retpt()' which has floating pointer as argument and increment *r by 1. A main() function contains one float variable p which is initialized with 22.6 and floating pointer '*q' which is initialized with address of variable 'p'. After that it prints the value of q before call to the function retpt() which is 0x8f64fff2.</p>
21.	<p>Write a function search() which scans a string from beginning is to end in search of a character. If the character is found it should return a pointer to the first occurrence of the given character in the string. If the given character is not found in the string, the function should return a NULL. The prototype of the function would be:</p> <pre> char *search(char *,char); </pre>
Ans.	<pre> #include<iostream.h> #include<conio.h> </pre>

```

#include<string.h>
#include<stdio.h>
char *search(char *,char);
int len;
void main()
{
    char str[20],ch,*f;
    clrscr();
    cout<<"Enter a string:";
    gets(str);
    cout<<"Enter the character to be searched for:";
    cin>>ch;
    len=strlen(str);
    f=search(str,ch);
    if(f!=NULL)
        cout<<"Character is found.";
    else
        cout<<"Character is not found.";
    getch();
}
char *search(char *x,char d)
{
    int i;
    for(i=0;i<len;i++)
    {
        if(*x==d)
            return x;
        x++;
    }
    return NULL;
}

```

22. Write a function to compress any given string such that the multiple blanks preset in it are eliminated. The function should return the compressed string.

Ans.

```

#include<iostream.h>
void removeSpaces(char* s)
{
    char* source = s;
    char* dest = s;
    while(*source) {
        if(*source == ' ')
        {
            source++;
        }
        else
        {
            *dest++ = *source++;
        }
    }
    *dest = 0;
}
int main()
{
    char input[50] = "I           like           milk";
    removeSpaces(input);
    cout<<input;
}

```

	<pre> return 0; } </pre>				
23	<p>Predict and explain the output of the following program:</p> <pre> int main() { struct S{ char carr[10]; int a; float b; }sa[2]; //assume that the first structure begins at address 1004 cout<<sa[0].carr<<*(&sa[0]).a<<*(&sa[0]).b<<"\n"; cout<<sa[1].carr<<*(&sa[1]).a<<*(&sa[1]).b<<"\n"; return 0; } </pre>				
Ans.	Students can you do this... Try...				
24.	C++ lets you pass a structure by value and it lets you pass the address of a structure. If sample is a structure variable, how would you pass it by value? How would you pass its address? Which method do you think is better?				
Ans.	<p>If we assume structure variable name as sample and function name as sample_function() then:</p> <table border="1"> <thead> <tr> <th>Pass a structure by value</th><th>Pass a structure by address</th></tr> </thead> <tbody> <tr> <td> <pre> struct SAMPLE sample; sample_function(sample); void sample_function(struct SAMPLE sample) { : : } </pre> </td><td> <pre> struct SAMPLE sample; sample_function(&sample); void sample_function(struct SAMPLE *sample) { : : } </pre> </td></tr> </tbody> </table> <p>Both the method have their own importance, so as per the program requirement we can use any of them.</p>	Pass a structure by value	Pass a structure by address	<pre> struct SAMPLE sample; sample_function(sample); void sample_function(struct SAMPLE sample) { : : } </pre>	<pre> struct SAMPLE sample; sample_function(&sample); void sample_function(struct SAMPLE *sample) { : : } </pre>
Pass a structure by value	Pass a structure by address				
<pre> struct SAMPLE sample; sample_function(sample); void sample_function(struct SAMPLE sample) { : : } </pre>	<pre> struct SAMPLE sample; sample_function(&sample); void sample_function(struct SAMPLE *sample) { : : } </pre>				
25.	<p>Write a function having this prototype:</p> <pre> int replace(char *s,char c1,char c2); </pre> <p>Have the function replace every occurrence of c1 in the string s with c2, ad have the function return the number of replacements it makes.</p>				
Ans.	<pre> int replace(char * str, char c1, char c2) { int count = 0; while (*str) // while not at end of string { if (*str == c1) { *str = c2; count++; } str++; // advance to next character } return count; } </pre>				
26.	<p>Given here is a structure defilation:</p> <pre> struct Box { char maker[21]; float height,width,length,volume; }; </pre> <p>Write a function that passes the address of a Box structure and that sets the volume member to the</p>				

	product of the other three dimensions.
Ans.	<pre> #include<iostream.h> struct box { char maker[40]; float height; float width; float length; float volume; }; box yours; float boxer_dimensions (const box * compute); void display_box (const box make); int main() { box yours ={"Apple", 10.0, 5.0,7.5};// to initialize a record char name[40]; float dia; dia= boxer_dimensions (&yours); //function call yours.volume = dia;// assigning results to volume member record display_box (yours);// function call return 0; } float boxer_dimensions (const box *compute)// specs calls for passing address of the structure { float Vol; Vol= ((compute->height)*(compute->length)*(compute->width)); //computation for volume here return Vol; } void display_box (const box make)/// display all results here { cout << make.maker <<endl; cout << make.height <<endl; cout << make.width <<endl; cout << make.length<< endl; cout << make.volume<<endl; } </pre>
27.	What is the advantage of passing arguments by reference? When and why is passing an object by reference preferable?
Ans.	<p>In passing arguments by reference method, the called function does not create its own copy of original values; rather, it refers to the original values only by different names i.e., the references. Thus the called function works with the original data and any change in the values gets reflected to the data.</p> <p>The passing an object by reference method is preferable in situations where we want the called function to work with the original object so that there is no need to create and destroy the copy of it.</p>
28.	Write a function fibonacci() that takes an int argument n and prints first n elements of Fibonacci series. (A function series is where each successive number is the sum of preceding two elements. For example, 0 1 1 2 3 5 8 is a Fibonacci series)
Ans.	<pre> #include<iostream.h> #include<stdio.h> #include<conio.h> int Fibonacci(int); void main() </pre>

```

{
    int n, i = 0, c;
    clrscr();
    cout<<"enter number :";
    cin>>n;
    cout<<"Fibonacci series\n";
    for ( c = 1 ; c <= n ; c++ )
    {
        cout<<Fibonacci(i)<<endl;
        i++;
    }
    getch();
}
int Fibonacci(int n)
{
    if ( n == 0 )
        return 0;
    else if ( n == 1 )
        return 1;
    else
        return ( Fibonacci(n-1) + Fibonacci(n-2) );
}

```

29. Correct the errors in the following program

```

class Sample { private:
                int x;
            public:
                void getdata(void)
                {      cout<<"Enter number: ";
                      cin>>x;
                }
                void display(void)
                {      cout<<x;
                }
            };

int main()
{
    Sample S;
    S->getdata();
    S->display();
    Sample *p;
    p=new Sample;
    p.getdata();
    (*p).display();
    return 0;
}

```

Ans.

```

class Sample { private:
                int x;
            public:
                void getdata(void)
                {      cout<<"Enter number: ";
                      cin>>x;
                }
                void display(void)
                {      cout<<x;
                }
            };

```

	<pre> int main() { Sample S; S.getdata(); S.display(); Sample *p; p=new Sample; p->getdata(); (*p).display(); return 0; } </pre>
30.	<p>What will be the output of the following program? Run this program and find out:</p> <pre> #include<iostream.h> struct Book { char *name; char *author; float royalty; }; int main() { Book b1={"Computers","DBA",10.5}; Book *p; p=&b1; cout<<*p->name<<*p->author<<p->royalty<<"\n"; cout<<p->name<<p->author<<p->royalty<<"\n"; return 0; } </pre>
Ans.	<p><u>Output:</u> CD10.5 ComputerDBA10.5</p>
31.	<p>Write a function that takes two string arguments and return the concatenated string.</p>
Ans.	<pre> #include<iostream.h> void stcat(char *str1, char *str2); void main() { char *str1, *str2; clrscr(); cout<<"\n\n\t ENTER THE FIRST STRING: "; gets(str1); cout<<"\n\n\t ENTER THE FIRST STRING: "; gets(str2); stcat(str1,str2); cout<<"\n\t THE CONCATENATED STRING IS: "; puts(str1); getch(); } void stcat (char *str1, char *str2) { int i = 0, len = 0; while(*(str1+len)!='\0') len++; while(*(str2+i)!='\0') { *(str1+len) = *(str2+i); i++; len++; } *(str1+len) = '\0'; } </pre>

	}
32.	What are this and *this? How are these two different?
Ans.	this is a pointer to the object whose member function is being executed. It is a pointer to the object itself while *this is an object pointed by the pointer this.
33.	What will be the output of the following program? <pre> #include<iostream.h> int main() { int x[3][5]={ {18,20,13,24,35}, {7,8,6,19,10}, {19,22,30,21,15} }; int *n=&x[0][0]; cout<<"1. (*(n+3)+1) \t="<< (*(n+3)+1)<<endl; cout<<"2. *(n+2) \t="<< *(n+2)<<endl; cout<<"3. (*(x+2)+5 \t="<< (*(x+2)+5<<endl; cout<<"4. ++*n \t="<< ++*n<<endl; cout<<"5. (*(x)+2)+1 \t="<< (*(x)+2)+1<<endl; cout<<"6. *n \t\t="<< *n<<endl; cout<<"7. (*(x+2)+1) \t="<< (*(x+2)+1)<<endl; cout<<"8. (*(x+1)+3) \t="<< (*(x+1)+3)<<endl; cout<<"9. (*(x+1)) \t="<< (*(x+1))<<endl; cout<<"10. *(n+5)+1 \t="<< *(n+5)+1<<endl; return 0; } </pre>
Ans.	Output: <pre> 1. (*(n+3)+1) = 25 2. *(n+2) = 13 3. (*(x+2)+5 = 18 4. ++*n = 19 5. (*(x)+2)+1 = 14 6. *n = 19 7. (*(x+2)+1) = 22 8. (*(x+1)+3) = 19 9. (*(x+1)) = 7 10. *(n+5)+1 = 8 </pre>
34.	What will be the output of the following program? <pre> #include<iostream.h> #include<stdlib.h> int main() { system("cls"); char string[]="Pointers and Strings"; cout<<*&string[2]<<'\\n'; cout.write(string+5,15).put('\\n'); cout.write(string,20).put('\\n'); cout<<*(string+3)<<"\\n"; return 0; } </pre>
Ans.	Output: <pre> i ers and Strings Pointers and Strings n </pre>

LONG ANSWER QUESTIONS

1.	<p>Write a function substr() that will scan a string for the occurrence of a give substring. the prototype of the function would be:</p> <pre>char *substr(char *string1,char string2);</pre> <p>The function should return a pointer to the element in string1 where strig2 begins. If string2 doesn't occur in string1 then substr() should return a NULL.</p> <p>For example, if string1 is "Ena Meena Deeka", and string2 is "Meena" the substr() should return address of 'M' in string1.</p> <p>Write main() function also that uses the function substr().</p>
Ans.	<pre>#include <iostream.h> #include<stdio.h> char *get_substr(char *sub, char *str); int main() { char *substr,*str; cout<<"Enter the string :"; gets(str); cout<<"\nEnter the substring :"; gets(substr); substr = get_substr(substr,str); if (substr!='\0') cout << "substring found: " <<substr; else cout<< "substring not found"; return 0; }</pre> <pre>char *get_substr(char *sub, char *str) // Return pointer to substring or null if not found. { int t; char *p, *p2, *start; for(t=0; str[t]!='\0'; t++) { p = &str[t]; start = p; p2 = sub; while(*p2!='\0' && *p2==*p) // check for substring { p++; p2++; } /* If at end of p2 (i.e., substring), then a match has been found. */ if(!*p2) return start; // return pointer to beginning of substring } return 0; }</pre>
2.	<p>Suppose 7 names are stored in a array of pointers names[] as shown below:</p> <pre>char *names[]= { "Anand","Naureen","Banjot","Wahid","sheena" };</pre> <p>Write a program to reverse the order of these names.</p>
Ans.	<pre>#include<iostream.h> #include<conio.h> #include<string.h></pre>

	<pre> void main() { clrscr(); char *name[]={ "anand", "naureen", "banjot", "wahid", "sheena" }; int i,j; cout<<"\nOriginal string\n"; for(i=0;i<5;i++) cout<<name[i]<<endl; char *t; for(i=0,j=4;i<5/2;i++,j--) { t=name[i]; name[i]=name[j]; name[j]=t; } cout<<"\nReversed string:\n"; for(i=0;i<5;i++) cout<<name[i]<<endl; getch(); } </pre>
3.	<p>Imagine a publishing company that markets both books and audio-cassette versions of its works. Create a class called Publication that stores the title (a string) and price of a publication. From this class derive two classes: Book, which adds a page count (type int); and Tape, which adds a playing time in minutes (type float). Each of the three class should have a getData() function to get its data from the user at the keyboard, and a putdata() function to display the data.</p> <p>Write a main() program that creates an array of pointers to Publication. In a loop, ask the user for data about a particular book or Tape, and use new to create a object of type Book or Tape to hold the data. Put the pointer to the object in the data for all books and tapes, display the resulting data for all the books and taps entered, using a for loop and a single statement such as</p> <pre>pubarr[i]->putdata();</pre> <p>to display the data from each object in the array.</p>
Ans.	<pre> #include<iostream.h> #include<string.h> class Publication { private: char title[20]; float price; public: void getName() { cout<<"Enter Title: "; cin>>title; cout<<"Enter Price: \$"; cin>>price; } void putName() { cout<<"\nTitle: "<<title; cout<<" , Price: \$"<<price; } virtual void getData() = 0; }; class Book : public Publication { private: int pages; </pre>

```

public:
    void getData()
    {
        Publication::getName();
        cout<<"Enter Pages: "; cin>>pages;
    }
    void putData()
    {
        Publication::putName();
        cout<<" , Pages: "<<pages<<endl;
    }
};

class Tape : public Publication
{
private:
    float minutes;
public:
    void getData()
    {
        Publication::getName();
        cout<<"Enter Minutes: "; cin>>minutes;
    }
    void putData()
    {
        Publication::putName();
        cout<<" , Minutes: "<<minutes<<endl;
    }
};

int main()
{
    Publication* ptrPub[100];
    int n = 0;
    char choice;
    do
    {
        cout<<"Book or Tape? (b/t): "; cin>>choice;
        if(choice == 'b')
            { ptrPub[n] = new Book; ptrPub[n]->getData(); }
        else
            { ptrPub[n] = new Tape; ptrPub[n]->getData(); }
        n++; cout<<"Enter another? (y/n): "; cin>>choice;
    } while(choice == 'y');

    for(int i=0; i<n; i++)
        ptrPub[i]->putName();
    cout<<endl;
    return 0;
}

```

4. Given the following incomplete class definition:

```

class Player
{
    char firstname[15],surname[15];
    int runs,sixes,fours;
    float strike-rate;
public:

```

	<pre> Player(); //constructor ~Player(); //Destruct char *getname(); { return strcat(firstname,lastname); } int getruns() { rerurn runs; } int getsix() { rerurn sixes; } int getfours() { rerurn fours; } float getst_rate() { rerurn strike-rate; } }; </pre> <p>Write a program that uses array of pointers to object to store the details of various Players. Get details of the players from the user at the keyboard and print the details of the Player who has made maximum runs.</p>
Ans.	
5.	<p>Create some objects of the Player class (of question 4), and put them on a List, an array of pointers to objects. Display the contents of the resulting list in two ways:</p> <p>(i) Use println() to print an entire list.</p> <p>(ii) Using a while loop ask for the Player's name and display his details and then remove this Player from the List.</p>
Ans.	Students take help of answer number 4

CHAPTER-9

ARRAYS

VERY SHORT/SHORT ANSWER QUESTIONS

1.	Define the term data structure and state its significance.	
Ans.	A data structure is a named group of data of different data types which can be processed as a single unit. Data structures are very important in a computer system, as these not only allow the user to combine various data types in a group but also allow processing of the group as a single unit thereby making things much simpler and easier.	
2.	Differentiate between one-dimensional and two-dimensional arrays.	
Ans.	<div>One-dimensional array</div> <div>A one-dimensional array is a group of elements having same data type and same name. There is no rows and columns in one-dimensional array. Syntax: datatype Arrayname[size]; Example: int A[10];</div>	<div>Two-dimensional array</div> <div>A two-dimensional array is an array in which each element is itself a 1-D array. There is a concept of rows and columns in two-dimensional array. Syntax: datatype Arrayname[rowsize][col-size]; Example: int A[10][5];</div>
3.	Explain (i) Linear search method (ii) Binary search method. Which of the two is more efficient for sorted data?	
Ans.	<div>(i) <u>Linear search method</u>: In linear search, each element of the array is compared with the given Item to be searched for, one by one.</div> <div>(ii) <u>Binary search method</u>: Binary search technique searches the given Item in a sorted array. The search segment reduces to half at every successive stage. The binary search method is more efficient for sorted data.</div>	
4.	Explain sorting along with two popular sort techniques.	
Ans.	<div>Sorting of an array means arranging the array elements in a specified order i.e., either ascending or descending order. Two popular sort techniques are as following:</div> <div>(i) <u>Selection Sort</u>: In selection sort, the smallest key from the remaining unsorted array is searched for and put in the sorted array. This process repeats until the entire array is sorted.</div> <div>(ii) <u>Bubble Sort</u>: In bubble sort, the adjoining values are compared and exchanged if they are not in proper order. This process is repeated until the entire array is sorted.</div>	
5.	Design an algorithm that will allow you to insert a data item NAM in the i th position in a single-dimensional array NAMES having an element (i<n).	
Ans.	<div>1.[Initialize the value of ctr] Set ctr=n</div> <div>2.Repeat for ctr=n down to pos[Shift the elements down by one position] Set NAMES[ctr+1]=NAMES[ctr][End of loop]</div> <div>3.[insert the elements at required position]Set NAMES[i]=NAM</div> <div>4.[Reset n] Set n= n+1</div> <div>5.Display the new list of arrays</div> <div>6.End</div>	
6.	Write a user-define function Upper-half() which takes a two dimensional array A, with N rows and N columns as argument and point the upper half of the array.	
	<div><div>2 3 1 5 0</div><div>7 1 5 3 1</div><div>e.g., If A is 2 5 7 8 1</div><div>0 1 5 0 1</div><div>3 4 9 1 5</div></div>	<div><div>2 3 1 5 0</div><div>1 5 3 1</div><div>The output will be 7 8 1</div><div>0 1</div><div>5</div></div>
Ans.	<div>Void Upper-half(int b[][10],int N)</div> <div>{</div> <div> int i,j;</div> <div> for(i=N;i>0;i--)</div> <div> {</div> <div> for(j=N;j>0;j--)</div> <div> {</div> <div> if(i>=j)</div> <div> cout<<b[i][j]<<" ";</div>	

	<pre> else cout<<" "; } cout<<"\n"; } } </pre>
7.	<p>Consider the linear array A[-10;10], B[1925:1990], C[25].</p> <p>(a) Find the number of elements in each array</p> <p>(b) Suppose base (A)=400 and word size (A)=2 words, find the addresses of A[-3], A[0], A[3]</p>
Ans.	<p>(a) $U-L+1 = 10-(-10)+1=21$, $U-L+1 = 1990-1925+1=66$, 25</p> <p>(b) Address of A[-3] = $400 + 2(-3-(-3))$ $= 400+2(0)$ $= 400$</p> <p>Address of A[0] = $400 + 2(0-(-3))$ $= 400+2(3)$ $= 406$</p> <p>Address of A[3] = $400 + 2(3-(-3))$ $= 400+2(6)$ $= 412$</p>
8.	<p>Suppose an array A[10] stores numeric values only. Write algorithms to</p> <p>(i) calculate the average of the values in A</p> <p>(ii) print the even numbers stored in A.</p>
Ans.	<p>(i) calculate the average of the values in A</p> <ol style="list-style-type: none"> 1. Start 2. read A[i] 3. let i=0, sum=0, avg=0 4. add A[i] into sum and store it into sum 5. divide sum by 10 and store it in avg 6. check whether i is less than 10 if yes then increment i by 1 7. print avg 8. End <p>(ii) print the even numbers stored in A.</p> <ol style="list-style-type: none"> 1. Start 2. read A[i] 3. let i=0 4. check whether A[i]%2 is equal to 0 5. if yes then print A[i] 6. check whether i is less than 10 if yes then increment i by 1 7. End
9.	<p>An array Arr[50][100] is stored in the memory along the row with each element occupying 2 bytes of memory. Find out the base address of the location Arr[20][50], if the location of Arr[10][25] is stored at the address 10000.</p>
Ans.	<p>Address of Arr[i][j] along the row= Base Address + $w*(I*C+j)$</p> <p>Address of Arr[10][25]= Base Address + $2*(10*100+25)$ $10000= \text{Base Address} + 2*(1025)$ $10000= \text{Base Address} + 2050$ Base Address= $10000-2050$ Base Address= 7950</p> <p>Address of Arr[20][50]= Base Address + $2*(20*100+50)$</p>

	$= 7950 + 2 * (2050)$ $= 7950 + 4100$ $= 12050$
10.	An array Array[20][15] is stored in the memory along the column with each element occupying 8 bytes of memory. Find out the Base address and address of the element Array [2][3], if the element Array [10][25] is stored at the address 1000.
Ans.	<p>Given $A[R][C]=A[20][15]$ i.e., $R=20$ $C=15$ Element size $W=8$ bytes Base Address $B=?$ Lowest row index $lr=0$, Lowest column index $lc=0$ Given $A[4][5]=1000$ To find address of $A[2][3]$ Address in column major is calculated as $A[I][J]=B+W(I-lr)+R(J-lc)$ Since we have $A[4][5]=1000$, we get $1000=B+8((4-0)+20(5-0))$ $1000=B+832$ Base Address $B=1000-832=168$ Now $A[2][3]=B+W(I-lr)+R(J-lc)$ $=168+8((2-0)+20(3-0))$ $=168+469$ $A[2][3]=664$</p>
11.	<p>An array X[7][20] is stored in the memory with each element requiring 2 bytes of storage. If the base address of array is 2000, calculate the location of X[3][5] when the array X is stored in column major order. Note: X[7][20] means valid row indices are 0 to 6 and valid column indices are 0 to 10.</p>
Ans.	<p>Address in column major is calculated as $X[I][J]=B+W(I-lr)+R(J-lc)$ $X[3][5]=2000+2((3-0)+7(5-0))$ $=2000+2(3+35)$ $=2000+2(38)$ $=2000+76$ $=2076$</p>
12.	An array Arr[15][20] is stored in the memory along the row with each element occupying 4 bytes of memory. Find out the Base address and address of the element Arr[3][2], if the element Arr[10][25] is stored at the address 1500.
Ans.	<p>Total no. of Rows $R=15$ Total no. of Columns $C=20$ Lowest Row $lr=0$ Lowest Column $lc=0$ Size of element $W=4$ bytes Arr[I][J] i.e., Arr[5][2]=1500 Arrangement Order: Row wise Base Address $B=?$ $\Rightarrow Arr[I][J]=B+W(C(I-lr)+(J-lc))$ $Arr[5][2]=B+4(20(5-0)+(2-0))$ $1500=B+408$ $B=1092$ Base Address=1092</p>

	$\begin{aligned} \text{Arr}[3][2] &= B + W(C(3-0) + (2-0)) \\ &= 1092 + 4(20(3-0) + (2-0)) \\ &= 1092 + 248 \\ &= 1340 \\ \text{Arr}[3][2] &= 1340 \end{aligned}$
13.	<p>An array X[10][20] is stored in the memory with each element requiring 4 bytes of storage. If the base address of array is 1000, calculate the location of X[5][15] when the array X is stored in column major order.</p> <p>Note: X[10][20] means valid row indices are 0 to 9 and valid column indices are 0 to 19.</p>
Ans.	<p>Address in column major is calculated as</p> $\begin{aligned} X[I][J] &= B + W(I - l_r) + R(J - l_c) \\ X[5][15] &= 1000 + 4((5-0) + 10(15-0)) \\ &= 1000 + 4(5 + 150) \\ &= 1000 + 4(155) \\ &= 1000 + 620 \\ &= 1620 \end{aligned}$
14.	<p>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 array VAL is 1500, determine the location of VAL[12][9] when the array VAL is stored (i) Row wise (ii) Column wise.</p>
Ans.	<p>Base address B=1500 Element width w=4 bytes Total rows r=15 Total columns c=10 ARR[I][J] = ARR[12][9] => I=12, J=9 Lowest row index $l_r=0$ in C++ Lowest column index $l_c=0$ in C++</p> <p>(i) Row wise</p> $\begin{aligned} \text{VAL}[I][J] &= B + w(c(I - l_r) + (J - l_c)) \\ \text{VAL}[12][9] &= 1500 + 4(10(12-1) + (9-1)) \\ &= 1500 + 472 \\ &= 1972 \end{aligned}$ <p>(ii) Column wise</p> $\begin{aligned} \text{VAL}[I][J] &= B + W(I - l_r) + R(J - l_c) \\ &= 1500 + 4((12-1) + 15(9-1)) \\ &= 1500 + 4(131) \\ &= 1500 + 524 \\ &= 2024 \end{aligned}$
15.	<p>An array ARR[5][5] is stored in the memory with each element occupying 4 bytes of space. Assuming the base address of ARR to be 1000, compute the address of ARR[2][4], when the array is stored: (i) Row wise (ii) Column wise.</p>
Ans.	<p>Base address B=1000 Element width w=4 bytes Total rows r=5 Total columns c=5 ARR[I][J] = ARR[2][4] => I=2, J=4 Lowest row index $l_r=0$ in C++</p>

	<p>Lowest column index $l_c=0$ in C++</p> <p>(i) Row wise</p> $ARR[I][J] = B + w(c(J - l_r) + (J - L_c))$ $ARR[2][4] = 1000 + 4(5(2-0) + (4-0))$ $= 1000 + 56$ $= 1056$ <p>(ii) Column wise</p> $ARR[2][4] = B + w((I - l_r) + r(I - l_c))$ $ARR[2][4] = 1000 + 4((2-0) + 5(4-0))$ $= 1000 + 88$ $= 1088$
16.	Each element of an array DATA[1..10][1..10] requires 8 bytes of storage. If base address of array DATA is 2000, determine the location of DATA[4][5], when the array is stored (i) Row-wise (ii) Column-wise.
Ans.	<p>Base address B=2000 Element width w=8 bytes Total rows r=10 Total columns c=10 $ARR[I][J] = ARR[4][5] \Rightarrow I=4, J=5$ Lowest row index $l_r=0$ in C++ Lowest column index $l_c=0$ in C++</p> <p>(i) Row wise</p> $DATA[I][J] = B + w(c(I - l_r) + (J - L_c))$ $DATA [4][5] = 2000 + 8(10(4-1) + (5-1))$ $= 2000 + 272$ $= 2272$ <p>(ii) Column wise</p> $DATA [I][J]=B+W(I-l_r)+R(J-l_c)$ $=2000+8((4-1)+10(5-1))$ $=2000+8(43)$ $=2000+344$ $=2344$
17.	An array Arr[40][30] is stored in the memory along the column with each element occupying 4 bytes. Find out the base address and address of the element S [22][15], if the element S[15][10] is stored at the memory location 7200.
Ans.	<p>Address of S[i][j] along the column =Base Address + W [(i-L1) + (j-L2) * M]</p> $\text{Address of S[15][10] = Base Address + 4 [(15 - 1) + (10-1) x 40]}$ $7200 = \text{Base Address} + 4 [374]$ $\text{Base Address} = 7200 - (4 \times 374)$ $\text{Base Address} = 7200 - 1496$ $= 5704$ <p>Address of S[20][15] = $5704 + 4 ((20 - 1) + (15 - 1) \times 40)$</p> $= 5704 + 4 \times 579$ $= 5704 + 2316$ $= 8020$

18.	An array T[50][20] is stored in the memory along the column with each element occupying 4 bytes. Find out the base address and address of the element T [30][15], if the element T[25][10] is stored at the memory location 9800.
Ans.	<p>T[50][20] No. of Rows(i.e., R) = 50 No. of Cols(i.e., C) = 20 Element size(W) = 4 bytes $T[I][J] = T[30][15] \Rightarrow I=30, J=15$</p> <p>Address of T[25][10] = 9800 Base Address (B) = ? Lowest Row (i.e., I_r) = 0 Lowest Col (i.e., I_c) = 0</p> <p>Formula to calculate address in Column Major arrangement is:</p> $T[P][Q] = B + W[(P - I_r) + R(Q - I_c)]$ $T[25][10] = B + 4((25 - 0) + 50(10 - 0))$ $9800 = B + 4(525) \quad (\because T[25][10] = 9800 \text{ given})$ $9800 = B + 2100$ $\Rightarrow B = 9800 - 2100 = 7700$ <p>Parallely, $T[I][J] = B + W[(I - I_r) + R(J - I_c)]$</p> $T[30][15] = 7700 + 4[(30 - 0) + 50(15 - 0)]$ $= 7700 + (4 \times 780)$ $= 7700 + 3120$ $= 10820$
19.	An array T[90][100] is stored in the memory along the column with each element occupying 4 bytes. Find out the memory location for the element T [10][40], if the Base Address of the array is 7200.
Ans.	$\text{Loc}(T[I][J]) = \text{Base}(T) + W(I + J \times N)$ <p>(where N is the number of rows, LBR = LBC = 0)</p> $= 7200 + 4[10 + 40 \times 90]$ $= 7200 + 4[10 + 3600]$ $= 7200 + 4 \times 3610$ $= 7200 + 14440$ $= 21640$
20.	An array Arr[35][15] is stored in the memory along the row with each element occupying 4 bytes. Find out the base address and address of an element Arr[20][5], if the location Arr[2][2] is stored at the address 3000.
Ans.	<p>A[35][15] \Rightarrow rows R=35, columns C=15 Let base address be B Given element width W=4 bytes and A[2][2]=3000 In Row major,</p> $A[I][J] = B + W(C(I - I_r) + (J - I_c))$ <p>where I_r=lowest row and I_c=lowest column</p> $A[2][2] = B + W(C(2 - 0) + (2 - 0))$ $3000 = B + 4(15(2) + 2)$ $3000 = B + 128$ <p>Base Address B = 3000 - 128 = 2872 Using same formula</p> $A[20][5] = 2872 + 4(15(20 - 0) + (5 - 0))$ $= 2872 + 1220$ $= 4092$
21.	An array Arr[15][35] is stored in the memory along the column with each element occupying 8 bytes. Find out

	the base address and address of the element Arr[2][5], if the location Arr[5][10] is stored at the address 4000.
Ans.	<p>Arr[15][35] No. of Rows(i.e., R) = 15 No. of Cols(i.e., C) = 35 Element size(W) = 8 bytes Arr[I][J] = Arr[2][5] => I=2, J=5</p> <p>Address of Arr[5][10] = 4000 Base Address (B) = ? Lowest Row (i.e., I_r) = 0 Lowest Col (i.e., I_c) = 0</p> <p>Formula to calculate address in Column Major arrangement is:</p> $\begin{aligned} \text{Arr}[P][Q] &= B + W[(P - I_r) + R(Q - I_c)] \\ \text{Arr}[5][10] &= B + 8((5 - 0) + 15(10 - 0)) \\ 4000 &= B + 8(155) \\ 4000 &= B + 1240 \\ \Rightarrow B &= 4000 - 1240 = 2760 \end{aligned}$ <p>Parallely, Arr[I][J] = B + W[(I - I_r) + R(J - I_c)]</p> $\begin{aligned} \text{Arr}[2][5] &= 2760 + 8[(2 - 0) + 15(5 - 0)] \\ &= 2760 + (8 \times 77) \\ &= 2760 + 616 \\ &= 3376 \end{aligned}$
22.	An array MAT[30][10] is stored in the memory column wise with each element occupying 8 bytes of memory. Find out the base address and the address of element MAT[20][5], if the location of MAT[5][7] is stored at the address 1000.
Ans.	<p>Base Address B No of rows m=30 Element size W=8 Lowest Row and column indices $I_r, I_c=0$ Address of lth, jth element of array in column major order is: Address of MAT[I][J] = B + W(m(J - I_c) + (I - I_r)) MAT[5][7] = 1000</p> $\begin{aligned} 1000 &= B + 8(30(7-0)+(5-0)) \\ 1000 &= B + 8(30(7)+(5)) \\ 1000 &= B + 8(210 + 5) \\ 1000 &= B + 8(215) \\ 1000 &= B + 1720 \\ B &= 1000 - 1720 \\ B &= -720 \end{aligned}$ <p>⇒ Base address is -720</p> <p>Now address of MAT[20][5] is computed as:</p> $\begin{aligned} \text{MAT}[20][5] &= -720 + 8(30(5 - 0) + (20 - 0)) \\ &= -720 + 8(30(5) + (20)) \\ &= -720 + 8(150 + 20) \\ &= -720 + 8(170) \\ &= -720 + 1360 \\ &= 640 \end{aligned}$
23	Write an algorithm to search for an ITEM linearly in array X[-10:10]
Ans.	<ol style="list-style-type: none"> ctr=-10 Repeat steps 3 and 4 until ctr>10

	<pre> 3. If X[ctr]==ITEM then { print "Search Successfull" Print ctr, "is the location of", ITEM break } 4. ctr=ctr+1 /* End of Repeat */ 5. if ctr>10 then print "Search Unsuccessfull" 6. END </pre>
24.	Write an algorithm to search for an ITEM using binary search in array X[-10:10]
Ans.	<pre> 1. Set beg=-10,last=10 2. REPEAT steps 3 through 6 UNTIL beg>last //INT() is used to extract integer part 3. mid=INT((beg+last)/2) 4. if X[mid]==ITEM then { print "Search Successful" print ITEM,"fount at",mid break } /* go out of the loop*/ 5. if X[mid]<ITEM then beg=mid+1 6. if X[mid]>ITEM then last=mid-1 /* END of repeat */ 7. if beg!=last print "Unsuccessful Search" 8. END </pre>
25.	Write an algorithm to insert ITEM at an appropriate position in array X[-10:10]
Ans.	<pre> 1. ctr=-10 /*Initialize the counter */ 2. If LST=10 then { print "Overflow:" Exit from program } 3. if X[ctr]>ITEM then pos=1 else { 4. Repeat steps 5 and 6 until ctr>=10 5. if X[ctr]<=ITEM and ITEM<=X[ctr+1] then { pos=ctr+1 break } 6. ctr=ctr+1 7. ctr=10 then pos=10+1 } /* end of if step 3*/ /* shift the elemets to create space */ 8. ctr=10 /*Initialize the counter */ 9. while ctr>=pos perform steps 10 through 11 10. { X[ctr+1]=X[ctr] 11. ctr=ctr-1 } 12. X[pos]=ITEM /* Insert the elements */ 13. END. </pre>

26.	Write an algorithm to delete an ITEM at position 0 in array X[-3:5]. The free space should be put in the beginning of array.
Ans.	<pre> 1. ctr=-3 2. If LST=0 { print "Underflow" Exit from program } 3. If(pos==0) X[pos]=0; print "Zero (0) signifies the deleted element" /*After this the free space will be put in the beginning of array */ 4. ctr=pos 5. Repeat steps 6 and 7 until ctr>=5 6. X[ctr]=X[ctr-1] 7. ctr=ctr-1 /* End of Repeat*/ 8. END </pre>
27.	Write algorithm to sort an array B[-3:5]: (i) using selection sort (ii) using bubble sort
Ans.	<p>(i) using selection sort:</p> <pre> 1. L=-3, U=5 2. small=B[L] /* Initialize small with first array element */ 3. For I=L TO U do { 4. small=B[I],pos=I /* Loop to find smallest element and its position */ 5. For J=I TO U do { 6. If B[J]<small then 7. { small=B[J] 8. pos=J } J=J+1 } /*end of inner loop*/ /* swap the smallest element with Ith element*/ 9. temp=B[I] 10. B[I]=small 11. B[pos]=temp } /*end of outer loop*/ 12. END. </pre> <p>(ii) using bubble sort:</p> <pre> 1. L=-3, U=5 2. For I=L TO U 3. { For J=L TO [(U-1)-I] //need not consider already settled heavy elements// // that is why (U-1)-I 4. { if B[J]>B[J+1] then { 5. temp=B[J] 6. B[J]=B[J+1] 7. B[J+1]=temp } /*end of if*/ } /*end of inner loop*/ </pre>

	<pre> } /*end of outer loop*/ 8. END. </pre>
28.	<p>The following array of integers is to be arranged in ascending order using the bubble sort technique: 26 21 20 23 29 17 Give the contents of array at the end of each iteration. Do not write the algorithm.</p>
Ans.	<p>Bubble Sort (Bold elements depicts that they are to be compared in the next pass.)</p> <p>Step 1. 26, 21, 20, 23, 29, 17 Step 2. 21, 26, 20, 23, 29, 17 Step 3. 21, 20, 26, 23, 29, 17 Step 4. 21, 20, 23, 26, 29, 17 Step 5. 21, 20, 23, 26, 29, 17 Step 6. 21, 20, 23, 26, 17, 29 Step 7. 20, 21, 23, 26, 17, 29 Step 8. 20, 21, 23, 26, 17, 29 Step 9. 20, 21, 23, 26, 17, 29 Step 10. 20, 21, 23, 17, 26, 29 Step 11. 20, 21, 23, 17, 26, 29 Step 12. 20, 21, 23, 17, 26, 29 Step 13. 20, 21, 23, 17, 26, 29 Step 14. 20, 21, 17, 23, 26, 29 Step 15. 20, 21, 17, 23, 26, 29 Step 16. 20, 21, 17, 23, 26, 29 Step 17. 20, 21, 17, 23, 26, 29 Step 18. 20, 17, 21, 23, 26, 29 Step 19. 20, 17, 21, 23, 26, 29 Step 20. 20, 17, 21, 23, 26, 29 Step 21. 20, 17, 21, 23, 26, 29 Step 22. 17, 20, 21, 23, 26, 29</p>
29.	<p>Write an algorithm to merge two arrays X[6], Y[5] stored in descending order. The resultant array should be in ascending order.</p>
Ans.	<p>Assuming that L=0 and U=6-1, 5-1 and (6+5)-1 respectively for X, Y, and Z</p> <pre> 1. ctrX=6-1; ctrY=5-1; ctrZ=0; 2. while ctrX>=0 and ctrY>=0 perform steps 3 through 10 3. { If X[ctrX]<=Y[ctrY] then 4. { Z[ctrZ]=X[ctrX] 5. ctrZ=ctrZ+1 6. ctrX=ctrX-1 } 7. else 8. { Z[ctrZ]=Y[ctrY] 9. ctrZ=ctrZ+1 10. ctrY=ctrY-1 } 11. } 12. if ctrX<0 then 13. { while ctrY>=0 perform steps 13 through 15 14. { 15. Z[ctrZ]=Y[ctrY] 16. ctrZ=ctrZ+1 17. ctrY=ctrY-1 18. } 19. } 20. if ctrY<0 then 21. { while ctrX>=0 perform steps 18 through 20 22. { Z[ctrZ]=X[ctrX] </pre>

	<pre> 19. ctrZ=ctrZ+1 20. ctrX=ctrX-1 } } </pre>
30.	Write an algorithm to add corresponding elements of two matrices A[3 x 3] and B[3 x 3]
Ans.	<pre> /* Read the two matrices */ 1. for i=1 to 3 perform step 2 through 4 2. { for j=1 to 3 perform step 3 through 4 3. { Read A[i,j] 4. Read B[i,j] } } /* Calculate the sum of the two and store it in third matrix C */ 5. for i=1 to 3 perform step 6 through 8 { 6. for j=1 to 3 perform step 7 through 8 7. { C[i,j]=0 8. C[i,j]=A[i,j]+B[i,j] } } </pre>
31.	Write an algorithm to subtract a matrix A[4 x 4] from a matrix X[4 x 4]
Ans.	<pre> /* Read the two matrices */ 1. for i=1 to 4 perform step 2 through 4 2. { for j=1 to 4 perform step 3 through 4 3. { Read A[i,j] 4. Read B[i,j] } } /* Calculate the sum of the two and store it in third matrix C */ 5. for i=1 to 4 perform step 6 through 8 { 6. for j=1 to 4 perform step 7 through 8 7. { C[i,j]=0 8. C[i,j]=A[i,j]-B[i,j] } } </pre>
32.	Write an algorithm to print all those elements of a matrix X[4 x 4] that are not diagonal elements.
Ans.	<p>Students I am giving you the program for printing Non Diagonal elements of a matrix X[4x4], try to convert this code into algorithm.</p> <pre> #include<conio.h> #include<iostream.h> void accept(int a[4][4],int size) { cout<<"Diagonal One:"; for (int i=0;i<size;i++) for(int j=0;j<size;j++) if (i != j && i != size-j-1) cout<<a[i][j]; } void main() { int a[4][4]={5,4,3,4},{6,7,9,1},{8,0,3,7},{2,4,5,9}}; </pre>

	<pre> clrscr(); accept(a,4); getch(); } </pre>
33.	Write a user-defined function in C++ to find and display the sum of both the diagonal elements of a two dimensional array MATRIX[6][6] containing integers.
Ans.	<pre> float diagonalSum(float MATRIX[6][6], int r, int c) { int i,j; float sum=0; //We are calculating sum of diagonal elements considering both diagonals //We are adding intersecting element on two diagonal twice for(i=0;i<r;i++) { for(j=0;j<c;j++) { if(i==j) //elements on first diagonal sum+= MATRIX [i][j]; if((i+j)==(r-1)) // elements on off-diagonal sum+= MATRIX [i][j]; } } return sum; } </pre>
34.	What is the pre-condition for applying binary search algorithm?
Ans.	For applying binary search algorithm the array, to be scanned, must be sorted in any order (ascending or descending).
35.	Write a user defined function in C++ to display the multiplication of row elements of two dimensional array A[4][6] containing integers.
Ans.	<pre> void RowMulti(int A[4][6]) { int Mul[4]; for(int i=0;i<4;i++) { Mul[i]=1; for(int j=0;j<6;j++) Mul[i]*=A[i][j]; cout<<"Product of row"<<i+1<<"="<<Mul[i]<<endl; } } </pre>
36.	Write a user defined function in C++ to display the sum of row elements of two dimensional array A[5][6] containing integers.
Ans.	<pre> void RowSum(int A[5][6]) { int SUMC[5]; for(int i=0;i<5;i++) { SUMC[i]=0; for(int j=0;j<6;j++) SUMC[i]+=A[i][j]; cout<<"Sum of row"<<i+1<<"="<< SUMC[i]<<endl; } } </pre>
37.	Write a user defined function in C++ to display the sum of column elements of two dimensional array R[7][7] containing integers.
Ans.	<pre> void COLSUM(int R[7][7]) { </pre>

	<pre> int SUMC; for (int j=0;j<7;j++) { SUMC=0; for(int i=0;i<7;i++) SUMC=SUMC + R[i][j]; Cout<< "Sum of Column "<<j<<" = "<<SUMC ; } </pre>
38.	Write a user defined function in C++ to display the sum of row elements of two dimensional array M[5][6] containing integers.
Ans.	Same as Q. No. 36
39.	Consider 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.
Ans.	<p>Insertion sort:</p> <p>Step-1 - ∞, 42, 29, 74, 11, 65, 58</p> <p>Step-2 - ∞, 29, 42, 74, 11, 65, 58</p> <p>Step-2 - ∞, 29, 42, 11, 74, 65, 58</p> <p>Step-4 - ∞, 29, 42, 11, 65, 74, 58</p> <p>Step-5 - ∞, 29, 42, 11, 58, 65, 74</p> <p>Step-6 - ∞, 11, 29, 42, 58, 65, 74</p>
40.	Write a user-defined function in C++ to display those elements of a two dimensional 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]);
Ans.	<pre> void Showhundred(int T[4][4]) { for(int I = 0; I<4; I++) { for(int J = 0; J<4; J++) { if (T[I][J]%100 == 0) cout<<"Elemets which are divisible by 100 are:" <<A[I][J]<<endl; } } } </pre>
41.	Each element of two-dimensional array (with 5 rows and 4 columns) is stored in one memory location. If A(1,1) is at location 2000, what is the address of A(4,4) ? The arrangement is row-major. Use a suitable formula for the calculation.
Ans.	<p>A[5][4] => rows R=5, columns C=4</p> <p>Let base address be B</p> <p>Given element width W=1 bytes and A[1][1]=2000</p> <p>In Row major,</p> $A[I][J]=B+W(C(I-lr)+(j-lc))$ <p>where lr=lowest row and lc=lowest column</p> $A[1][1]=B+W(C(1-0)+(1-0))$ $2000=B+1(4(1)+1)$ $2000=B+5$ <p>Base Address B=2000-5=1995</p> <p>Using same formula</p> $A[4][4]=1995+1(4(4-0)+(4-0))$ $=1995+20$

	=2015
42.	Calculate the address of X[4,3] in a two-dimensional array X[1....5, 1.....4] stored in row-major order in the main memory. Assuming base address to be 1000 and that each requires 4 words of storage.
Ans.	$X[4][3] = B + W(C(I-1) + (J-1))$ $= 1000 + 4(4(4-1) + (3-1))$ $= 1000 + 4(4(3) + (2))$ $= 1000 + 56$ $= 1056$

LONG ANSWER QUESTIONS

1.	What are data structures? What are their types and sub-types? Explain each of the subtypes with examples.
Ans.	<p>The data structures are named group of data of some data types. The data structures can be classified into following two types:</p> <p>1. Simple Data Structure: These data structure are normally built from primitive data types like integers, reals, characters, boolean. Simple data structure can be classified into following two categories:</p> <p><u>(a) Array:</u> Arrays refer to a named list of a finite number n of similar data elements. For example, <code>int ARR[10];</code> Above array ARR have 10 elements, each elements will be referenced as <code>Arr[0]</code>, <code>ARR[1]</code>.....<code>ARR[9]</code>.</p> <p><u>(b) Structure:</u> Structure refers to a named collection of variables of different data types. For example, a structure named as STUD contains (Rno, Name, Mark), then individual fields will be referenced as <code>STUD.fieldname</code> such as, <code>STUD.Rno</code>, <code>STUD.Name</code> etc.</p> <p>2. Compound Data Structure: Simple data structure can be combine in various ways to form more complex structures called compound data structures which are classified into following two categories:</p> <p><u>(a) Linear data structure:</u> These data structures are a single level data structures representing linear relationship among data. Following are the types of linear data structure:</p> <p>(i) Stacks: Stack is a LIFO (Last In First Out) list. For example, stack of plates on counter, as that plates are inserted or removed only from the top of the stack.</p> <p>(ii) Queue: Queue is a FIFO (First In First Out) list. For example, line of people waiting for their turn to vote.</p> <p>(iii) Linked List: Linked lists are special lists of some data elements linked to one another. For example, peoples seating in a cinema hall where each seat is connected to other seat.</p> <p><u>(b) Non-Linear data structure:</u> These data structures are multilevel data structure representing hierarchical relationship among data. For example, relationship of child, parent and grandparent.</p>
2.	Write an algorithm to search for given ITEM in a given array X[n] using linear search technique. If the ITEM is found, move it at the top of the array. If the ITEM is not found, insert it at the end of the array.
Ans.	<p>Students I gave you solution of 2 part of the question</p> <p>First part Linear Search Technique Algorithm</p> <pre> 1. LB=0 2. Repeat steps 3 and 4 until LB>UB //UB means Upper Bound(length of array) 3. If ARR[LB]==ITEM then { pos=LB break } 4. LB=LB+1 5. if LB>UB then print "Value Not Found" else { //Second part swapping of searched item at top of the array temp=ARR[pos] ARR[pos]=ARR[0] ARR[0]=temp } </pre>

	Third part is inserting the item which is not present at the end of the array, try this part.
3.	<p>Write an algorithm to search for 66 and 71 in the following array: 3, 4, 7, 11, 18, 29, 45, 71, 87, 89, 93, 96, 99</p> <p>Make use of binary search technique. Also give the intermediate results while executing this algorithm.</p> <p>Convert this algorithm into a C++ program.</p>
Ans.	<p><u>Algorithm:</u></p> <ol style="list-style-type: none"> 1. Set beg=0, last=12 2. REPEAT steps 3 through 6 UNTIL beg>last //INT() is used to extract integer part 3. mid=INT((beg+last)/2) 4. if A[mid]==ITEM then <ul style="list-style-type: none"> { print "Search Successful" print ITEM, "found at", mid break /* go out of the loop*/ } 5. if A[mid]<ITEM then <ul style="list-style-type: none"> beg=mid+1 6. if A[mid]>ITEM then <ul style="list-style-type: none"> last=mid-1 /* END of repeat */ 7. if beg!=last <ul style="list-style-type: none"> print "Unsuccessful Search" 8. END <p><u>Intermediate Results:</u></p> <p><u>(i) Search for 66.</u></p> <p>Step 1: beg=1; last=13; mid=INT(1+13)/2=7</p> <p>Step 2: A[mid] i.e., A[7] is 45 45<66 then beg=mid+1 i.e., beg=7+1=8</p> <p>Step 3: mid=Int((beg+last)/2)=INT((8+13)/2)=10 A[10] i.e., 89>66 then last = mid-1=10-1=9</p> <p>Step 4: mid=((8+9)/2)=8 A[8] is 71 71>66 than last = mid-1=8-1=7</p> <p>Step 5: mid=((8+7)/2)=7 A[7] is 45 45 < 66 then beg = mid+1=7+1=8</p> <p>Step 6: mid=((8+8)/2)=8 (beg=last=8) A[8] is 71 => 71!=66 "Search Unsuccessful!!!"</p> <p><u>(ii) Search for 71.</u></p> <p>Step 1: beg=1; last=13; mid=INT(1+13)/2=7</p> <p>Step 2: A[mid] i.e., A[7] is 45 45<71 then beg=mid+1 i.e., beg=7+1=8</p> <p>Step 3:</p>

```

mid=Int((beg+last)/2)=INT((8+13)/2)=10
A[10] i.e., 89>71 then last = mid-1=10-1=9
Step 4:
mid=((8+9)/2)=8
A[8] is 71    71=>71
"Search Successful!!!"

```

Program:

```

#include<iostream.h>
int Bsearch(int [],int);
int main()
{
    int A[]={3,4,7,11,18,29,45,71,87,89,93,96,99};
    int index;
    index=Bsearch(A,71);
    if(index!=-1)
        cout<<"Element not found..";
    else
        cout<<"Element found at
index:"<<index<<"/Position:"<<index+1<<endl;
    return 0;
}
int Bsearch(int A[],int item)
{
    int beg,last,mid;
    beg=0; last=13-1;
    while(beg<=last)
    {
        mid=(beg+last)/2;
        if(item==A[mid]) return mid;
        else if (item>A[mid]) beg=mid+1;
        else last=mid-1;
    }
    rerurn -1;
}

```

- 4. An array X[n] stores names only. The first position of the array does not store a name rather it stores the number of available free spaces in the array. Write an algorithm to insert or delete an ITEM (accept it from the users) in the given array.**

Ans. Insert an ITEM:

```

1. ctr=0                                /*Initialize the counter */
2. If LST=n then
    { print "Overflow:"
      Exit from program
    }
3. if X[ctr]>ITEM then
    pos=1
    else
    {
4. Repeat steps 5 and 6 until ctr>=U
5. if X[ctr]<=ITEM and ITEM<=X[ctr+1] then
    {
        pos=ctr+1
        break
    }
6. ctr=ctr+1
7. ctr=n then
    pos=n+1
    }
/* end of if step 3*/
/* shift the elemets to create space */

```


	<pre> 8. ctr=10 /*Initialize the counter */ 9. while ctr>=pos perform steps 10 through 11 10. { X[ctr+1]=X[ctr] 11. ctr=ctr-1 } 12. X[pos]=ITEM /* Insert the elements */ 13. END. Delete an ITEM 1. ctr=0 2. If n=0 { print "Underflow" Exit from program } 3. Repeat steps 4 and 5 until ctr<n 4. if(X[ctr]==ITEM) return ctr return -1 5. if(pos!=-1) X[pos]=0; print "Zero (0) signifies the deleted element" /*After this the free space will be put in the end of array */ 6. ctr=pos 7. Repeat steps 6 and 7 until ctr>=5 8. X[ctr]=X[ctr+1] 9. ctr=ctr+1 /* End of Repeat*/ 10.END </pre>
5.	<p>In array A[n], after deletion of any element, no element was shifted, thus, the free space is scattered across the array. You have been given the task to solve this problem. Write an algorithm to combine all the elements at the rear end of the array so that all the free spaces are available at the beginning of the array.</p>
Ans.	<pre> 1.ctr=pos 2.Repeat steps 3 and 4 until ctr<=1 3. A[ctr]=A[ctr-1] 4. ctr=ctr-1 /* End of Repeat*/ 5.Display the new list of element 6.End </pre>
6.	<p>Given the following array: 13, 7, 6, 21, 35, 2, 28, 64, 45, 3, 5, 1 Write an algorithm to sort the above array using exchange selection sort. Give the array after every iteration. Convert this algorithm into C++ program.</p>
Ans.	<p>Algorithm:</p> <pre> 1. L=0, U=11 2. small=A[L] /* Initialize small with first array element */ 3. For I=L TO U do { 4. small=A[I],pos=I /* Loop to find smallest element and its position */ 5. For J=I TO U do { 6. If A[J]<small then 7. { small=A[J] 8. pos=J } } J=J+1 </pre>

```

    } /*end of inner loop*/
    /* swap the smallest element with Ith element*/
9. temp=A[I]
10. A[I]=small
11. A[pos]=temp
    } /*end of outer loop*/
12. END.

```

Array status after every iteration:

Note: element with red color is smallest element

```

(1) 13, 7, 6, 21, 35, 2, 28, 64, 45, 3, 5, 1
(2) 1, 7, 6, 21, 35, 2, 28, 64, 45, 3, 5, 13
(3) 1, 2, 6, 21, 35, 7, 28, 64, 45, 3, 5, 13
(4) 1, 2, 3, 21, 35, 7, 28, 64, 45, 6, 5, 13
(5) 1, 2, 3, 5, 35, 7, 28, 64, 45, 6, 21, 13
(6) 1, 2, 3, 5, 6, 7, 28, 64, 45, 35, 21, 13
(7) 1, 2, 3, 5, 6, 7, 13, 64, 45, 35, 21, 28
(8) 1, 2, 3, 5, 6, 7, 13, 21, 45, 35, 64, 28
(9) 1, 2, 3, 5, 6, 7, 13, 21, 28, 35, 64, 45
(10) 1, 2, 3, 5, 6, 7, 13, 21, 28, 35, 45, 64

```

Program:

```

#include<iostream.h>
void SelSort(int []);
int main()
{
    int A[]={13,7,6,21,35,2,28,64,45,3,5,1};
    SelSort(A);
    cout<<"The sorted array is as following...";
    for(i=0;i<12;i++)
        cout<<A[i]<<" ";
    cout<<endl;
    return 0;
}

void SelSort(int A[])
{
    int small,pos,tmp;
    for(int i=0;i<12;i++)
    {
        small=A[i]
        pos=i;
        for(int j=i+1;j<size;j++)
        {
            if(A[j]<small)
                { small=A[j]; pos=j; }
        }
        tmp=A[i];
        A[i]=A[pos];
        A[pos]=tmp;
        cout<<"\n Array after pass- "<i+1<<"-is:";
        for(j=0;j<size;j++) cout<<A[j]<<" ";
    }
}

```

7. For the same array mentioned above in question 6, write an algorithm to sort the above array using bubble sort technique. Give the array-status after every iteration.

Ans. **Algorithm:**

```

1. L=0, U=11
2. For I=L TO U
3. { For J=L TO [(U-1)-I] //need not consider already settled heavy

```

```

elements//
                                // that is why (U-1)-I
4.  { if A[J]>A[J+1] then
      {
5.      temp=A[J]
6.      A[J]=A[J+1]
7.      A[J+1]=temp
      }
    }
    }
    }
8. END.

```

Array status after every iteration:

Note: Element in red color depict that they are to be compared in the next pass.

```

(1)  13, 7, 6, 21, 35, 2, 28, 64, 45, 3, 5, 1
(2)  7, 13, 6, 21, 35, 2, 28, 64, 45, 3, 5, 1
(3)  7, 6, 13, 21, 35, 2, 28, 64, 45, 3, 5, 1
(4)  7, 6, 13, 21, 35, 2, 28, 64, 45, 3, 5, 1
(5)  7, 6, 13, 21, 35, 2, 28, 64, 45, 3, 5, 1
(6)  7, 6, 13, 21, 2, 35, 28, 64, 45, 3, 5, 1
(7)  7, 6, 13, 21, 2, 28, 35, 64, 45, 3, 5, 1
(8)  7, 6, 13, 21, 2, 28, 35, 64, 45, 3, 5, 1
(9)  7, 6, 13, 21, 2, 28, 35, 45, 64, 3, 5, 1
(10) 7, 6, 13, 21, 2, 28, 35, 45, 3, 64, 5, 1
(11) 7, 6, 13, 21, 2, 28, 35, 45, 3, 5, 65, 1
(12) 7, 6, 13, 21, 2, 28, 35, 45, 3, 5, 1, 65
//(13) 6, 7, 13, 21, 2, 28, 35, 45, 3, 5, 1, 65
//(14) 6, 7, 13, 21, 2, 28, 35, 45, 3, 5, 1, 65
(15) 6, 7, 13, 21, 2, 28, 35, 45, 3, 5, 1, 65
//(16) 6, 7, 13, 2, 21, 28, 35, 45, 3, 5, 1, 65
//(17) 6, 7, 13, 2, 21, 28, 35, 45, 3, 5, 1, 65
//(18) 6, 7, 13, 2, 21, 28, 35, 45, 3, 5, 1, 65
(19) 6, 7, 13, 2, 21, 28, 35, 45, 3, 5, 1, 65
(20) 6, 7, 13, 2, 21, 28, 35, 3, 45, 5, 1, 65
(21) 6, 7, 13, 2, 21, 28, 35, 3, 5, 45, 1, 65
//(22) 6, 7, 13, 2, 21, 28, 35, 3, 5, 1, 45, 65
//(24) 6, 7, 13, 2, 21, 28, 35, 3, 5, 1, 45, 65
//(25) 6, 7, 13, 2, 21, 28, 35, 3, 5, 1, 45, 65
(26) 6, 7, 13, 2, 21, 28, 35, 3, 5, 1, 45, 65
//(27) 6, 7, 2, 13, 21, 28, 35, 3, 5, 1, 45, 65
//(28) 6, 7, 2, 13, 21, 28, 35, 3, 5, 1, 45, 65
//(29) 6, 7, 2, 13, 21, 28, 35, 3, 5, 1, 45, 65
(30) 6, 7, 2, 13, 21, 28, 35, 3, 5, 1, 45, 65
(31) 6, 7, 2, 13, 21, 28, 3, 35, 5, 1, 45, 65
(32) 6, 7, 2, 13, 21, 28, 3, 5, 35, 1, 45, 65
//(33) 6, 7, 2, 13, 21, 28, 3, 5, 1, 35, 45, 65
//(34) 6, 7, 2, 13, 21, 28, 3, 5, 1, 35, 45, 65
//(35) 6, 7, 2, 13, 21, 28, 3, 5, 1, 35, 45, 65
(36) 6, 7, 2, 13, 21, 28, 3, 5, 1, 35, 45, 65
//(37) 6, 2, 7, 13, 21, 28, 3, 5, 1, 35, 45, 65
//(38) 6, 2, 7, 13, 21, 28, 3, 5, 1, 35, 45, 65
//(39) 6, 2, 7, 13, 21, 28, 3, 5, 1, 35, 45, 65
(40) 6, 2, 7, 13, 21, 28, 3, 5, 1, 35, 45, 65
(41) 6, 2, 7, 13, 21, 3, 28, 5, 1, 35, 45, 65
(42) 6, 2, 7, 13, 21, 3, 5, 28, 1, 35, 45, 65
//(43) 6, 2, 7, 13, 21, 3, 5, 1, 28, 35, 45, 65

```

	<pre> //(44) 6, 2, 7, 13, 21, 3, 5, 1, 28, 35, 45, 65 //(45) 6, 2, 7, 13, 21, 3, 5, 1, 28, 35, 45, 65 (46) 6, 2, 7, 13, 21, 3, 5, 1, 28, 35, 45, 65 //(47) 2, 6, 7, 13, 21, 3, 5, 1, 28, 35, 45, 65 //(48) 2, 6, 7, 13, 21, 3, 5, 1, 28, 35, 45, 65 //(49) 2, 6, 7, 13, 21, 3, 5, 1, 28, 35, 45, 65 (50) 2, 6, 7, 13, 21, 3, 5, 1, 28, 35, 45, 65 (51) 2, 6, 7, 13, 3, 21, 5, 1, 28, 35, 45, 65 (52) 2, 6, 7, 13, 3, 5, 21, 1, 28, 35, 45, 65 //(53) 2, 6, 7, 13, 3, 5, 1, 21, 28, 35, 45, 65 //(54) 2, 6, 7, 13, 3, 5, 1, 21, 28, 35, 45, 65 //(55) 2, 6, 7, 13, 3, 5, 1, 21, 28, 35, 45, 65 //(56) 2, 6, 7, 13, 3, 5, 1, 21, 28, 35, 45, 65 //(57) 2, 6, 7, 13, 3, 5, 1, 21, 28, 35, 45, 65 //(58) 2, 6, 7, 13, 3, 5, 1, 21, 28, 35, 45, 65 //(59) 2, 6, 7, 13, 3, 5, 1, 21, 28, 35, 45, 65 (60) 2, 6, 7, 13, 3, 5, 1, 21, 28, 35, 45, 65 (61) 2, 6, 7, 3, 13, 5, 1, 21, 28, 35, 45, 65 (62) 2, 6, 7, 3, 5, 13, 1, 21, 28, 35, 45, 65 //(63) 2, 6, 7, 3, 5, 1, 13, 21, 28, 35, 45, 65 //(64) 2, 6, 7, 3, 5, 1, 13, 21, 28, 35, 45, 65 //(65) 2, 6, 7, 3, 5, 1, 13, 21, 28, 35, 45, 65 //(66) 2, 6, 7, 3, 5, 1, 13, 21, 28, 35, 45, 65 //(67) 2, 6, 7, 3, 5, 1, 13, 21, 28, 35, 45, 65 //(68) 2, 6, 7, 3, 5, 1, 13, 21, 28, 35, 45, 65 (69) 2, 6, 7, 3, 5, 1, 13, 21, 28, 35, 45, 65 (70) 2, 6, 3, 7, 5, 1, 13, 21, 28, 35, 45, 65 (71) 2, 6, 3, 5, 7, 1, 13, 21, 28, 35, 45, 65 //(72) 2, 6, 3, 5, 1, 7, 13, 21, 28, 35, 45, 65 //(73) 2, 6, 3, 5, 1, 7, 13, 21, 28, 35, 45, 65 //(74) 2, 6, 3, 5, 1, 7, 13, 21, 28, 35, 45, 65 //(75) 2, 6, 3, 5, 1, 7, 13, 21, 28, 35, 45, 65 //(76) 2, 6, 3, 5, 1, 7, 13, 21, 28, 35, 45, 65 //(77) 2, 6, 3, 5, 1, 7, 13, 21, 28, 35, 45, 65 //(78) 2, 6, 3, 5, 1, 7, 13, 21, 28, 35, 45, 65 (79) 2, 6, 3, 5, 1, 7, 13, 21, 28, 35, 45, 65 (80) 2, 3, 6, 5, 1, 7, 13, 21, 28, 35, 45, 65 (81) 2, 3, 5, 6, 1, 7, 13, 21, 28, 35, 45, 65 //(82) 2, 3, 5, 1, 6, 7, 13, 21, 28, 35, 45, 65 //(83) 2, 3, 5, 1, 6, 7, 13, 21, 28, 35, 45, 65 //(84) 2, 3, 5, 1, 6, 7, 13, 21, 28, 35, 45, 65 (85) 2, 3, 5, 1, 6, 7, 13, 21, 28, 35, 45, 65 (86) 2, 3, 1, 5, 6, 7, 13, 21, 28, 35, 45, 65 (87) 2, 1, 3, 5, 6, 7, 13, 21, 28, 35, 45, 65 (88) 1, 2, 3, 5, 6, 7, 13, 21, 28, 35, 45, 65 </pre>
8.	Using a two-dimensional array A[n x n], write an algorithm to prepare a one-dimensional array B[n²] that will have all the elements of A as if they are stored in column-major form.
Ans.	Can You do this try it.
9.	Suppose A, B, C are arrays of integers of sizes m, n, m+n respectively. The numbers in arrays A and B appear in descending order. Give an algorithm to produce a third array C, containing all the data of array A and B in ascending order.
Ans.	<p>Assuming that L=0 and U=m-1, n-1 and (m+n)-1 respectively for A, B, and C</p> <ol style="list-style-type: none"> ctrA=m-1; ctrB=n-1; ctrC=0; while ctrA>=0 and ctrB>=0 perform steps 3 through 10

```

3.  { If A[ctrA]<=B[ctrB] then
4.    {    C[ctrC]=A[ctrA]
5.        ctrC=ctrC+1
6.        ctrA=ctrA-1    }
7.    else
8.        {    C[ctrC]=B[ctrB]
9.            ctrC=ctrC+1
10.           ctrB=ctrB-1    }
11. }
12. if ctrA<0 then
13. {    while ctrB>=0 perform steps 13 through 15
14.     {
15.         C[ctrC]=B[ctrB]
16.         ctrC=ctrC+1
17.         ctrB=ctrB-1
18.     }
19. }
20. if ctrB<0 then
21. {    while ctrA>=0 perform steps 18 through 20
22.     {
23.         C[ctrC]=A[ctrA]
24.         ctrC=ctrC+1
25.         ctrA=ctrA-1
26.     }
27. }

```

10. From a two-dimensional array A[4 x 4], write an algorithm to prepare a one dimensional array B[16] that will have all the elements of A as if they are stored in row-major form. For example for the following array:

1	2	3	4
5	6	7	8
9	10	11	12
13	14	15	16

the resultant array should be

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16

Ans.

```

#include (iostream.h)

#include (conio.h)

void main( )
{
    int A[4][4], B[16];

    // Input elements
    for(int i = 0; i < 4 ; i++)
        for( int j = 0; j < 4 ; j++)
        {
            cout<<"\n Enter elements for "<< i+1 << ", "<< j+1 << "location :";
            cin >> A[i][j];
        }

    clrscr();
    //Print the array
    cout<<"\n The Original matrix : \n\n";

```

	<pre> for(i = 0; i < 4 ; i++) { for(j = 0; j < 4 ; j++) cout<< A[i][j]<<"\t"; cout<< "\n"; } int k = 0; // Convert 2 - D array into 1-D array by row-major rule for(i = 0; i < 4 ; i++) for(j = 0; j < 4 ; j++) B[k] = A[i][j]; //display the 1D Array for(k=0; k<16; k++) cout<< B[k] << " "; getch(); } </pre>
11.	<p>Suppose a one dimensional 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 linear search method, returning an integer 0 to show absence of the number and integer 1 to show the 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.</p>
Ans.	<pre> int Lsearch(int AR[10],int DATA,int N) { for(int i=0;i<n;i++) { if(AR[i]==DATA) return i; //return index of item in case of successful search } return -1; //the control will reach here only when item is not found } </pre>
12.	<p>Suppose a one dimensional array ARR containing integers is arranged in ascending order. Write a user defined function in C++ to search for one integer from ARR with the help of binary search method, returning an integer 0 to show absence of the number and integer 1 to show the presence of the number in the array. The function should have three parameters: (1) an array ARR (2) the number DATA to be searched and (3) the number of elements N.</p>
Ans.	<pre> int bsearch(int ARR[10],int DATA,int N) { int beg=0,last=N-1,mid; while(beg<=last) { mid=(beg+last)/2; if(ARR[mid]==DATA) return 1; //element is present in array else if(DATA>ARR[mid]) beg=mid+1; else last=mid-1; } return 0; //element is absent in array } </pre>
13.	<p>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 the numbers in array B appear in descending order. Write a user defined function in C++ to produce third array C by merging arrays A and B in Ascending order. Use A, B, and C as arguments in the function.</p>
Ans.	<pre> #include<iostream.h> void Merge(int A[],int M,int B[],int N,int C[]); </pre>

```

int mai()
{
    int A[50],B[50],C[50],MN=0,M,N;
    cout<<"How many elements do U want to create first array with? ";
    cin>>M;
    cout<<"Enter First Array's elements [ascending]...";
    for(int i=0;i<M;i++)
        cin>>A[i];
    cout<<"How many elements do U want to create second array with? ";
    cin>>N;
    MN=M+N;
    cout<<"Enter Second Array's elements [descending]...";
    for(int i=0;i<N;i++)
        cin>>B[i];
    Merge(A,M,B,N,C);
    cout<<"The merged array is....";
    for(i=0;i<MN;i++)
        cout<<C[i]<<" ";
    cout<<endl;
    return 0;
}

void Merge(int A[],int M,int B[],int N,int C[])
{
    int a,b,c;
    for(a=0,b=-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--];
    }
}

```

14. Suppose X, Y, Z are arrays of integers of size M, N and M+N respectively. The numbers in array X and Y appear in descending order. Write a user defined function in C++ to produce third array Z by merging arrays X and Y in descending order.

Ans.

```

#include<iostream.h>
void Merge(int X[],int M,int Y[],int N,int Z[]);
int main()
{
    int X[50],Y[50],Z[50],MN=0,M,N;
    cout<<"How many elements do U want to create first array with? ";
    cin>>M;
    cout<<"Enter First Array's elements [descending]...";
    for(int i=0;i<M;i++)
        cin>>X[i];
    cout<<"How many elements do U want to create second array with? ";
    cin>>N;
    MN=M+N;
    cout<<"Enter Second Array's elements [descending]...";
    for(int i=0;i<N;i++)
        cin>>Y[i];
    Merge(X,M,Y,N,Z);
}

```

```

        cout<<"The merged array is....";
        for(i=0;i<MN;i++)
            cout<<Y[i]<<" ";
        cout<<endl;
        return 0;
    }
    void Merge(int X[],int M,int Y[],int N,int Z[])
    {
        int x,y,z;
        for(x=-1,y=-1,z=-1;x>=0&&y>=0;)
        {
            if(X[x]<=Y[y]) Z[z++]=X[x--];
            else Z[z++]=Y[y--];
        }
        if(x<0)
        {
            while(x>=0)
                Z[z++]=X[x--];
        }
        else
        {
            while(y>=0)
                Z[z++]=Y[y--];
        }
    }
}

```

- 15.** Given two arrays of integers X and Y of sizes m and n respectively. Write a function named MERGE() which will produce a third array named Z, such that the following sequence is followed:
 (i) All odd numbers of X from left to right are copied into Z from left to right
 (ii) All even numbers of X from left to right are copied into Z from right to left
 (iii) All odd numbers of Y from left to right are copied into Z from left to right
 (iv) All even numbers of Y from left to right are copied into Z from right to left
 X, Y and Z are passed as argument to MERGE().
 e.g., X is {3, 2, 1, 7, 6, 3} and Y is {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}

Ans.

```

void MERGE(int X[],int Y[],int n,int m)
{
    int Z[20],i=0,j=0,k=0,l=m+n-1;
    while(i<n&&k<20)
    {
        if(X[i]%2!=0)
        {
            Z[k]=X[i];
            k++;
            i++;
        }
        else
        {
            Z[l]=X[i];
            l--;
            i++;
        }
    }
    while(j<m&&k<20)
    {
        if(Y[j]%2!=0)
        {
            Z[k]=Y[j];
            k++;
            j++;
        }
        else
        {
            Z[l]=Y[j];
            l--;
        }
    }
}

```


	<pre> j++; } } cout<<"The elements of an array C is:"; for(i=0;i<n+m;i++) cout<<"\n"<<Z[i]; } </pre>
16.	<p>Assume an array E containing elements of structure Employee is required to be arranged in descending order of Salary. Write a C++ function to arrange the 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:</p> <pre> struct Employee { int Eno; char Name[25]; float Salary; }; </pre>
Ans.	<pre> void Sort_Sal (Employee E[], int N) { Employee Temp; for (int I=0; I<N-1;I++) for (int J=0;J<N-I-1;J++) if (E[J].Salary <E[J+1]. Salary) { Temp = E[J]; E[J] = E[J+1]; E[J+1] = Temp; } } </pre>
17.	<p>Write a DSUM() function in C++ to find sum of Diagonal Elements from N x M Matrix. (Assuming that the N is a odd numbers)</p>
Ans.	<pre> int DSUM(int A[],int N) { int i,dsum1=0,dsum2=0; for(i=0;i<N;i++) { dsum1+=A[i][i]; dsum2+=A[N-(i+1)][i]; } return(dsum1+dsum2-A[N/2][N/2]); //because middle element is added twice } </pre>
18.	<p>Given two arrays of integers A and B of sizes M and N respectively. Write a function named MIX() which will produce a third array named C, such that the following sequence is followed:</p> <ul style="list-style-type: none"> (i) All even numbers of A from left to right are copied into C from left to right (ii) All odd numbers of A from left to right are copied into C from right to left (iii) All even numbers of B from left to right are copied into C from left to right (iv) All odd numbers of B from left to right are copied into C from right to left <p>X, Y and Z are passed as argument to MERGE(). e.g., A is {3, 2, 1, 7, 6, 3} and B is {9, 3, 5, 6, 2, 8, 10} the resultant array C is {2, 6, 6, 2, 8, 10, 5, 3, 9, 3, 7, 1, 3}</p>
Ans.	<pre> void MIX(int A[],int B[],int n,int m) { int C[20],i=0,j=0,k=0,l; l=m+n-1; while(i<n&&k<20) { if(A[i]%2==0) { C[k]=A[i]; </pre>

	<pre> k++; i++; } else { C[l]=A[i]; l--; i++; } } while(j<m&& k<20) { if(B[j]%2==0) { C[k]=B[j]; k++; j++; } else { C[l]=B[j]; l--; j++; } } cout<<"The elements of an array C is:"; for(i=0;i<n+m;i++) cout<<"\n"<<C[i]; } </pre>
19.	<p>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 and integer 1 to show the presence of the number in the array. The function should have three parameters: (1) an array P (2) the number DATA to be searched and (3) the number of elements N.</p>
Ans.	<pre> int bsearch(float P[10],int DATA,int N) { int beg=0,last=N-1,mid; while(beg<=last) { mid=(beg+last)/2; if(P[mid]==DATA) return 1; //element is present in array else if(DATA>P[mid]) beg=mid+1; else last=mid-1; } return 0; //element is absent in array } </pre>
20.	<p>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.</p> <p>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</p>
Ans.	<pre> void ElementSwap(int A[],int size) { int lim,tmp; if(size%2!=0) //if array has odd no. of element lim=size-1; else lim=size; for(int i=0;i<lim;i+=2) { tmp=A[i]; A[i]=A[i+1]; A[i+1]=tmp; } } </pre>

	<pre> } }</pre>												
21.	<p>Write a function in C++, which accepts an integer array and its 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 nine elements initially contains the elements as 3, 4, 5, 16, 9 then the function should rearrange the array as 9, 8, 15, 32, 27</p>												
Ans.	<pre>void RearrangeArray(int A[],int size) { for(int i=0;i<size;i++) { if(A[i]%2==0) A[i]*=2; else A[i]*=3; } }</pre>												
22.	<p>Write a function in C++ to print the product of each column of a two dimensional integer array passed as the argument of the function. Explain: if the two dimensional array contains</p> <table border="1"><tr><td>1</td><td>2</td><td>4</td></tr><tr><td>3</td><td>5</td><td>6</td></tr><tr><td>4</td><td>3</td><td>2</td></tr><tr><td>2</td><td>1</td><td>5</td></tr></table> <p>Then the output should appear as: Product of Column 1 = 24 Product of Column 2 = 30 Product of Column 3 = 240</p>	1	2	4	3	5	6	4	3	2	2	1	5
1	2	4											
3	5	6											
4	3	2											
2	1	5											
Ans.	<pre>void ColProd(int A[4][3],int r,int c) { int Prod[C],i,j; for(j=0;j<c;j++) { Prod[j]=1; for(i=0;i<r;i++) Prod[j]*=A[i][j]; cout<<"Product of Column" <<j+1<<"="<<Prod[j]<<endl; } }</pre>												
23.	<p>Write a function in C++ which accepts a 2D array of integers and its size as arguments and display the elements which lie on diagonals. [Assuming the 2D Array to be a square matrix with odd dimension i.e., 3 x 3, 5 x 5, 7 x 7 etc....] Example, if the array content is</p> <pre>5 4 3 6 7 8 1 2 9</pre> <p>Output through the function should be: Diagonal One: 5 7 9 Diagonal Two: 3 7 1</p>												
Ans.	<pre>const int n=5; void Diagonals(int A[n][n], int size) { int i,j; cout<<"Diagonal One:"; for(i=0;i<n;i++) cout<<A[i][i]<<" "; cout<<"\n Diagonal Two:"</pre>												

	<pre>for(i=0;i<n;i++) cout<<A[i][n-(i+1)]<<" "; }</pre>												
24.	<p>Write a function in C++ which accepts a 2D array of integers and its size as arguments and display 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., 3 x 3, 5 x 5, 7 x 7 etc....] Example, if the array content is</p> <pre>3 5 4 7 6 9 2 1 8</pre> <p>Output through the function should be: Middle Row: 7 6 9 Middle Column: 5 6 1</p>												
Ans.	<pre>const int S=7; // or it may be 3 or 5 int DispMRowMCol(int Arr[S][S],int S) { int mid=S/2; int i; //Extracting middle row cout<<"\n Middle Row:"; for(i=0;i<S;i++) cout<<Arr[mid][i]<<" "; //Extracting middle column cout<<"\n Middle Column:"; for(i=0;i<S;i++) cout<<Arr[i][mid]<<" "; }</pre>												
25.	<p>Write a function in C++ which accepts a 2D array of integers and its size as arguments and swaps 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</p> <p>4, 2, 6, 1, 7, 5, 23, 9, 10</p>												
Ans.	Same as Q-20 of Long Answer Question.												
26.	<p>Write a function in C++ to print the product of each row of a two dimensional integer array passed as the argument of the function. Explain: if the two dimensional array contains</p> <table><tr><td>20</td><td>40</td><td>10</td></tr><tr><td>40</td><td>50</td><td>30</td></tr><tr><td>60</td><td>30</td><td>20</td></tr><tr><td>40</td><td>20</td><td>30</td></tr></table> <p>Then the output should appear as: Product of Diagonal 1 = (1 x 5 x 2 x 4)=40 Product of Diagonal 2 = (3 x 6 x 3 x 2)=108</p>	20	40	10	40	50	30	60	30	20	40	20	30
20	40	10											
40	50	30											
60	30	20											
40	20	30											
Ans.	<pre>void RowProduct(int A[4][3],int R,int C) { int Prod[R]; for(int i=0;i<R;i++) { Prod[i]=1; for(int j=0;j<C;j++) Prod[i]*=A[i][j]; cout<<"Product of row"<<i+1<<"="<<Prod[i]<<endl; } }</pre>												
27.	Write a function REASSIGN() in C++, which accepts an array of integer and its size as parameters and divide all												

those array elements by 5 which are divisible by 5 and multiply other array element by 2.

Sample Input Data of the array

A[0]	A[1]	A[2]	A[3]	A[4]
20	12	15	60	32

Content of the array after calling REASSIGN() function

A[0]	A[1]	A[2]	A[3]	A[4]
4	24	3	12	64

Ans.

```
void REASSIGN (int Arr[ ], int Size)
{
    for (int i=0;i<Size;i++)
        if (Arr[i]%5==0)
            Arr[i]/=5;
        else
            Arr[i]*=2;
}
```

28. Write a function SORTSCORE() in C++ to sort an array of structure Examinee in descending order of Score using Bubble Sort.

Note. Assume the following definition of structure Examinee

```
struct Examinee
{
    long RollNo;
    char Name[20];
    float Score;
};
```

Sample Content of the array (before sorting)

RollNo	Name	Score
1001	Ravyank Kapur	300
1005	Farida Khan	289
1002	Anika Jain	345
1003	George Peter	297

Sample Content of the array (after sorting)

RollNo	Name	Score
1002	Anika Jain	345
1001	Ravyank Kapur	300
1003	George Peter	297
1005	Farida Khan	289

Ans.

```
void SORTSCORE(Examinee E[ ], int N)
{
    Examinee Temp;
    for (int I=0; I<N-1;I++)
        for (int J=0;J<N-I-1;J++)
            if (E[J].Score <E[J+1]. Score)
            {
                Temp = E[J];
                E[J] = E[J+1];
                E[J+1] = Temp;
            }
}
```

29. Write a function SORTPOINTS() in C++ to sort an array of structure Game in descending order of Points using Bubble Sort.

Note. Assume the following definition of structure Game

```
struct Game
{
    long PNo;    //Player Number
```

```
char PName[20];
float Points;
};
```

Sample Content of the array (before sorting)

<u>PNo</u>	<u>PName</u>	<u>Points</u>
103	Ritika Kapur	3001
104	John Philip	2819
101	Razia Abbas	3451
105	Tarun Kumar	2971

Sample Content of the array (after sorting)

<u>RollNo</u>	<u>Name</u>	<u>Score</u>
101	Razia Abbas	3451
103	Ritika Kapur	3001
105	Tarun Kumar	2971
104	John Philip	2819

Ans.

```
void SORTPOINTS(Game G[ ], int N)
{
    Game Temp;
    for (int I=0; I<N-1;I++)
        for (int J=0;J<N-I-1;J++)
            if (G[J].Points <G[J+1].Points)
            {
                Temp = G[J];
                G[J] = G[J+1];
                G[J+1] = Temp;
            }
}
```

30. Define a function SWAPCOL() in C++ to swap (interchange) the first column elements with the last column elements, for a two dimensional integer array passed as the argument of the function.

Example: If the two dimensional array contents

2	1	4	9
1	3	7	7
5	8	6	3
7	2	1	2

After swapping of the content of 1st column and last column, it should be:

9	1	4	2
7	3	7	1
3	8	6	5
2	2	1	7

Ans.

```
void SWAPCOL(int A[ ][100], int M, int N)
{
    int Temp, I;
    for (I=0;I<M;I++)
    {
        Temp = A[I][0];
        A[I][0] = A[I][N-1];
        A[I][N-1] = Temp;
    }
}
```

31. Define a function SWAPARR() in C++ to swap (interchange) the first row elements with the last row elements, for a two dimensional integer array passed as the argument of the function.

Example: If the two dimensional array contents

5	6	3	2
1	2	4	9
2	5	8	1
9	7	5	8

After swapping of the content of 1st column and last column, it should be:

9	7	5	8
1	2	4	9
2	5	8	1
5	6	3	2

Ans.

```
void SWAPARR (int A[100][], int M, int N)
{
    int Temp, I;
    for (I=0;I<M;I++)
    {
        Temp = A[0][I];
        A[0][I] = A[N-1][I];
        A[N-1][I] = Temp;
    }
}
```

CHAPTER-10
LINKED LISTS, STACKS AND QUEUES
VERY SHORT/SHORT ANSWER QUESTIONS

1.	Translate, following infix expression into its equivalent postfix expression: $((A-B)*(D/E))/(F*G*H)$														
Ans.	Equivalent postfix expression: $=((A-B)*(D/E))/(F*G*H)$ $=((AB-)*(DE/))/(FG*H*)$ $=AB - DE /* FG* H*/$														
2.	Translate, following infix expression into its equivalent postfix expression: $(A+B \uparrow D)/(E-F)+G$														
Ans.	$(A+[BD \uparrow])/(EF-)+G$ $=[ABD \uparrow +]/[EF-]+G$ $=[ABD \uparrow +EF-]/+G$ $=ABD \uparrow +EF-/G+$														
3.	Translate, following infix expression into its equivalent postfix expression: $A*(B+D)/E-F-(G+H/K)$														
Ans.	Equivalent postfix expression: $= A*(B+D)/E-F-(G+H/K)$ $= (A*(B+D)/E) - (F - (G + (H/K)))$ $= (A*(BD+)/E) - (F - (G + (HK/)))$ $= ((ABD+*) / E) - (F - (GHK/+))$ $= ABD+* E/F - GHK/+ -$														
4.	Write the equivalent infix expression for $10,3,*,7,1,-,*,23,+$														
Ans.	$10 * 3 * (7 - 1) + 23$														
5.	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)														
6.	Consider the arithmetic expression P, written in postfix notation: $12,7,3,-,/2,1,5,+,*,+$ (a) Translate P, into its equivalent infix expression. (b) Evaluate the infix expression.														
Ans.	(a) Consider the following arithmetic expression P, written in postfix notation: P: 12, 7, 3, -, /, 2, 1, 5, +, *, + Translate P into infix expression. P: 12,[7-3],/,2,1,5,+,*,+ $= [12/(7-3)], 2, 1, 5, +, *, +$ $= [12/(7-3)], 2, [1+5], *, +$ $= [12/(7-3)], [2*(1+5)], +$ $= 12/(7-3) + 2*(1+5)$ (b) Evaluate the infix expression. P: 12, 7, 3, -, /, 2, 1, 5, +, *, +,) <table border="1" style="margin-left: 40px;"> <thead> <tr> <th>Symbol</th><th>Stack</th></tr> </thead> <tbody> <tr><td>12</td><td>12</td></tr> <tr><td>7</td><td>12,7</td></tr> <tr><td>3</td><td>12,7,3</td></tr> <tr><td>-</td><td>12,4</td></tr> <tr><td>/</td><td>3</td></tr> <tr><td>2</td><td>3,2</td></tr> </tbody> </table>	Symbol	Stack	12	12	7	12,7	3	12,7,3	-	12,4	/	3	2	3,2
Symbol	Stack														
12	12														
7	12,7														
3	12,7,3														
-	12,4														
/	3														
2	3,2														

	<table><tr><td>1</td><td>3,2,1</td></tr><tr><td>5</td><td>3,2,1,5</td></tr><tr><td>+</td><td>3,2,6</td></tr><tr><td>*</td><td>3,12</td></tr><tr><td>+</td><td>15</td></tr><tr><td>)</td><td>15</td></tr></table>	1	3,2,1	5	3,2,1,5	+	3,2,6	*	3,12	+	15)	15																																																										
1	3,2,1																																																																						
5	3,2,1,5																																																																						
+	3,2,6																																																																						
*	3,12																																																																						
+	15																																																																						
)	15																																																																						
7.	Convert the following infix notation of expression to an equivalent postfix notation of expression (Show status of stack after execution of each operation): (A+B)*C-D/E																																																																						
Ans.	<p>Conversion of (A+B)*C-D/E into postfix expression</p> <table><tr><th>Step</th><th>Input element/ symbol taken</th><th>Action</th><th>Stack status</th><th>Output to be printed</th></tr><tr><td></td><td></td><td></td><td> #(empty)</td><td></td></tr><tr><td>1.</td><td> '('</td><td>PUSH</td><td> #'('</td><td></td></tr><tr><td>2.</td><td> 'A'</td><td>Print</td><td> #'('</td><td> A</td></tr><tr><td>3.</td><td> '+'</td><td>PUSH</td><td> #'(+</td><td> A</td></tr><tr><td>4.</td><td> 'B'</td><td>Print</td><td> #'(+</td><td> A</td></tr><tr><td>5.</td><td> ')'</td><td>POP & Print POP</td><td> #'(# #</td><td> AB+</td></tr><tr><td>6.</td><td> '*'</td><td>PUSH</td><td> #*</td><td> AB+</td></tr><tr><td>7.</td><td> 'C'</td><td>Print</td><td> #*</td><td> AB+C</td></tr><tr><td>8.</td><td> '-'</td><td>PUSH</td><td> #*-</td><td> AB+C</td></tr><tr><td>9.</td><td> 'D'</td><td>Print</td><td> #*-</td><td> AB+C*D</td></tr><tr><td>10.</td><td> '/'</td><td>PUSH</td><td> #*-/</td><td> AB+C*D</td></tr><tr><td>11.</td><td> 'E'</td><td>Print</td><td> #*-/</td><td> AB+C*DE/</td></tr><tr><td>12.</td><td> ;</td><td>POP & Print STOP</td><td> #(empty)</td><td> AB+C*DE/-</td></tr></table> <p>The resultant expression is AB+C*DE/-</p>	Step	Input element/ symbol taken	Action	Stack status	Output to be printed				#(empty)		1.	'('	PUSH	#'('		2.	'A'	Print	#'('	A	3.	'+'	PUSH	#'(+	A	4.	'B'	Print	#'(+	A	5.	')'	POP & Print POP	#'(# #	AB+	6.	'*'	PUSH	#*	AB+	7.	'C'	Print	#*	AB+C	8.	'-'	PUSH	#*-	AB+C	9.	'D'	Print	#*-	AB+C*D	10.	'/'	PUSH	#*-/	AB+C*D	11.	'E'	Print	#*-/	AB+C*DE/	12.	;	POP & Print STOP	#(empty)	AB+C*DE/-
Step	Input element/ symbol taken	Action	Stack status	Output to be printed																																																																			
			#(empty)																																																																				
1.	'('	PUSH	#'('																																																																				
2.	'A'	Print	#'('	A																																																																			
3.	'+'	PUSH	#'(+	A																																																																			
4.	'B'	Print	#'(+	A																																																																			
5.	')'	POP & Print POP	#'(# #	AB+																																																																			
6.	'*'	PUSH	#*	AB+																																																																			
7.	'C'	Print	#*	AB+C																																																																			
8.	'-'	PUSH	#*-	AB+C																																																																			
9.	'D'	Print	#*-	AB+C*D																																																																			
10.	'/'	PUSH	#*-/	AB+C*D																																																																			
11.	'E'	Print	#*-/	AB+C*DE/																																																																			
12.	;	POP & Print STOP	#(empty)	AB+C*DE/-																																																																			
8.	<p>Consider each of the following postfix expressions: P1 : 5, 3, +, 2, *, 6, 9, 7, -, /, - P2 : 3, 5, +, 6, 4, -, *, 4, 1, -, 2, ↑, + P3 : 3, 1, +, 2, ↑, 7, 4, -, 2, *, +, 5, - Translate each expression into infix notation and then evaluate.</p>																																																																						
Ans.	<p>P1: (((5+3)*2)-(6/(9-7))) (8*2)-(6/2) 16-3 13 P2: (((3+5)*(6-4))+((4-1)^2)) ((8*2)+3^2) (16+3^2) 16+9 25 P3: Students why don't you try at least one.</p>																																																																						
9.	Give postfix form of the following expression A*(B+(C+D)*(E+F)/G)*H																																																																						
Ans.	<p>A*(B+(CD+EF+*)/G)*H A*(B+CD+EF+*G/))*H (A*(BCD+EF+*G/+))H (ABCD+EF+*G/+)*H ABCD+EF+*G/+*H*</p>																																																																						
10.	Give postfix form for A+[(B+C)+(D+E)*F]/G																																																																						

Ans.	A+[{B+C)+((D+E)*F)}/G] =A+[{(BC+)+(DE+)*F}/G] =A+[{(BC+)+(DE+F*)}/G] =A+[{(BC+DE+F*+)/G] =A+[BC+DE+F*+G/] =ABC+DE+F*+G/+				
11.	Give postfix form expression for the following: (i) NOT A OR NOT B AND NOT C (ii) NOT (A OR B) AND C				
Ans.	(i) =((A NOT) OR ((B NOT) AND (C NOT))) =((A NOT) OR ((B NOT C NOT AND)) =A NOT B NOT C NOT AND OR (ii) Try this and see your progress.				
12.	Evaluate the following postfix notation of expression: True, False, NOT, AND, True, True, AND, OR				
Ans.	Step	Input Symbol	Action Taken	Stack status	Output
	1.	True	Push	True (↑ - top) ↑	
	2.	False	Push	True, False ↑	
	3.	NOT	Pop (1 element) Push result (True)	True ↑ True, True ↑	NOT False = True
	4.	AND	Pop (2 element) Push result (True)	↑ (empty stack) True ↑	True AND True = True
	5.	True	Push	True, True ↑	
	6.	True	Push	True, True, True ↑	
	7.	AND	Pop (2 element) Push result (True)	True ↑ True, True ↑	True AND True = True
	8.	OR	Pop (2 element) Push result (True)	↑ (empty stack) True ↑	True OR True = True
				Ans = True	
13.	Write an algorithm to convert infix expression to postfix expression.				
Ans.	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.				
14.	Write an algorithm to insert element into (i) Stack as an array (ii) Linked stack.				
Ans.	Stack as an array /* Assuming that array stack can hold maximum N elements 1. Top=-1 2. Read Item //Item, which is to be pushed 3. If (top==N-1) then 4. {Print "overflow!!" } 5. Else 6. { top = top + 1 7. Stack [top]=Item } 8. END Linked stack. /*Get new node for the ITEM to be pushed*/ 1. NEWPTR = new Node 2. NEWPTR ->INFO = ITEM; NEWPTR->LINK=NULL /*Add new node at the top*/ 3. If TOP = NULL then /*stack is empty*/ 4. TOP=NEWPTR 5. Else 6. { NEWPTR ->LINK=TOP 7. TOP=NEWPTR } //end of step 3 8. END.				
15.	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.	SNo.	Symbol	Action taken	Stack	Intermediate output
	1	5	operand, push	5	
	2	11	operand, push	5,11	
	3	-	operator, pop twice		5-11=-6
			Evaluate and push back	6	
	4	6	operand, push	6,-6	
	5	8	operand, push	6,-6,8	
	6	+	operator, pop twice	6	-6+8=-14
			Evaluate and push back	6,14	
	7	12	operand, push	6,14,12	
	8	*	operator, pop twice	6	12*14=168
			Evaluate and push back	6,168	
	9	/	operator, pop twice		168/6
	10		pop all	-1/28 Ans.	
16.	Suppose a queue is maintained by a circular array QUEUE with N=12 memory cells. Find the number of elements in QUEUE if (a) FRONT = 4, REAR = 8; (b) FRONT = 10 REAR = 3; and (c) FRONT = 5, REAR = 6 and then two elements are deleted.				
Ans.	Try by yourself				
17.	Let P be the postfix arithmetic expression: 7, 2, -, 1, 14, -, 1, 2, * Evaluate P using stack and showing the status of the stack at every step.				
Ans.	SNo.	Symbol	Action taken	Stack	intermediate output

	1	7	operand, push	7	
	2	2	operand, push	7, 2	
	3	-	operator, pop twice		7-2=5
			Evaluate and push back	5	
	4	1	operand, push	5, 1	
	5	14	operand, push	5, 1, 14	
	6	-	operator, pop twice	5	1-14=-13
			Evaluate and push back	5, -13	
	7	1	operand, push	5, -13, 1	
	8	2	operand, push	5, -13, 1, 2	
	9	*	operator, pop twice	5, -13	1*2=2
			Evaluate and push back	5, -13, 2	
	As 2 is the Top most value so answer should be 2.				
18.	Consider the infix expression Q : A+B * C ↑ (D/E)/F. Translate Q into P, where P is the postfix equivalent expression of Q. what will be the result of Q if this expression is evaluated for A, B, C, D, E, F as 2, 3, 2, 7, 2, 2 respectively.				
Ans.	P = ABCDE/^*F/+ 2,3,2,7,2 2,3,2->7/2->3 2,3,2,3 2,3->2^3->8 2,3,8 2->3*8->24 2,24,2 2->24/2->12 2,12 2+12 Result of evaluation = 14				
19.	Differentiate between (i) Linear Queue and Circular Queue (ii) A Queue and a Dequeue.				
Ans.	(i) Linear Queue 1. A linear queue is like a straight line in which all elements or instructions stand one behind the other. 2. Tasks lined up in this queue format are executed in the order of their placement, on a FIFO (First In First Out) basis. 3. In a linear queue, a new task is inserted at the end of the list, while a deletion is made at the front of the list. 4. Allocate new, larger block of memory reflective of the entire (existing) queue and the queue-size additions. Circular Queue 1. A circular queue has a circular structure. The last element of this queue is connected with the first element, thus completing the circle. 2. Tasks in this format are not essentially executed in the order in which they are sent. 3. In a circular queue, insertions and deletions can happen at any position in the queue. 4. Allocate ONLY the new object or structure-type required. (ii) A Queue and dequeue A queue is a linear structure implemented in FIFO (First In First Out) manner where insertions can occur only at the “rear” end and deletion can occur only at the “front” end whereas Dequeues are the refined queues in which elements can be added or removed at either end but not in the middle.				
20.	Write an algorithm to insert an ITEM in a QUEUE implemented as an array.				
Ans.	1. if rear = NULL Then {				

	2. rear = front=0 3. QUEUE[0] = ITEM } 4. Else If rear = N-1 Then 5. Print "QUEUE FULL, OVERFLOW!!" 6. Else { 7. QUEUE[rear+1]=ITEM 8. rear=rear+1 9. END.
21.	Write an algorithm to delete an ITEM from a QUEUE implemented as an array.
Ans.	1. If front = Null Then 2. Print "Queue Empty" 3. Else { 4. ITEM=QUEUE[front] 5. If front=rear Then { 6. front = rear = NULL } 7. Else 8. front=front+1 } /* end of step 3 */ 9. END.
22.	Write an algorithm to insert an ITEM in a QUEUE implemented as a linked list.
Ans.	1. NEWPTR = new Node 2. NEWPTR -> INFO = ITEM; NEWPTR->LINK=NULL /*insert in the queuep*/ 3. If rear = NULL then { 4. Front = NEWPTR 5. Rear = NEWPTR } 6. Else { 7. Real ->LINK= NEWPTR 8. rear=NEWPTR } 9. END.
23	Write an algorithm to delete an ITEM from a QUEUE implemented as a linked list.
Ans.	1. If front = Null Then 2. Print "Queue Empty" 3. Else { 4. ITEM=front-> INFO 5. If front=rear Then { 6. front = rear = NULL } 7. Else 8. front=front->LINK

	} 9. END.				
24.	Write equivalent postfix prefix and expressions for the infix expression given below: (a) $A+B-D/X$ (b) $(X+Y)/(Z*Y)-R$				
Ans.	Postfix: (i) $AB+DX / -$ (ii) $XY+ZY*/R-$ Prefix (i) $-+AB/DX$ (ii) $-/+XY*ZYR$				
25.	Evaluate the following postfix notation of expression: $10\ 20 + 25\ 15 - * 30 /$				
Ans.	SNo.	Symbol	Action taken	Stack	intermediate output
	1	10	operand, push	10	
	2	20	operand, push	10, 20	
	3	+	operator, pop twice		10+20=30
			Evaluate and push back	30	
	4	25	operand, push	30, 25	
	5	15	operand, push	30, 25, 15	
	6	-	operator, pop twice	30	25-15=10
			Evaluate and push back	30, 10	
	7	*	operator, pop twice		30*10=300
			Evaluate and push back	300	
	8	30	operand, push	300, 30	
	9	/	operator, pop twice		300/30=10
	10		Evaluate and push back	10	
	11		pop all	10 Ans.	
26.	Evaluate the following postfix notation of expression: $20\ 10 + 5\ 2 * - 10 /$				
Ans.	SNo.	Symbol	Operation	Stack	Intermediate output
	1	20	Push	20[↑ signifies top] ↑	
	2	10	Push	20, 10 ↑	
	3	+	Pop twice calculate	#	20+10=30
			Push the result	30 ↑	
	4	5	Push	30, 5 ↑	
	5	2	Push	30, 5, 2 ↑	
		*	Pop twice calculate	30 ↑	5 * 2 = 10
			Push the result	30, 10 ↑	
	6	-	Pop twice calculate	#	30 – 10 = 20
			Push the result	20 ↑	
	7	10	Push	20, 10 ↑	
		/	Pop twice calculate	#	20 / 10 = 2
			Push the result	2	
	8	End of	Pop	2	

		Expression				
					Ans. = 2	
27.	Evaluate the following postfix expression using a stack and show the contents of stack after execution of each operation: 120, 45, 20, +, 25, 15, -, +, *					
Ans.	SNo.	Symbol	Action taken	Stack	intermediate output	
	1	120	operand, push	120		
	2	45	operand, push	120, 45		
	3	20	operand, push	120, 45, 20		
	4	+	operator, pop twice	120	45+20=65	
			Evaluate and push back	120, 65		
	5	25	operand, push	120, 65, 25		
	6	15	operand, push	120, 65, 25, 15		
	7	-	operator, pop twice	120, 65	25-15=10	
			Evaluate and push back	120, 65, 10	30*10=300	
	8	+	operator, pop twice	120	65+10=75	
			Evaluate and push back	120, 75		
	9	*	operator, pop twice		120*75=9000	
			Evaluate and push back	9000		
	10		pop all	9000 Ans.		
28.	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.	SNo.	Symbol	Action taken	Stack	intermediate output	
	1	20	operand, push	20		
	2	45	operand, push	20, 45		
	3	+	operator, pop twice		20+45=65	
			Evaluate and push back	65		
	4	20	operand, push	65, 20		
	5	10	operand, push	65, 20, 10		
	6	-	operator, pop twice	65	20-10=10	
			Evaluate and push back	65, 10		
	7	15	operand, push	65, 10, 15		
	8	+	operator, pop twice	65	10+15=25	
			Evaluate and push back	65, 25		
	9	*	operator, pop twice		65*25=1625	
			Evaluate and push back	1625		
	10		pop all	1625 Ans.		
29.	Use a stack to evaluate the following postfix expression and show the content of the stack after execution of each operation. Don't write any code. Assume as if you are using push and pop member functions of the stack AB-CD+E*+ (where A=5, B=3, C=5, D=4, and E=2)					
Ans.	Expression is 5, 3, -, 5, 4, +, 2, *, +					
	SNo.	Symbol	Action taken	Stack	intermediate output	
	1	5	operand, push	5		
	2	3	operand, push	5, 3		
	3	-	operator, pop twice		5-3=2	
			Evaluate and push back	2		
	4	5	operand, push	2, 5		
	5	4	operand, push	2, 5, 4		
	6	+	operator, pop twice	2	5+4=9	
			Evaluate and push back	2, 9		

	7	2	operand, push	2, 9, 2																																																							
	8	*	operator, pop twice	2	9*2=18																																																						
			Evaluate and push back	2, 18																																																							
	9	+	operator, pop twice		2+18=20																																																						
			Evaluate and push back	20																																																							
	10		pop all	20 Ans.																																																							
30.	Change the following infix expression into postfix expression. (A+B) *C+D/E-F																																																										
Ans.	Equivalent postfix expression: = (A+B) *C+D/E-F = (((A+B)*C) + (D/E)) – F = (((AB+)*C) + (DE/)) – F = AB+ C* DE/ + F-																																																										
31.	Evaluate the following postfix notation of expression: (Show status of stack after each operation) True, False, NOT, OR, False, True, OR, AND																																																										
Ans.	<table><tr><th>Element Scanned</th><th>Stack</th></tr><tr><td>True</td><td>True</td></tr><tr><td>False</td><td>True,False</td></tr><tr><td>NOT</td><td>True,True</td></tr><tr><td>OR</td><td>True</td></tr><tr><td>False</td><td>True,False</td></tr><tr><td>True</td><td>True,False,True</td></tr><tr><td>OR</td><td>True,True</td></tr><tr><td>AND</td><td>True</td></tr></table>		Element Scanned	Stack	True	True	False	True,False	NOT	True,True	OR	True	False	True,False	True	True,False,True	OR	True,True	AND	True																																							
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OR	True,True																																																										
AND	True																																																										
32.	Convert the following infix expression to its equivalent postfix expression showing stack contents for the conversion: X - Y / (Z + U) * V																																																										
Ans.	X - Y / (Z + U) * V = (X - ((Y / (Z + U)) * V)) <table><tr><th>Element Scanned</th><th>Stack</th><th>Postfix</th></tr><tr><td>(</td><td></td><td></td></tr><tr><td>X</td><td></td><td>X</td></tr><tr><td>-</td><td>-</td><td></td></tr><tr><td>(</td><td></td><td></td></tr><tr><td>(</td><td></td><td></td></tr><tr><td>Y</td><td></td><td>XY</td></tr><tr><td>/</td><td>-/</td><td></td></tr><tr><td>(</td><td></td><td></td></tr><tr><td>Z</td><td></td><td>XYZ</td></tr><tr><td>+</td><td>-/+</td><td></td></tr><tr><td>U</td><td></td><td>XYZU</td></tr><tr><td>)</td><td>-/</td><td>XYZU+</td></tr><tr><td>)</td><td>-</td><td>XYZU+/-</td></tr><tr><td>*</td><td>_*</td><td></td></tr><tr><td>V</td><td></td><td>XYZU+/-V</td></tr><tr><td>)</td><td>-</td><td>XYZU+/-V*</td></tr><tr><td>)</td><td></td><td>XYZU+/-V*-</td></tr></table>					Element Scanned	Stack	Postfix	(X		X	-	-		((Y		XY	/	-/		(Z		XYZ	+	-/+		U		XYZU)	-/	XYZU+)	-	XYZU+/-	*	_*		V		XYZU+/-V)	-	XYZU+/-V*)		XYZU+/-V*-
Element Scanned	Stack	Postfix																																																									
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)		XYZU+/-V*-																																																									
33.	Convert the following infix expression to its equivalent postfix expression showing stack contents for the conversion: A+B*(C-D)/E																																																										

Ans.	Symbol scanned from infix	Stack status (bold letter shows the top of the stack)	Postfix expression
		(
	(((
	A	((A
	+	((+	A
	B	((+	AB
)	(AB+
	*	(*	AB+
	((*(AB+
	C	(*(AB+C
	-	(*(-	AB+C
	D	(*(-	AB+CD
)	(*	AB+CD-
	/	(/	AB+CD-*
	E	(/	AB+CD-*E
)		AB+CD-*E/

Answer: Postfix expression of $(A+B)*(C-D)/E$ is $AB+CD-*E/$

LONG ANSWER QUESTIONS

1.	Write an algorithm that depending upon user's choice, either pushes or pops an element in a stack implemented as an array. (The elements are not shifted after a push or a pop).
Ans.	<p><u>Algorithm for user choice:</u></p> <ol style="list-style-type: none"> 1. ch=0 // Initialize a variable for user choice 2. Read ch //Enter, user choice 1 for push and 2 for pop 3. If(ch == 1) then /* if top is at end of stack-array */ 4. call push function 5. Else 6. call pop function 7. End <p><u>Algorithm for pushing in stack-array:</u></p> <p>/* Assuming that array-stack can hold maximum N elements*/</p> <ol style="list-style-type: none"> 1. top=-1 /* Initialize stack with invalid subscript value to show that it is empty. Legal subscript values are 0..... (N-1) */ 2. Read Item //Item, which is to be pushed 3. If(top== N-1) then /* if top is at end of stack-array */ 4. { print "Overflow !!" } 5. Else 6. { top = top+1 /* Increment top to move to next empty position to hold new item*/ 7. Stack[top]=Item } 8. END. <p><u>Algorithm for popping in stack-array:</u></p> <p>/* Firstly, check for underflow condition */</p> <ol style="list-style-type: none"> 1. If top== -1 then { 2. Print "Underflow!!" 3. Exit from program } 4. Else

	<pre> { 5. print stack(top) 6. top=top-1 /* top moved, so that the top most element becomes inaccessible which is a sort of a deletion */ } 7. END </pre>
2.	A line of text is read from the input terminal into a stack. Write an algorithm to output the string in the reverse order, each character appearing twice (e.g., the string a b c d e should be changed to ee dd cc bb aa).
Ans.	<pre> 1. Ptr=top 2. While (ptr <> NULL or ptr <> 0) do steps 3 through 5. 3. { print ptr -> INFO, ptr -> INFO // print twice 4. Pop (stack, ITEM) 5. Ptr=ptr-1 } </pre>
3.	Write an algorithm that depending upon user's choice, either pushes or pops an elements in a stack implemented as an array. (The elements are shifted towards right to combine all free spaces in the left)
Ans.	<p><u>Algorithm for user choice:</u></p> <pre> 1. ch=0 // Initialize a variable for user choice 2. Read ch //Enter, user choice 1 for push and 2 for pop 3. If(ch == 1) then /* if top is at end of stack-array */ 4. call push function 5. Else 6. call pop function 7. End </pre> <p><u>Algorithm for pushing in stack-array:</u></p> <p>/* Assuming that array-stack can hold maximum N elements*/</p> <pre> 1. top=-1 /* Initialize stack with invalid subscript value to show that it is empty. subscript values are 0..... (N-1) */ 2. Read Item //Item, which is to be pushed 3. If(top== N-1) then /* if top is at end of stack-array */ 4. { print "Overflow !!" } 5. Else 6. { top = top+1 /* Increment top to move to next empty position to hold new item*/ 7. Stack[top]=Item } 8. END. </pre> <p><u>Algorithm for popping in stack-array:</u></p> <p>/* Firstly, check for underflow condition */</p> <pre> 1. If top== -1 then { 2. Print "Underflow!!" 3. Exit from program } 4. Else </pre>

	<pre> { 5. print stack(top) 6. top=top-1 /* top moved, so that the top most element becomes inaccessible which is a sort of a deletion */ } 7. END </pre> <p>Note: We have to shift elements to the right for insertion and left for removal of an element. We face the same problem while implementing the list with the use of the array. If we push and pop the elements from the start of the array for stack implementation, this problem will arise. In case of push, we have to shift the stack elements to the right. However, in case of pop, after removing the element, we have to shift the elements of stack that are in the array to the left. If we push the element at the end of the array, there is no need to shift any element. Similarly as the pop method removes the last element of the stack which is at the end of the array, no element is shifted. To insert and remove elements at the end of the array we need not to shift its elements. Best case for insert and delete is at the end of the array where there is no need to shift any element. We should implement push() and pop() by inserting and deleting at the end of an array.</p>
4.	Write an algorithm that either pushes or pops an element in a linked stack, depending upon user's choice.
Ans.	<p><u>Algorithm for user choice:</u></p> <pre> 1. ch=0 // Initialize a variable for user choice 2. Read ch //Enter, user choice 1 for push and 2 for pop 3. If(ch == 1) then /* if top is at end of stack-array */ 4. call push function 5. Else 6. call pop function 7. End </pre> <p><u>Algorithm for pushing in Linked-Stack</u> Step-1: If the Stack is empty go to step-2 or else go to step-3 Step-2: Create the new element and make your "stack" and "top" pointers point to it and quit. Step-3: Create the new element and make the last (top most) element of the stack to point to it Step-4: Make that new element your TOP most element by making the "top" pointer point to it.</p> <p><u>Algorithm for popping in Linked-Stack:</u> Step-1: If the Stack is empty then give an alert message "Stack Underflow" and quit; or else proceed Step-2: If there is only one element left go to step-3 or else step-4 Step-3: Free that element and make the "stack", "top" and "bottom" pointers point to NULL and quit Step-4: Make "target" point to just one element before the TOP; free the TOP most element; make "target" as your TOP most element</p>
5.	Convert the expression (A+B)/(C-D) into postfix expression and then evaluate it for A=10, B=20, C=15, D=5. Display the stack status after each operation.
Ans.	<p>(A+B)/(C-D) Equivalent postfix expression: AB+CD-/ Evaluation of expression: Putting A=10, B=20, C=15 and D=5 into expression =AB+CD-/ =10 20 + 15 5 - / =[10+20] / [15 - 5] =30/10 =3</p>
6.	Write an algorithm to insert or delete an element from a queue (implemented as an array) depending upon user's choice. The elements are not shifted after insertion or deletion.

<p>Ans.</p>	<p><u>Algorithm for user choice:</u></p> <ol style="list-style-type: none"> 1. ch=0 // Initialize a variable for user choice 2. Read ch //Enter, user choice 1 for push and 2 for pop 3. If(ch == 1) then /* if top is at end of Array-Queue */ 4. call insert function 5. Else 6. call delete function 7. End <p><u>Algorithm for inserting in Array-Queue:</u></p> <ol style="list-style-type: none"> 1. If rear = NULL Then <ul style="list-style-type: none"> { 2. rear=front=0 3. QUEUE[0]=ITEM } 4. Else If rear= N-1 then 5. Print "QUEUE FULL, OVERFLOW!!" 6. Else <ul style="list-style-type: none"> { 7. QUEUE[rear+1]=ITEM 8. rear=rear+1 } 9. END. <p><u>Algorithm for deleting in Array-Queue:</u></p> <ol style="list-style-type: none"> 1. If front==NULL Then 2. Print "Queue Empty" 3. Else <ul style="list-style-type: none"> { 4. ITEM=QUEUE[front] 5. If front=rear Then <ul style="list-style-type: none"> { 6. front=rear=NULL } 7. Else 8. front = front + 1 } 9. END
<p>7.</p>	<p>Write an algorithm to insert or delete an element from a queue (implemented as an array) depending upon user's choice. The elements are shifted towards left to combine all free space in the right.</p>
<p>Ans.</p>	<p><u>Algorithm for user choice:</u></p> <ol style="list-style-type: none"> 1. ch=0 // Initialize a variable for user choice 2. Read ch //Enter, user choice 1 for push and 2 for pop 3. If(ch == 1) then /* if top is at end of Array-Queue */ 4. call insert function 5. Else 6. call delete function 7. End <p><u>Algorithm for inserting in Array-Queue:</u></p> <ol style="list-style-type: none"> 1. If rear = NULL Then <ul style="list-style-type: none"> { 2. rear=front=0 3. QUEUE[0]=ITEM

	<pre> } 4. Else If rear= N-1 then 5. Print "QUEUE FULL, OVERFLOW!!" 6. Else { 7. QUEUE[rear+1]=ITEM 8. rear=rear+1 } 9. END. </pre> <p><u>Algorithm for deleting in Array-Queue:</u></p> <pre> 1. If front==NULL Then 2. Print "Queue Empty" 3. Else { 4. ITEM=QUEUE[front] 5. If front=rear Then { 6. front=rear=NULL } 7. Else 8. front = front + 1 } /* end of step 3*/ 9. END </pre>
8.	Write an algorithm to insert or delete an element from a linked queue depending upon user's choice.
Ans.	<p><u>Algorithm for user choice:</u></p> <pre> 1. ch=0 // Initialize a variable for user choice 2. Read ch //Enter, user choice 1 for push and 2 for pop 3. If(ch == 1) then /* if top is at end of Array-Queue */ 4. call insert function 5. Else 6. call delete function 7. End </pre> <p><u>Algorithm for inserting in Linked-Queue:</u></p> <pre> /* Allocate space for ITEM to be inserted */ 1. NEWPTR = new node 2. NEWPTR -> INFO = ITEM; NEWPTR -> LINK=NULL /* Insert in the queue */ 3. If rear = NULL Then { 4. front = NEWPTR 5. rear = NEWPTR 6. else { 7. rear -> LINK = NEWPTR 8. rear=NEWPTR } 9. END. </pre> <p><u>Algorithm for deleting in Linked-Queue:</u></p> <pre> 1. If front==NULL Then </pre>

	<pre> 2. Print "Queue Empty" 3. Else { 4. ITEM=front->INFO 5. If front=rear Then { 6. front=rear=NULL } 7. Else 8. front = front + 1 } 9. END </pre>
9.	Write an algorithm to implement input-restricted deque. (both the operations i.e., insertions and deletions should be taken care of).
Ans.	<p><u>Algorithm to add an element into DeQueue :</u></p> <p>Assumptions: pointer f,r and initial values are -1,-1 Q[] is an array max represent the size of a queue</p> <p>enq_front</p> <p>step1. Start step2. Check the queue is full or not as if (f <> max) step3. If false update the pointer f as f= f+1 step4. Insert the element at pointer f as Q[f] = element step5. Stop</p> <p>enq_back</p> <p>step1. Start step2. Check the queue is full or not as if (r == max-1) if yes queue is full step3. If false update the pointer r as r= r+1 step4. Insert the element at pointer r as Q[r] = element step5. Stop</p> <p><u>Algorithm to delete an element from the DeQueue</u></p> <p>deq_front</p> <p>step1. Start step2. Check the queue is empty or not as if (f == r) if yes queue is empty step3. If false update pointer f as f = f+1 and delete element at position f as element = Q[f] step4. If (f== r) reset pointer f and r as f=r=-1 step5. Stop</p> <p>deq_back</p> <p>step1. Start step2. Check the queue is empty or not as if (f == r) if yes queue is empty step3. If false delete element at position r as element = Q[r] step4. Update pointer r as r = r-1 step5. If (f == r) reset pointer f and r as f = r= -1 step6. Stop</p>
10.	Write algorithms to (i) insert an element in a circular queue and (ii) delete an element from a circular queue.
Ans.	<p>Here, CQueue is a circular queue where to store data. Rear represents the location in which the data element is to be inserted and Front represents the location from which the data element is to be removed. Here N is the maximum size of CQueue and finally, Item is the new item to be added. Initailly Rear = 0 and Front = 0.</p> <p>1. If Front = 0 and Rear = 0 then Set Front := 1 and go to step 4.</p>

	<ol style="list-style-type: none"> 2. If Front = 1 and Rear = N or Front = Rear + 1 then Print: "Circular Queue Overflow" and Return. 3. If Rear = N then Set Rear := 1 and go to step 5. 4. Set Rear := Rear + 1 5. Set CQueue [Rear] := Item. 6. Return <p>Here, CQueue is the place where data are stored. Rear represents the location in which the data element is to be inserted and Front represents the location from which the data element is to be removed. Front element is assigned to Item. Initially, Front = 1.</p> <ol style="list-style-type: none"> 1. If Front = 0 then Print: "Circular Queue Underflow" and Return. /*..Delete without Insertion 2. Set Item := CQueue [Front] 3. If Front = N then Set Front = 1 and Return. 4. If Front = Rear then Set Front = 0 and Rear = 0 and Return. 5. Set Front := Front + 1 6. Return.
11.	<p>Each node of a STACK contains the following information, in addition to pointer field:</p> <p style="text-align: center;">(ii) Pin code of city, (ii) Name of city</p> <p>Give the structure of node for the linked STACK in question.</p> <p>TOP is a pointer that points to the topmost node of the STACK. Write the following functions:</p> <p>(i) PUSH () – To push a node into the STACK, which is allocated dynamically.</p> <p>(ii) POP () – to remove a node from the STACK, and release the memory.</p>
Ans.	<pre> 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() { </pre>

	<pre> 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; } } </pre>
12.	<p>Write a function in C++ to Delete an element into a dynamically allocated Queue where each node contains a real number as data. Assume the following definition of MYNODE for the same.</p> <pre> struct MYNODE { float NUM; MYNODE * Link; }; </pre>
Ans.	<pre> 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; front=front -> Link; delete temp; } } </pre>
13.	<pre> class queue { int data[10]; int front, rear; public: queue() { front = - 1; rear = - 1; } } </pre>

	<pre> void add() ; //to add an element into the queue void remove() ; //to remove an element from the queue void Delete(int ITEM() ; //to delete all elements which are equal to ITEM }; Complete the class with all function definitions for a circular array Queue. Use another queue to transfer data temporarily. </pre>
Ans.	<pre> class queue { int data[10] ; int front, rear ; public : queue() { front = - 1 ; rear = - 1 ; } void add() ; void remove() ; void Delete(int ITEM() ; } ; void queue::add() { if((front==0 && rear==9) (rear==front-1)) { cout<<"Over flow"; return; } int X; cout<<"Enter the data:"; cin>>X; if(rear==-1) { front=0; rear=0; } else if(rear==9) rear=0; else rear++; data[rear]=X; } void queue::remove() { if(front==-1) { cout<<"Underflow"; return; } int X; X=data[front]; if(front==rear) { front=-1; rear=-1; } else if(front==9) front=0; else front++; cout<<X<<"Removed" ; } </pre>

	<pre> } void queue::DElete(int ITEM) { if(front== -1) { cout<<"Underflow"; return; } queue t; t.front=0; while(1) //will repeat endless untill encounters a break statement { if(data[front]!=ITEM) { t.rear++; t.data[t.rear]=data[front]; } if(front==rear) break; front++; if(front==10) front=0; } //copy temp data to current data front=0; rear=-1; while(t.frot<=t.rear) { rear++; data[rear]=t.data[t.front]; t.front++; } } </pre>
14.	<p>Introduction</p> <pre> 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. }; </pre> <p>Complete the class with all function definitions. Use another stack to transfer data temporarily.</p>
Ans.	<pre> class stack { int data[10] : int top ; public : stack() { top = - 1; } void push() ; void pop() ; void Delete(int ITEM); </pre>

```

        void display()
        {
            for(int i=top;i>=0;i--)
                cout<<data[i]<<"\n";
        }
    } ;
void stack::push()
{
    if(top==9)
    {
        cout<<"Overflow";
        return;
    }
    int X;
    cout<<"Enter the data:";
    cin>>X;
    top++;
    data[top]=X;
}
void stack::pop()
{
    if(top== -1)
    {
        cout<<"Uderflow";
        return;
    }
    int X;
    X=data[top];
    top--;
    cout<<X<<"Removed";
}
void stack::Delete(int ITEM)
{
    stack t;
    if(top== -1)
    {
        cout<<"underflow";
        return;
    }
    while(top>=0)
    {
        if(data[top]!=ITEM)
        {
            top++;
            t.data[t.top]=data[top];
        }
        top--;
    }
    while(t.top>=0)          //copy the emp data to current data
    {
        top++;
        data[top]=t.data[t.top];
        t.top--;
    }
}

```

- 15. Define functions stackpush() to insert nodes and stackpop() to delete nodes, for a linked list implemented stack having the following structure for each node:**
struct node

	<pre> { char name[20]; int age; node *Link; }; </pre>
Ans.	<pre> void stack::stackpush() { node *nptr; nptr=new node; nptr->link=NULL; cout<<"Enter name for new node:"; gets(nptr->name); cout<<"Enter age for new node:"; cin>>nptr->age; if(top==NULL) top=nptr; else { nptr->link=top; top=nptr; } } void stack::stackpop() { if(top==NULL) cout<<"Underflow"; else { cout<<"Element being popped is \n"; cout<<top->name<<": "<<top->age<<endl; node *ptr; ptr=top; top=top->link; delete ptr; } } </pre>
16.	<p>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:</p> <pre> struct node { char name[20] ; int age ; node *Link ; }; class queue { node *rear, *front ; public : queue() { rear = NULL;front = NULL}; void queins() ; void quedel() ; }; </pre>
Ans.	<pre> void queue::queins() { node *ptr; </pre>

	<pre> 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; } } </pre>
17.	<p>Write a function in C++ to Delete an element from a dynamically allocated Queue where each node contains a real number as data. Assume the following definition of MYNODE for the same.</p> <pre> struct MYNODE { float NUM; MYNODE * Link; }; </pre>
Ans.	<pre> struct MYNODE { float NUM; MYNODE *Link; }; class Queue { MYNODE *front,*rear; public: Queue() { front=rear=NULL; } void Insert(); void Delete(); void Display(); </pre>

	<pre> }; void Queue::Delete() { MYNODE *temp; if(front== NULL) cout<<"Queue Underflow"; else { cout<<"\nThe content of the element to delete:"<<front → NUM; temp=front; front=front → Link; delete temp; } } </pre>
18.	<p>Write a function QUEINS () in C++ to insert an element in a dynamically allocated Queue containing nodes of the following given structure:</p> <pre> struct Node { int PId; // Product Id char Pname[20]; NODE *Next; }; </pre>
Ans.	<pre> Class Queue { Node *Front, *Rear; public: QUEUE() // Constructor to initialize Front and Rear { Front = NULL; Rear = NULL; } void QUEINS(); // Function to insert a node void QUEDEL(); // Function to delete a node void QUEDISP(); // Function to display nodes ~Queue(); //Destructor to delete all nodes }; void Queue::QUEINS() { Node *Temp; Temp = new Node; cin>> Temp->PID; gets(Temp->Pname); Temp->Next=NULL; if (Rear == NULL) { Front = Temp; Rear = Temp; } else { Rear->Next = Temp; Rear = Temp; } } </pre>
19.	<p>Write a function QUEDEL () in C++ to display and delete an element in a dynamically allocated Queue containing nodes of the following given structure:</p>

	<pre> struct Node { int Itemno; char Itemname[20]; NODE *Link; }; </pre>
Ans.	<pre> struct Node { int itemno; char Itemname[20] ; Node *Link ; } ; class Queue { Node *front,*rear; public: Queue() { front=rear=NULL; } void Insert(); void Delete(); void Display(); }; void Queue::Delete() { Node *Temp; if(front==NULL) cout<<"Queue Underflow. No element to delete"; else { cout<<"\n The item number for the element to delete.<<front->CNo; cout<<"\n The item name for the element to delete"<<front->CName; Temp=front; front = front->Link; delete Temp; } } </pre>

DATABASE CONCEPT

TYPE A : VERY SHORT ANSWER QUESTION

1.	What is the function of database management system ?
Ans.	Following are the function of database management system: - To organize information - To store information - To retrieve information As efficiently and effectively as possible
2.	What is data redundancy? What are the problems associated with it?
Ans.	Data redundancy means duplication of data. It causes duplicate data at different locations which destroys the integrity of the database and wastage of storage space.
3.	How do database management system overcome the problems associated with data redundancy ?
Ans.	Database normalization prevents redundancy and makes the best possible usage of storage .Proper use of foreign keys can minimize data redundancy and chance of destructive anomalies. However, concerns of efficiency and convenience can sometimes result in redundant data design despite the risk of corrupting the data. A solution to the problem is to place the redundant data in a separate table, one in which the data no longer will be redundant.
4.	How do database management system ensure data security and privacy ?
Ans.	A database management system ensure data security and privacy by ensuring that only means of access to the database is through the proper channel and also by carrying out authorization checks whenever access to sensitive data is attempted.
5.	What are the three levels of data abstraction?
Ans.	<ul style="list-style-type: none"> a. Internal Level b. Conceptual Level c. External Level (View Level)
6.	What do you understand by data independence?
Ans.	Data independence allows modification of a scheme definition in one level without affecting a scheme definition in the next higher level.
7.	What are the two types of data independence? How they different?
Ans.	<p>There are two levels of data independence: Physical and Logical.</p> <p>Physical Data Independence modifies the scheme followed at the physical level without affecting the scheme followed at the conceptual level.</p> <p>Whereas Logical Data Independence modifies the conceptual scheme without causing any changes in the schemes followed at view levels.</p>
8.	Define the following terms :
Ans.	<p>(i) Integrated database: Integrated database means union of several otherwise distinct data files, with any redundancy among those files partially or wholly eliminated.</p> <p>(ii) Shared database: Sharing of data means that individual pieces of data in the database may be shared among several different users, in the sense that each of those users may have access to the same piece of data and each of them may use it for different purpose. The database which contains this type of data is called shared database.</p> <p>(iii) View: A view is a pseudo-table or virtual table. It displays the data. The data is derived from one or more base tables.</p> <p>(iv) Database system: A database is a collection of interrelated data and a database system is basically a computer base recordkeeping system.</p> <p>(v) Data security: Data security refers to protection of data against accidental or intentional disclosure to unauthorized persons, or unauthorized modification or destruction.</p> <p>(vi) Data integrity: Data integrity refers to maintaining and assuring the accuracy and consistency of data over its entire life cycle</p>
9.	Name the different data models available for database system. Which of them is the most preferred one ?
Ans.	<p>There are generally three data models available as following :</p> <p>(i) Relational Model</p>

	<p>(ii) Network Model (iii) Hierarchical Model</p> <p>Among these three level relational level is the most preferred one because it does not use pointers or links. Instead, it relates records by the values they contain.</p>
10.	What are the similarities and differences between network and hierarchical data models ?
Ans.	The network model and hierarchical model are similar in the sense that data and relationships among data are represented by records and links respectively. The difference between these two is that in network model records are organized as collection of arbitrary graphs and in hierarchical model records are organized as collection of trees.
11.	Define the following terms :
Ans.	<p>(a) Relation: A relation is a two-dimensional table. It contains number of rows(tuples) and columns(attributes).</p> <p>(b) Tuple: This is the horizontal part of the relation. One row represents one record of the relation. The rows of a relation are also called tuples.</p> <p>(c) Attribute: The columns of a table are also called attributes. The column is the vertical part of the relation.</p> <p>(d) Domain: A domain is a pool of values from which the actual value present in a given column are taken.</p> <p>(e) Primary key: It is a column (or columns) in a table that uniquely identifies each row. A primary key value is unique and cannot be null. There is only one primary key for a table.</p> <p>(f) Candidate key: It is a column (or columns) that uniquely identify rows in a table. Any of the identified candidate keys can be used as the table's primary key.</p> <p>(g) Cartesian product: The Cartesian product is a binary operation and is denoted by a cross(x). It yields a relation with all possible combinations of the tuples of the two relations operated upon.</p> <p>(h) degree: It is the number of columns (or attributes) in a table.</p>
12.	What do you mean by relational database?
Ans.	A relational database is a collection of data items organized as a set of formally described tables from which data can be accessed easily.
13.	What do you understand by unary relation, binary relation?
Ans.	<p>Unary relation: If a relation is between entities in a single entity type then it is called a <i>unary relation</i>. For example 'friendship' between entities within the entity type PERSON.</p> <p>Binary relation: If a relation is between entities in one entity type and entities in another entity type then it is called a <i>binary relation</i> because two entity types are involved in the relationship type. For example is 'Purchased' between entity types CUSTOMER and PRODUCT.</p>
14.	What are views? How are they useful?
Ans.	<p>A view is a pseudo-table or virtual table. It displays the data. The data is derived from one or more base tables.</p> <p>Syntax: CREATE VIEW <view name> AS SELECT <attribute list> FROM <table(s)> WHERE <condition(s)>;</p> <p>The usefulness of views lies in the fact that they provide an excellent way to give people access to some but not all of the information in a table</p> <p>Define the following :</p>
15.	(i) Primary key: It is a column (or columns) in a table that uniquely identifies each row. A primary key value is unique and cannot be null. There is only one primary key for a table.
Ans.	<p>(ii) Candidate key: It is a column (or columns) that uniquely identify rows in a table. Any of the identified candidate keys can be used as the table's primary key.</p> <p>(iii) Alternate key : A candidate key that is not the primary key is called an Alternate Key.</p> <p>(iv) Foreign key: It is a column (or a set of columns) that refers to the primary key in another table i.e. it is used as a link to a matching column in another table.</p>
16.	What is an Alternate Key?
Ans.	<p>A candidate key that is not the primary key is called an Alternate Key.</p> <p>For example in Student table if there are two candidate keys – StudId and Stud_Name and StudId is the primary Key then Stud_Name is the alternate key.</p>
17.	What is the importance of a primary key in a table ? Explain with a suitable example.
Ans.	A primary key is a set of one or more attributes that can uniquely identify tuples within the relation.

	<p>For example, in the following table ITEM, the column Ino can uniquely identify each row in the table, hence Ino is the primary key of the following table.</p> <table><tr><th>Ino</th><th>Item</th><th>Quantity</th></tr><tr><td>1</td><td>Pen</td><td>220</td></tr><tr><td>2</td><td>CD</td><td>530</td></tr><tr><td>3</td><td>DVD</td><td>450</td></tr><tr><td>4</td><td>Duster</td><td>110</td></tr></table>	Ino	Item	Quantity	1	Pen	220	2	CD	530	3	DVD	450	4	Duster	110
Ino	Item	Quantity														
1	Pen	220														
2	CD	530														
3	DVD	450														
4	Duster	110														
18. Ans.	<p>What do you understand by the terms Primary Key and Degree of a relation in relational database?</p> <p>A primary key is a column (or columns) in a table that uniquely identifies each row. A primary key value is unique and cannot be null. There is only one primary key for a table.</p> <p>Number of columns(attributes) in a relation are called its degree.</p>															
19. Ans.	<p>What do you understand by the terms Candidate Key and Cardinality of relation in relational database?</p> <p>A candidate key is a column (or columns) that uniquely identify rows in a table. Any of the identified candidate keys can be used as the table's primary key.</p> <p>Cardinality of relation represents number of rows (or tuples) in a relation.</p>															
20. Ans.	<p>What is the function of select and project operation ?</p> <p>The select operation selects tuples from a relation that satisfy a given condition. The selection is denoted by lowercase Greek letter σ (sigma).</p> <p>The project operation yields a “vertical” subset of a given relation in contrast to the “horizontal” subset returned by select operation. The projection lets you select specified attributes in a specified order. Projection is denoted by Greek letter π (pi).</p>															
21. Ans.	<p>What is the Cartesian product? How is it different from join operation?</p> <p>When you join two or more tables without any condition, it is called Cartesian product or Cross Join.</p> <p>The difference between Cartesian Product and Join is – In Join operation we have to mention the column name from both the tables on which join has to be perform for eg. Select EmpName,Salary from Employee, SalaryRange where Employee.Salary =SalaryRange.MinSalary.</p> <p>Whereas in Cartesian product we do not mention any condition for eg. Select a.Id,b.Id from Employee a,Manager b;</p>															
22. Ans.	<p>What does union operation do? What are the conditions to carry out union operation?</p> <p>The union operation is a binary operation that requires two relations as its operands. It produces a third relation that contains tuples from both the operand relations. The union operation is denoted by \cup . Thus, to denote the union of two relations X and Y, we will write as X \cup Y.</p> <p>Following two condition must be satisfied by two operands A and B :</p> <p>(i)The relations A and B must be of the same degree. That is, they must have the same number of attributes.</p> <p>(ii) The domains of the <i>i</i>th attributes of A and the <i>i</i>th attributes of B must be the same.</p>															
23. Ans.	<p>What are the set difference and set intersection operations? How are they different?</p> <p>The set difference operation, denoted by – (minus) allows us to find tuples that are in one relation but not in another. The expression A – B results in a relation containing those tuples in A but not in B.</p> <p>The set intersection operation finds tuples that are common to the two operands relations. The set intersection operation is denoted by \cap . That means A \cap B will yield a relation having tuples common to A and B.</p> <p>The difference between these two is that in set difference operation the result will contain those tuples which are in one operand but not in other.</p> <p>Whereas in set intersection operation result will contain those tuples which are common in both the operands.</p>															
	<p>Give the following relations</p> <div><p>EMPL (FirstName, LastName, Workdept, Empno, Educlevel, Jobcode, Salary, Bonus, hiredate)</p><p>Dept (Deptno, Deptname, Mgrno, Adurdept)</p></div> <p>Statement for creating above table :</p>															

	<pre> CREATE TABLE EMPL (FirstName char(20), LastName char(20), WorkDept char(15), Empno integer, Educlevel char(10), Jobcode integer, Salary decimal, Bonus decimal, Hiredate date); CREATE TABLE Dept (Deptno integer, DeptName char(20), Mgrno integer, Adurdept char(20)); CREATE TABLE Supplier (Sno integer, Pno integer); CREATE TABLE Part (Pno integer, Colour char(10)); </pre> <p>Write relational expression for question 24 – 27 using the above relations.</p>
24.	List employees' first and last names.
Ans.	SELECT FirstName, LastName from EMPL;
25.	Give all information on employees in manufacturing system.
Ans.	SELECT * from EMPL WHERE Workdept = "Manufacture";
26.	Just give employee names in manufacturing systems.
Ans.	SELECT FirstName from EMPL WHERE Workdept IN ("Manufacture");
27.	Give employee names outside manufacturing systems.
Ans.	Ans : SELECT FirstName from EMPL WHERE Workdept NOT IN ('Manufacture');
28.	List employee names and their departments for employee numbers between 100 and 300
Ans.	SELECT EmpName, DeptName from EMPL WHERE Empno BETWEEN 100 and 300;
30.	List employee numbers, names and educational levels for three educational 16, 18, and 20.
Ans.	SELECT Empno, FirstName, Educlevel from EMPL WHERE Educlevel IN (16, 18, 20);
31.	List employee numbers and name in manufacturing system for job code 54.
Ans.	SELECT Empno, FirstName from EMPL WHERE Workdept = 'Manufacture' AND Jobcode = 54;
32.	Same request as above with educational level below 15.
Ans.	SELECT Empno, FirstName from EMPL WHERE Workdept = 'Manufacture' AND Jobcode <= 15;
33.	List those employees' last name and monthly salary plus bonus, whose job code is at least three times their educational level and whose annual basic salary plus bonus exceed 100000.
Ans.	SELECT LastName, Salary+Bonus from EMPL WHERE Jobcode = (Educlevel * 3) AND ((Salary * 12) + Bonus) > 100000;
34.	List employee last name, work department and monthly salary for those in Services, Planning and Information center departments.
Ans.	SELECT LastName, Workdept , Salary from EMPL WHERE Deptname IN ('Services', 'Planning', 'Information center');
35.	List employee last name, work department, department number, and department name.
Ans.	SELECT LastName, Workdept , Deptno, Deptname from EMPL, Dept WHERE Empl.Deptno = Dept.Deptno ;
36.	Which employees earn more than their manager ?
Ans.	SELECT EmpName from EMPL, MANG WHERE empl.mgrid=mang.mgrid and EMPL.Salary > MANG.Salary ;
37.	List suppliers who supply only red parts.

Ans.	SELECT SupName from Supplier WHERE colour = 'Red' ;
38.	What is meant by functional dependency? Give example of functional dependence .
Ans.	<p>A functional dependency occurs when one attribute in a relation uniquely determines another attribute. This can be written A -> B which would be the same as stating "B is functionally dependent upon A."</p> <p>Examples:</p> <p>In a table listing employee characteristics including Social Security Number (SSN) and name, it can be said that name is functionally dependent upon SSN (or SSN -> name) because an employee's name can be uniquely determined from their SSN. However, the reverse statement (name -> SSN) is not true because more than one employee can have the same name but different SSNs.</p>

TYPE B : SHORT ANSWER QUESTIONS

1.	Draw a diagram explaining various levels of data abstraction.												
Ans.	<div style="text-align: center;"> <pre> graph TD subgraph External V1[View 1] V2[View 2] V3[View 3] end V1 --> C[Conceptual] V2 --> C V3 --> C C --> P[Physical] </pre> <p style="text-align: center;">The Three Levels of Data Abstraction.</p> </div>												
2.	What is meant by “data independence”? Make a list of data independence capabilities.												
Ans.	<p>Data independence is the ability to modify a scheme definition in one level without affecting a scheme definition in a higher level.</p> <p>data independence capabilities :</p> <ul style="list-style-type: none"> ✓ Physical Data Independence has ability to modify the scheme followed at the physical level without affecting the scheme followed at the conceptual level. ✓ Logical Data Independence has ability to modify the conceptual scheme without causing any changes in the schemes followed at view levels. 												
3.	What are the main difference between a file-processing system and a database management system?:												
Ans.	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: center;"><u>File-processing system</u></th><th style="text-align: center;"><u>Database management system</u></th></tr> </thead> <tbody> <tr> <td>It has problem of data redundancy.</td><td>It can reduce data redundancy to a large extent.</td></tr> <tr> <td>Data is insecure.</td><td>Provide more security to data.</td></tr> <tr> <td>Cannot store data permanently.</td><td>Can store data permanently.</td></tr> <tr> <td>Cannot change and access file-oriented data</td><td>Can change and access data in DBMS.</td></tr> <tr> <td>Cannot recall or recover the file-oriented data</td><td>DBMS solve such type of problem</td></tr> </tbody> </table>	<u>File-processing system</u>	<u>Database management system</u>	It has problem of data redundancy.	It can reduce data redundancy to a large extent.	Data is insecure.	Provide more security to data.	Cannot store data permanently.	Can store data permanently.	Cannot change and access file-oriented data	Can change and access data in DBMS.	Cannot recall or recover the file-oriented data	DBMS solve such type of problem
<u>File-processing system</u>	<u>Database management system</u>												
It has problem of data redundancy.	It can reduce data redundancy to a large extent.												
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Cannot store data permanently.	Can store data permanently.												
Cannot change and access file-oriented data	Can change and access data in DBMS.												
Cannot recall or recover the file-oriented data	DBMS solve such type of problem												
4.	This chapter has described some of the major advantage of a database system. What are the disadvantage ?												
Ans.	<p>Following are the some of disadvantage of database system :</p> <ul style="list-style-type: none"> (a) Security may be compromised without good controls. (b) Integrity may be compromised without good controls. (c) Extra hardware may be required. (d) Performance overhead may be significant. (e) System is likely to be complex. 												
5.	Explain deference between physical and logical data independence.												

Ans.	<u>Physical data independence</u>		<u>Logical data independence</u>	
	Modifies the scheme followed at the physical level without affecting the scheme followed at the conceptual level.		Modifies the conceptual scheme without causing any changes in the schemes followed at view levels.	
	Less difficult to achieve.		More difficult to achieve because the	
	Application programs are not heavily dependent on the physical structure of the database.		Application programs are heavily dependent on the logical structure of the database.	
6.	Illustrate the difference between the three levels of data abstraction.			
Ans.	<u>Internal Level</u>	<u>Conceptual Level</u>	<u>External Level</u>	
	Describes how the data is actually stored on the storage medium.	Describes what data are actually stored in the database and relationship existing among data.	Concerned with the data is viewed by individual users.	
	At this level, complex low-level data structure are described in details.	At this level, the database is described logically in terms of simple data-structures.	Only a part of the database relevant to the users is provided to them through this level.	
7.	What is relation? What is the difference between a tuple and an attribute?			
Ans.	A relation is a two-dimensional table. It contains number of rows (tuples) and columns (attributes). This is the horizontal part of the relation. One row represents one record of the relation. The rows of a relation are also called tuples.			
8.	What is relation? Define the properties of a relation.			
Ans.	A relation is a two-dimensional table. It contains number of rows (tuples) and columns (attributes). A relation has following properties : (a). In any given column of the table, all items are of the same kind whereas items in different columns may not be of the same kind. (b). For a row, each coloums must have an atomic value and also for a row, a columns cannot more than one value. (c). All of a relations are distinct. That is, a relation does not contain two rows which are identical in every column. That is, each row of the relation can be uniquely identified by its contents. (d). The ordering of two within a relation is immaterial. That is, we cannot retrieved any thing by saying that from row number 5, column name is to be accessed. Thee is no order maintained for rows inside a relation. (e). The columns of a relation are assigned distinct names and the ordering of these columns is immaterial.			
9.	Summarise the major difference between a relation and a traditional file.			
Ans.	File System vs Data base Management System: - 1. Files act locally where as DBMS saves directly in a database 2. Saves in temporary locations where as DBMS in well arranged and permanent data base locations 3. In File System., transactions are not possible where as various transactions like insert, delete, view, updating etc are possible in DBMS 4. Data will be accessed through single or various files where as in DBMS, tables (schema) is used to access data. 5. A "File manager" is used to store all relationships in directories in File Systems where as a data base manager (administrator) stores the relationship in form of structural tables 6. Last.... but not the least.... Data in data bases are more secure compared to data in files!!			

STRUCTURED QUERY LANGUAGE

TYPE A : VERY SHORT ANSWER QUESTIONS

1.	What is SQL? What are the various subdivisions of SQL?
Ans.	SQL means Structured Query Language. It is the set of commands that is recognized by all RDBMS. Data Definition Language (DDL) Data Manipulation Language (DML) Data Control Language (DCL)
2.	Give examples of some DDL commands and some DML commands.
Ans.	DDL Commands 1) CREATE 2) ALTER 3) DROP DML Commands 1) INSERT INTO 2) DELETE 3) UPDATE
3.	What is the difference between column constraint and table constraint? Name some database integrity constrains.
Ans.	The difference between column constraint and table constraint is that column constraint applies only to individual columns, whereas table constraints apply to groups of one or more columns. Following are the few of database integrity constrains: ➤ Unique constraint ➤ Primary Key constraint ➤ Default constraint ➤ Check constraint
4.	1. How do following constraint work?
Ans.	<div style="display: flex; justify-content: space-between;"> <div> (i) Unique <u>Unique:</u> This constraint ensures that no two rows have the same value in the specified columns. For eg , CREATE TABLE employee (ecode integer NOT NULL UNIQUE, ename char(20),Sex char(2)); </div> <div> (ii) Primary Key <u>Primary Key:</u> Primary key does not allow NULL value and Duplicate data in the column which is declared as Primary Key. For eg , CREATE TABLE employee (ecode integer NOT NULL PRIMARY KEY, ename char(20),Sexchar(2)); </div> <div> (iii) Default <u>Default:</u> When a user does not enter a value for the column, automatically the defined default value is inserted in field. A column can have only one default value. For eg , CREATE TABLE employee (ecode integer NOT NULL PRIMARY KEY, ename char(20), Sexchar(2), Grade char(2) DEFAULT = 'E1'); </div> <div> (iv) Check <u>Check:</u> This constraint limits values that can inserted into a column of table. For eg , CREATE TABLE employee (ecode integer NOT NULL PRIMARY KEY, ename char(20),Sex char(2) , Grade char(2) DEFAULT = 'E1' , Gross decimal CHECK (gross > 2000)); </div> </div>
5.	Compare DISTINCT and ALL keywords when used with SELECT command.
Ans.	DISTINCT keyword is used to restrict the duplicate rows from the results of a SELECT statement. ALL keyword retains the duplicate rows, by default ALL keyword is use by SELECT statement.
6.	What is wrong with the following statement? Write the corrected form of this query :
	SELECT * FROM employee WHERE grade = NULL ;

Ans.	IS NULL should be used in place of = NULL. Following is the correct statement : SELECT * FROM employee WHERE grade IS NULL ;											
7.	What is the difference between where and having clause ?											
Ans.	<table><tr><th>WHERE CLAUSE</th><th>HAVING CLAUSE</th></tr><tr><td>Places conditions on individual rows.</td><td>Places conditions on groups.</td></tr><tr><td>Cannot include aggregate function.</td><td>Can include aggregate function.</td></tr><tr><td>For eg. SELECT * FROM student WHERE Rno >=10;</td><td>For eg. SELECT AVG(marks) FROM student GROUP BY grade HAVING grade = 'B1';</td></tr></table>		WHERE CLAUSE	HAVING CLAUSE	Places conditions on individual rows.	Places conditions on groups.	Cannot include aggregate function.	Can include aggregate function.	For eg. SELECT * FROM student WHERE Rno >=10;	For eg. SELECT AVG(marks) FROM student GROUP BY grade HAVING grade = 'B1';		
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For eg. SELECT * FROM student WHERE Rno >=10;	For eg. SELECT AVG(marks) FROM student GROUP BY grade HAVING grade = 'B1';											
8.	What is difference between working of the following functions?											
Ans.	Count(*), Count (<column-name>), Count (DISTINCT), Count (ALL) <u>Count(*)</u> :- The COUNT(*) function returns the number of records in a table: SELECT COUNT(*) FROM student; <u>Count (<column-name>)</u> :- The COUNT(<column-name>) function returns the number of values (NULL values will not be counted) of the specified column: SELECT COUNT(name) FROM student; <u>Count (DISTINCT)</u> :- The COUNT(DISTINCT column_name) function returns the number of distinct values of the specified column: SELECT COUNT(DISTINCT city) FROM student; <u>Count (ALL)</u> :- to count the number of non-null values in column dept, i.e. counting repetitions too. SELECT COUNT(ALL) FROM student;											
9.	1. What is the difference between SELECT INTO and CREATE VIEW commands?											
Ans.	<table><tr><th>SELECT INTO command</th><th>CREATE VIEW command</th></tr><tr><td>SELECT INTO creates a new table by extracting data from other table.</td><td>The CREATE VIEW creates view from a table.</td></tr><tr><td>Resides physically in the database.</td><td>Not a part of the database's physical representation.</td></tr><tr><td>Used to create backup copies of tables.</td><td>Not used for backup purpose.</td></tr><tr><td>For eg. SELECT Lastname, FirstName INTO Person_Backup FROM Persons;</td><td>For eg. CREATE VIEW v_student AS SELECT Roll_no, Name, Class FROM student;</td></tr></table>		SELECT INTO command	CREATE VIEW command	SELECT INTO creates a new table by extracting data from other table.	The CREATE VIEW creates view from a table.	Resides physically in the database.	Not a part of the database's physical representation.	Used to create backup copies of tables.	Not used for backup purpose.	For eg. SELECT Lastname, FirstName INTO Person_Backup FROM Persons;	For eg. CREATE VIEW v_student AS SELECT Roll_no, Name, Class FROM student;
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For eg. SELECT Lastname, FirstName INTO Person_Backup FROM Persons;	For eg. CREATE VIEW v_student AS SELECT Roll_no, Name, Class FROM student;											
10.	What are views? When can a view be updated?											
Ans.	A view is, in essence, a virtual table. It does not physically exist. Rather, it is created by a query joining one or more tables. In following condition a view can be updated : ✓ If it has only one base table. ✓ If select statement used in view contains group by clause then we cant update view.											
11.	What is the condition of dropping a table?											
Ans.	There is a one condition for dropping a table that is a table must be an empty table which we want to drop.											
Note: For the following questions consider the tables EMP given in book.												
12.	Insert a record with suitable data in the table EMP, taking system date as the Hiredate.											
Ans.	INSERT INTO emp VALUES (1101, 'ROBIN', 'CLERK', 7902, curdate(), 5000.00, 500.00, 10);											
13.	To create a table DEPTO30 to hold the employee numbers, names, jobs and salaries of employee in department with DeptNo = 30.											

Ans.	CREATE TABLE DEPTP30 AS(SELECT EmpNo, EmpName, Job, Sal FROM EMP WHERE DeptNo=30);		
14.	Display names all employees whose names include either of the substring “TH” or “LL”.		
Ans.	SELECT empname FROM emp WHERE(empname LIKE '%TH%' OR empname LIKE '%LL%');		
15.	Display data for all CLERKS who earn between 1000 and 2000.		
Ans.	SELECT * FROM emp WHERE((job LIKE 'clerk') AND (sal BETWEEN 1000 AND 2000));		
16.	Display data for all employees sorted by their department, seniority and salary.		
Ans.	SELECT * FROM emp ORDER BY deptno, hiredate, sal;		
17.	Write a SQL statement to list EmpNo, EmpName, DeptNo, for all the employees. This information is should be sorted on EmpName.		
Ans.	SELECT empno, empname,deptno FROM emp ORDER BY empname;		
18.	Write SQL statement for : Find all the employees who have no manager.		
Ans.	SELECT empname FROM emp WHERE mgr IS NULL;		
19.	Write a SQL statement (s) to list all employees in the following format:		
	EMPLOYEE	WORKS IN DEPARTMENT	DeptNo
	7369-SMITH	WORKS IN DEPARTMENT	20
	7300-SUDHIR	WORKS IN DEPARTMENT	20
	7345-RAJ	WORKS IN DEPARTMENT	10
	7329-SMITHS	WORKS IN DEPARTMENT	30
	7234-SANTOSH	WORKS IN DEPARTMENT	30
Ans.	SELECT ename,'WORKS IN DEPARTMENT', deptno FROM emp;		
20.	To find all those employees whose job does not start with ‘M’.		
Ans.	SELECT empname FROM emp WHERE job NOT LIKE 'M%';		
21.	To display all employees who were hired during 1995.		
Ans.	SELECT ename FROM emp WHERE YEAR(hiredate) = '1995';		
22.	To display DeptNo, Job, EmpName in reverse order of salary from the EMP table.		
Ans.	SELECT deptno,job,empname FROM emp ORDER BY sal DESC;		
23.	List EmpName, Job, Sal for all the employees who have a manager.		
Ans.	SELECT empname , job, salary from EMP WHERE mgr IS NOT NULL;		
24.	List the minimum and maximum salary of each job type.		
Ans.	SELECT job,MIN(sal),MAX(sal) FROM emp GROUP BY job;		
25.	Show the average salary for all departments with more than 3 people for job.		
Ans.	SELECT AVG(sal) FROM emp GROUP BY deptno HAVING COUNT(job)>3;		
26.	Display only the jobs with maximum salary greater than or equal to 3000.		
Ans.	SELECT job FROM emp GROUP BY job HAVING MAX(salary)>=3000;		
27.	Find out number of employee having ‘Manager’ as job.		
Ans.	SELECT COUNT(empname) FROM emp WHERE job LIKE 'Manager';		
28.	Create view Dept20 with EmpName and the Sal of employees for dept 20.		
Ans.	CREATE VIEW dept20 as SELECT empname, sal FROM emp WHERE deptno=20;		
29.	Find the average salary and average total remuneration for each job type remember salesman earn commission.		
Ans.	SELECT AVG(sal) , AVG(sal + IFNULL(comm, 0)) FROM emp GROUP BY job;		
30.	What happens if you try to drop a table on which a view exists?		
Ans.	If we try to drop a table on which a view exist, then the table is dropped but DBMS invalidates these dependent views but does not drop them. We cannot use these views unless we recreate the table or drop and recreate the objects so that they no longer depend on the table.		
31.	Create a view with one of the columns Salary * 12. Try updating columns of this view.		
Ans.	CREATE VIEW emp_view (v_empno,v_empname,v_avgsal) AS SELECT empno, empname, salary*12 FROM emp; UPDATE emp_view SET empname = 'MOHAN' WHERE empno=8698;		
32.	Can you create view of view?		
Ans.	Yes, We can create view of view.		

33.	Write a suitable SQL statement to display ALL employees working in New York in the following format :
	EmpName Salary Location
Ans.	SELECT A.empname, A.salary,B.location FROM emp A INNER JOIN dept B on A.deptno=B.deptno WHERE location LIKE 'NewYork';
34.	Write a suitable SQL statement to display employees' name of all the employees of GRADE 3.
Ans.	SELECT empname FROM emp A, salgrade B WHERE grade=3 AND A.empno=B.empno;
35.	Write a suitable SQL statement to find out the total number of employees from EMP table.
Ans.	SELECT count(empname) from EMP;

TYPE B : SHORT ANSWER QUESTIONS

1. Consider the following tables STORE and SUPPLIERS and answer (a) and (b) parts of this question:

Table: STORE

ItemNo	Item	Scode	Qty	Rate	LastBuy
2005	Sharpener Classic	23	60	8	31-Jun-09
2003	Ball Pen 0.25	22	50	25	01-Feb-10
2002	Gel Pen Premium	21	150	12	24-Feb-10
2006	Gel Pen Classic	21	250	20	11-Mar-09
2001	Eraser Small	22	220	6	19-Jan-09
2004	Eraser Big	22	110	8	02-Dec-09
2009	Ball Pen 0.5	21	180	18	03-Nov-09

Table: SUPPLIERS

Scode	Sname
21	Premium Stationers
23	Soft Plastics
22	Tetra Supply

(a) Write SQL commands for the following statements:

(i) To display details of all the items in the Store table in ascending order of LastBuy.

Ans. SELECT * FROM STORE ORDER BY LastBuy;

(ii) To display ItemNo and Item name of those items from Store table, whose Rate is more than 15 Rupees.

Ans. SELECT ItemNo, Item FROM STORE WHERE Rate >15;

(iii) To display the details of those items whose Supplier code (Scode) is 22 or Quantity in Store (Qty) is more than 110 from the table Store.

Ans. SELECT * FROM STORE WHERE Scode = 22 OR Qty >110;

(iv) To display Minimum Rate of items for each Supplier individually as per Scode from the table Store.

Ans. SELECT Scode, MIN(Rate) FROM STORE GROUP BY Scode;

<div>(b)</div> <div>(i)</div> <div>Ans.</div>	<div>Give the output of the following SQL queries:</div> <div>SELECT COUNT(DISTINCT Scode) FROM Store;</div> <div>COUNT(DISTINCT Scode)</div> <div>3</div>																																																
<div>(ii)</div> <div>Ans.</div>	<div>SELECT Rate*Qty FROM Store WHERE ItemNo=2004;</div> <div>RATE*QTY</div> <div>880</div>																																																
<div>(iii)</div> <div>Ans.</div>	<div>SELECT Item,Sname FROM Store S, Suppliers P WHERE S.Scode=P.Scode AND ItemNo=2006;</div> <div>ITEMSNAME</div> <div>Gel Pen ClassicPremium Stationers</div>																																																
<div>(iv)</div> <div>Ans.</div>	<div>SELECT MAX(LastBuy) FROM Store;</div> <div>MAX (LASTBUY)</div> <div>24-Feb-10</div>																																																
2.	<div>Consider the following table Item and Customer. Write SQL commands for the statement (i) to (iv) and give outputs for SQL queries (v) to (viii).</div> <div>Table : ITEM</div> <table><tr><th>i_ID</th><th>ItemName</th><th>Manufacturer</th><th>Price</th></tr><tr><td>PC01</td><td>Personal Computer</td><td>ABC</td><td>35000</td></tr><tr><td>LC05</td><td>Laptop</td><td>ABC</td><td>55000</td></tr><tr><td>Pc03</td><td>Personal Computer</td><td>XYZ</td><td>32000</td></tr><tr><td>Pc06</td><td>Personal Computer</td><td>COMP</td><td>37000</td></tr><tr><td>Lc03</td><td>Laptop</td><td>PQR</td><td>57000</td></tr></table> <div>Table : CUSTOMER</div> <table><tr><th>C_ID</th><th>CustomerName</th><th>City</th><th>I_ID</th></tr><tr><td>01</td><td>N Roy</td><td>Delhi</td><td>LC03</td></tr><tr><td>06</td><td>H Singh</td><td>Mumbai</td><td>PC03</td></tr><tr><td>12</td><td>R Pandey</td><td>Delhi</td><td>PC06</td></tr><tr><td>15</td><td>C Sharma</td><td>Delhi</td><td>LC03</td></tr><tr><td>16</td><td>K Agarwal</td><td>Banglore</td><td>PC01</td></tr></table>	i_ID	ItemName	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	C_ID	CustomerName	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	Banglore	PC01
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<div>(i)</div> <div>Ans.</div>	<div>To display the details of those Customer whose City is Delhi.</div> <div>SELECT * FROM CUSTOMER WHERE CITY = 'DELHI';</div>																																																
<div>(ii)</div> <div>Ans.</div>	<div>To display the details of Item whose Price is in the range of 3500 to 55000 (Both values included).</div> <div>SELECT * FROM ITEM WHERE PRICE BETWEEN 35000 AND 55000;</div>																																																
<div>(iii)</div> <div>Ans.</div>	<div>To displa the customerName, City from table Customer, and ItemName and Price from table Item, with their corresponding matching I_ID.</div> <div>SELECT CUSTOMERNAME,CITY,ITEMNAME,PRICE FROM CUSTOMER A INNER JOIN ITEM B WHERE A.I_ID=B.I_ID;</div>																																																
<div>(iv)</div> <div>Ans.</div>	<div>To increase the Price of all Items by 1000 in the table Item.</div> <div>UPDATE ITEM SET PRICE=PRICE+1000;</div>																																																
<div>(v)</div> <div>Ans.</div>	<div>SELECT DISTINCT City FROM Customer;</div> <div>City</div> <div>Delhi</div> <div>Mumbai</div> <div>Banglore</div>																																																

(vi)	SELECT ItemName, Max(Price), Count(*) FROM Item GROUP BY ItemName;		
Ans.	<u>Name</u>	<u>Max(Price)</u>	<u>Count (*)</u>
	Laptop	58000	2
	Personal Computer	38000	3
(vii)	SELECT CustomerName, Manufacturer From Item, Customer WHERE Item.I_Id=Customer.I_Id;		
Ans.	<u>Cname</u>	<u>Manufacturer</u>	
	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.	<u>Name</u>	<u>Price*100</u>	
	Personal Computer	3600000	
	Laptop	5600000	

3.	Consider the following tables. Write SQL commands for the statements (i) to (iv) and give outputs for SQL queries (v) to (viii).				
	TABLE : SENDER				
	SenderID	SenderName	SenderName	SenderCity	
	ND01	R Jain	2,ABC Appts	New Delhi	
	MU02	H Sinha	12, Newtown	Mumbai	
	MU15	S Jha	27/A, Park Street	Mumbai	
	ND50	T Prasad	122-K, SDA	New Delhi	
	TABLE : RECIPIENT				
	RecID	SenderID	RecName	RecAddress	ReCity
	KO05	ND01	R Bajpayee	5, Central Avenue	Kolkata
	ND08	MU02	S Mohan	116, A vihar	New Delhi
	MU19	ND01	H singh	2a, Andheri east	Mumbai
	MU32	MU15	P K Swamy	B5, c S Terminus	Mumbai
	ND48	ND50	S Tirupathi	13, B1 d, Mayur vihar	New Delhi
(i)	To display the names of all Senders from Mumbai				
Ans.	SELECT SENDERNAME FROM SENDER WHERE SENDERCITY='MUMBAI' ;				
(ii)	To display the RecID, SenderName, SenderAddress, RecName, RecAddress for every Recipient				
Ans.	SELECT RECID, SENDERNAME,SENDERADDRESS,RECNAME,RECADDRESS FROM RECIPIENT A INNER JOIN SENDER B ON A.SENDERID=B.SENDERID;				
(iii)	To display Recipient detail in asending order of RecName				
Ans.	SELECT * FROM RECIPIENT ORDER BY RECNAME;				
(iv)	To display number of Recipients from each city				
Ans.	SELECT RECCITY,COUNT(RECNAME) FROM RECIPIENT GROUP BY RECCITY;				
(v)	SELECT DISTINCT Sendercity FROM Sender;				
Ans.	<u>Sendercity</u>				
	New Delhi				
	Mumbai				

(vi)	SELECT A.SenderName, B.RecName FROM Sender A, Recipient B WHERE A.SenderID=B.SenderID AND B.RecCity='Mumbai';																																																																													
Ans.	<table><tr><td>SenderName</td><td>RecName</td></tr><tr><td>R Jain</td><td>H Singh</td></tr><tr><td>S Jha</td><td>P K Swamy</td></tr></table>	SenderName	RecName	R Jain	H Singh	S Jha	P K Swamy																																																																							
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(viii)	SELECT RecID, RecName FROM Recipient WHERE SenderID='MU02' OR SenderID='ND50';																																																																													
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6	Risky Business	Comedy	R	Cruise	2	44.95																																																																								
7	Cocoon	Scifi	PG	Ameche	2	31.95																																																																								
8	Crocodile Dundee	Comedy	PG13	Harris	2	69.95																																																																								
9	101 Dalmatians	Comedy	G		3	59.95																																																																								
10	Tootsie	Comedy	PG	Hoffman	1	29.95																																																																								
(b)	Find the total value of the movie cassettes available in the library.																																																																													
Ans.	SELECT COUNT(TITLE) FROM MOV;																																																																													
(c)	Display a list of all movies with Price over 20 and sorted by Price.																																																																													
Ans.	SELECT * FROM MOV WHERE PRICE>20 ORDER BY PRICE;																																																																													
(d)	Display all the movies sorted by Qty in decreasing order.																																																																													
Ans.	SELECT * FROM MOV ORDER BY QTY DESC;																																																																													
(e)	Display a report listing a movie number, current value and replacement value for each movie in the above table. Calculate the replacement value for all movies as																																																																													
Ans.	<p style="text-align: center;">QTY * Price * 1.15</p> SELECT NO,PRICE AS 'CURRENT VALUE', (QTY*PRICE*1.15) AS 'REPLACEMENT VALUE' FROM MOV;																																																																													
(f)	Count the number of movies where Rating is not “G”.																																																																													
Ans.	SELECT COUNT(TITLE) FROM MOV WHERE RATING<>'G' ;																																																																													

(g)	Insert a new movie in MOV table. Fill all the columns with values.																																																						
Ans.	INSERT IN TO MOV VALUES(11,'Republic Day','Drama','R','Turner',3,38.95);																																																						
(h)	Give the output of following SQL commands on the basis of table MOV.																																																						
(i)	Select AVG(Price) from MOV where Price < 30;																																																						
Ans.	<u>AVG(Price)</u> 19.95																																																						
(ii)	Select MAX(Price) from MOV where price > 30;																																																						
Ans.	<u>MAX(Price)</u> 79.95																																																						
(iii)	Select SUM(Price * QTY) from MOV where QTY < 4;																																																						
Ans.	<u>SUM(Price*QTY)</u> 791.75																																																						
(iv)	Select COUNT(DISTINCT TYPE) from MOV;																																																						
Ans.	<u>COUNT(DISTINCT TYPE)</u> 4																																																						
5.	Write SQL statement to create EMPLOYEE relation which contains EmpNo, Name, Skill, PayRate.																																																						
Ans.	CREATE TABLE EMPLOYEE(EmpNo VARCHAR(10), Name CHAR(20), Skill CHAR(20), PayRate DECIMAL);																																																						
6.	Create a table with the under mentioned structures																																																						
	<table><tr><th colspan="2">Table : EMP</th><th colspan="2">Table : PROJECT</th><th colspan="2">Table : DEPT</th></tr><tr><td>EmpNo</td><td>NUMBER(4)</td><td>ProjId</td><td>NUMBER(4)</td><td>DeptNo</td><td>NUMBER(2)</td></tr><tr><td>DeptNo</td><td>NUMBER(2)</td><td>ProjDesig</td><td>CHAR(20)</td><td>DeptName</td><td>CHAR(12)</td></tr><tr><td>EmpName</td><td>CHAR(10)</td><td>ProjStartDT</td><td>DATE</td><td>Location</td><td>CHAR(12)</td></tr><tr><td>Job</td><td>CHAR(10)</td><td>ProjEndDT</td><td>DATE</td><td></td><td></td></tr><tr><td>Manager</td><td>NUMBER(4)</td><td>BudgetAmount</td><td>NUMBER(7)</td><td></td><td></td></tr><tr><td>Hiredate</td><td>DATE</td><td>MaxNoStaff</td><td>NUMBER(2)</td><td></td><td></td></tr><tr><td>Salary</td><td>NUMBER(7,2)</td><td></td><td></td><td></td><td></td></tr><tr><td>Commission</td><td>NUMBER(7,2)</td><td></td><td></td><td></td><td></td></tr></table>	Table : EMP		Table : PROJECT		Table : DEPT		EmpNo	NUMBER(4)	ProjId	NUMBER(4)	DeptNo	NUMBER(2)	DeptNo	NUMBER(2)	ProjDesig	CHAR(20)	DeptName	CHAR(12)	EmpName	CHAR(10)	ProjStartDT	DATE	Location	CHAR(12)	Job	CHAR(10)	ProjEndDT	DATE			Manager	NUMBER(4)	BudgetAmount	NUMBER(7)			Hiredate	DATE	MaxNoStaff	NUMBER(2)			Salary	NUMBER(7,2)					Commission	NUMBER(7,2)				
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Hiredate	DATE	MaxNoStaff	NUMBER(2)																																																				
Salary	NUMBER(7,2)																																																						
Commission	NUMBER(7,2)																																																						
Ans.	CREATE TABLE EMP (EmpNo INTEGER(4), DeptNo INTEGER(2), EmpName CHAR(10), Job CHAR(10), Manager INTEGER(4), HireDate DATE, Salary DECIMAL(7,2), Commission DECIMAL(7,2)); CREATE TABLE PROJECT (ProjId INTEGER(4), ProjDesign CHAR(20), ProjStartDT DATE, ProjEndDT DATE, BudgetAmount INTEGER(7), MaxNoStaff INTEGER(2)); CREATE TABLE DEPT (DeptNo INTEGER(2), DeptName CHAR(12), Location CHAR(12));																																																						
7.	Create a table called SALEGRADE with the columns specified below : <div>LowSal NUMBER(7,2) HighSal NUMBER(7,2) Grade NUMBER(2)</div>																																																						
Ans.	CREATE TABLE SALEGRADE(LowSal DECIMAL(7,2) CHECK(LowSal>=1000.00), HighSal DECIMAL(7,2) CHECK(HighSal<=10000.00), Grade INTEGER);																																																						
8.	Write SQL commands for (a) to (f) and write the outputs for (g) on the basis of tables FURNITURE and ARRIVALS: TABLE : FURNITURE																																																						
	<table><tr><th>NO</th><th>ITEMNAME</th><th>TYPE</th><th>DATEOFSTOCK</th><th>PRICE</th><th>DISCOUNT</th></tr><tr><td>1</td><td>White lotus</td><td>Double Bed</td><td>23/02/02</td><td>30000</td><td>25</td></tr><tr><td>2</td><td>Pink feather</td><td>Baby cot</td><td>20/01/02</td><td>7000</td><td>20</td></tr><tr><td>3</td><td>Dolphin</td><td>Baby cot</td><td>19/02/02</td><td>9500</td><td>20</td></tr><tr><td>4</td><td>Decent</td><td>Office Table</td><td>01/01/02</td><td>25000</td><td>30</td></tr></table>	NO	ITEMNAME	TYPE	DATEOFSTOCK	PRICE	DISCOUNT	1	White lotus	Double Bed	23/02/02	30000	25	2	Pink feather	Baby cot	20/01/02	7000	20	3	Dolphin	Baby cot	19/02/02	9500	20	4	Decent	Office Table	01/01/02	25000	30																								
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3	Dolphin	Baby cot	19/02/02	9500	20																																																		
4	Decent	Office Table	01/01/02	25000	30																																																		

5	Comfort zone	Double Bed	12/01/02	25000	25
6	Donald	Baby cot	24/02/02	6500	15
7	Royal Finish	Office Table	20/02/02	18000	30
8	Royal tiger	Sofa	22/02/02	31000	30
9	Econo sitting	Sofa	13/12/01	9500	25
10	Eating Paradise	Dining Table	19/02/02	11500	25

TABLE : ARRIVALS

NO	ITEMNAME	TYPE	DATEOFSTOCK	PRICE	DISCOUNT
11	Wood Comfort	Double Bed	23/03/03	25000	25
12	Old Fox	Sofa	20/02/03	17000	20
13	Micky	Baby cot	21/02/03	7500	15

(a) **To show all information about the Baby cots from the FURNITURE table.**

Ans. `SELECT * FROM FURNITURE WHERE TYPE='Baby cot' ;`

(b) **To list the ITEMNAME which are priced at more than 15000 from the FURNITURE table.**

Ans. `SELECT ITEMNAME FROM FURNITURE WHERE PRICE>15000 ;`

(c) **To list ITEMNAME and TYPE of those items, in which DATEOFSTOCK is before 22/01/02 from the FURNITURE table in descending order of ITEMNAME.**

Ans. `SELECT ITEMNAME, TYPE FROM FURNITURE WHERE DATEOFSTOCK<{22/01/02} ORDER BY ITEMNAME DESC ;`

(d) **To display ITEMNAME and DATEOFSTOCK of those items, in which the DISCOUNT percentage is more than 25 form FURNITURE table.**

Ans. `SELECT ITEMNAME,DATEOFSTOCK FROM FURNITURE WHERE DISCOUNT>25 ;`

(e) **To count the number of items, whose TYPE is "Sofa" from FURNITURE table.**

Ans. `SELECT COUNT(TYPE) FROM FURNITURE WHERE TYPE='SOFA' ;`

(f) **To insert a new row in the ARRIVALS table with the following data:**

Ans. **14, 'Velvet touch', 'Double bed', {25/03/03}, 25000,30**

`INSERT INTO ARRIVALS VALUES(14, 'Velvet touch', 'Double bed', {25/03/03}, 25000,30) ;`

(g) **Give the output of following SQL statement:**

NOTE : Outputs of the below mentioned queries should be based on original data given in both the tables, i.e., without considering the insertion done in (f) part of this question :

(i) **Select COUNT (distinct TYPE) from FURNITURE;**

Ans. `COUNT(distinct TYPE)`

5

(ii) **Select MAX(DISCOUT) form FURNITURE, ARRIVALS;**

Ans. `MAX(DISCOUNT)`

30,25

(iii) **Select AVG(DISCOUT) form FURNITURE where TYPE = 'Baby cot';**

Ans. `AVG(DISCOUT)`

15

(iv) **Select SUM(PRICE) from FURNITURE where DATEOFSTOCK<{12/02/02};**

Ans. `SUM(PRICE)`

66500

9. **Differentiate between SQL commands DROP TABLE and DROP VIEW.**

Ans.

DROP TABLE:- DROP TABLE statement is used to delete the table and all its data from the database entirely. The syntax for DROP TABLE is DROP TABLE ;

DROP VIEW:- Removes an existing view from a database. DROP VIEW statement is used to remove a view or an object view from the database. The syntax for DROP VIEW is DROP VIEW ;

10.

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	SEX	EXPERIENCE
101	John	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	Morphy	ORTHOPEDIC	M	15

TABLE : SALARY

ID	BASIC	ALLOWANCE	CONSULTATION
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)

Ans.

Display NAME of all doctors who are in “MEDICINE” having more than 10 year experience from the table DOCTOR.

SELECT NAME FROM DOCTOR WHERE DEPT='MEDICINE' AND EXPERIENCE>10 ;

(ii)

Ans.

Display the average salary of all doctors working in “ENT” department using the tables DOCTOR and SALARY. Salary=BASIC + ALLOWANCE.

SELECT AVG(BASIC+ALLOWANCE) FROM DOCTOR A, SALARY B WHERE DEPT='ENT' AND A.ID=B.ID ;

(iii)

Ans.

Display the minimum ALLOWANCE of female doctors.

SELECT MIN(ALLOWANCE) FROM DOCTOR A AND SALARY B WHERE SEX='F' AND A.ID=B.ID ;

(iv.)

Ans.

Display the highest consultation fee among all male doctor.

SELECT MAX(CONST) FROM DOCTOR A, SALARY B WHERE SEX='M' AND A.ID=B.ID ;

(v)

Ans.

SELECT count(*) from DOCTOR where SEX=“F”.

count (*)

4

(vi)

Ans.

SELECT NAME, DEPT, BASIC from DOCTOR Salary WHERE DEPT=“ENT” AND DOCTORID=SALARY.ID

NAME	DEPT	BASIC
John	ENT	12000

11. What are DDL and DML commands?

(a) DDL is short form of Data Definition Language statements are used to build and modify the structure of database, tables and other objects in the database. When you execute a DDL statement, it takes effect immediately. Some of the commands comprising DDL are CREATE TABLE, DROP TABLE and CREATE INDEX.

Ans. DML is abbreviation of Data Manipulation Language. It is used to retrieve, store, modify, delete, insert and update data in database. Examples: SELECT, UPDATE, INSERT statements.

(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_FLIGHTS	NO_STOPS
IC301	MUMBAI	DELHI	8	0
IC799	BANGALORE	DELHI	2	1
MC101	INDORE	MUMBAI	3	0
IC302	DELHI	MUMBAI	8	0
AM812	KANPUR	BANGALORE	3	1
IC899	MUMBAI	KOCHI	1	4
AM501	DELHI	TRIVANDRUM	1	5
MU499	MUMBAI	MADRAS	3	3
IC701	DELHI	AHMEDABAD	4	0

Table : FARES

FL_NO	AIRLINES	FARE	TAX%
IC701	Indian Airlines	6500	10
MU499	Sahara	9400	5
AM501	Jet Airways	13450	8
IC899	India Airlines	8300	4
IC302	Indian Airlines	4300	10
IC799	Indian Airlines	10500	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' LIKE 'KANPUR' AND
ENDING LIKE 'BANGALORE' ;`

(ii) Arrange the contents of the table FLIGHTS in the ascending order of FL_NO.

Ans. `SELECT * FROM FLIGHTS ORDER BY FL_NO`

(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 `FLIGHTS`.`FL_NO`, (`FARE`+`FARE`*(`TAX%`/100)) FROM `FLIGHTS`,`FARES`
WHERE `STARTING` LIKE 'DELHI' AND `ENDING` LIKE 'MUMBAI' AND
`FLIGHTS`.`FL_NO` = `FARES`.`FL_NO` ;`

(iv) Display the minimum fare “Indian Airlines” is offering from the table FARES.

Ans. `SELECT MIN(FARE) FROM FARES ;`

(v) `SELECT FL_NO, NO_FLIGHTS, AIRLINES from FLIGHTS, FARES WHERE STARTING = “DELHI” AND
FLIGHTS.FL_NO=FARES.FL_NO.`

Ans. ERROR - Column 'FL_NO' in field list is ambiguous

Correct Code and Ans.


```
SELECT FLIGHTS.FL_NO,NO_FLIGHTS,FARES.AIRLINES FROM FLIGHTS,FARES
WHERE FLIGHTS.STARTING LIKE 'DELHI' AND FLIGHTS.FL_NO = FARES.FL_NO;
```

FL_NO	NO_FLIGHTS	AIRLINES
IC302	8	Indian Airlines
AM501	1	Jet Airways
IC701	4	Indian Airlines

(vi) **SELECT count(distinct ENDING) from FLIGHTS.**

Ans. count(distinct ENDING)
7

12. 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).

Table : Workers

W_ID	FIRSTNAME	LASTNAME	ADDRESS	CITY
102	Sam	Tones	33 Elm St.	Paris
105	Sarah	Ackerman	440 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

Table : 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 WORKERS ORDER BY LASTNAME ;`

(iii) **To display the Firstname, Lastname, and Total Salary of all clerk from the tables WORKERS and DESIG, where Total Salary is calculated as Salary + Benefits.**

Ans. `SELECT FIRSTNAME, LASTNAME, SALARY+BENEFITS AS 'TOTAL SALARY' FROM WORKERS, DESIG WHERE WORKERS.W_ID=DESIG.W_ID ;`

(iv) **To display the Minimum salary among Managers and Clerks from the table DESIG.**

Ans. `SELECT MIN(SALARY) FROM DESIG WHERE DESIGNATION IN('MANAGER', 'CLERK') ;`

(v) **SELECT FIRSTNAME, SALARY FROM WORKERS, DESIG WHERE DESIGNATION = 'Manager' AND WORKERS.W_ID=DESIG.W_ID;**

Ans.	<table><tr><td><u>FIRSTNAME</u></td><td><u>SALARY</u></td></tr><tr><td>Sam</td><td>75000</td></tr><tr><td>Manila</td><td>70000</td></tr><tr><td>George</td><td>75000</td></tr></table>	<u>FIRSTNAME</u>	<u>SALARY</u>	Sam	75000	Manila	70000	George	75000
<u>FIRSTNAME</u>	<u>SALARY</u>								
Sam	75000								
Manila	70000								
George	75000								
(vi)	SELECT COUNT(DISTINCT DESIGNATION) FROM DESIG;								
Ans.	<u>COUNT(DISTINCT DESIGNATION)</u> 4								
(vii)	SELECT DESIGNATION, SUM(SALARY) FROM DESIG GROUP BY DESIGNATION HAVING COUNT(*)<3;								
Ans.	<table><tr><td><u>DESIGNATION</u></td><td><u>SUM(SALARY)</u></td></tr><tr><td>Director</td><td>85000</td></tr><tr><td>Salesman</td><td>60000</td></tr></table>	<u>DESIGNATION</u>	<u>SUM(SALARY)</u>	Director	85000	Salesman	60000		
<u>DESIGNATION</u>	<u>SUM(SALARY)</u>								
Director	85000								
Salesman	60000								
(viii)	SELECT SUM(BENEFITS) FROM DESIG WHERE DESIGNATION='Salesman';								
Ans.	<u>SUM(BENEFITS)</u> 15000								

13.	<p>Consider the following tables GARMENT and FABRIC. Write SQL commands for the statements (i) to (iv) and give outputs for SQL queries (v) to (viii).</p> <p>Table: GARMENT</p> <table><tr><th>GCODE</th><th>DESCRIPTION</th><th>PRICE</th><th>FCODE</th><th>READYDATE</th></tr><tr><td>10023</td><td>PENCIL SKIRT</td><td>1150</td><td>F03</td><td>19-DEC-08</td></tr><tr><td>10001</td><td>FORMAL SHIRT</td><td>1250</td><td>F01</td><td>12-JAN-08</td></tr><tr><td>10012</td><td>INFORMAL SHIRT</td><td>1550</td><td>F02</td><td>06-JAN-08</td></tr><tr><td>10024</td><td>BABY TOP</td><td>750</td><td>F03</td><td>07-APR-07</td></tr><tr><td>10090</td><td>TULIP SKIRT</td><td>850</td><td>F02</td><td>31-MAR-07</td></tr><tr><td>10019</td><td>EVENING GOWN</td><td>850</td><td>F03</td><td>06-JUN-08</td></tr><tr><td>10009</td><td>INFORMAL PANT</td><td>1500</td><td>F02</td><td>20-OCT-08</td></tr><tr><td>10007</td><td>FORMAL PANT</td><td>1350</td><td>F01</td><td>09-MAR-08</td></tr><tr><td>10020</td><td>FROCK</td><td>850</td><td>F04</td><td>09-SEP-07</td></tr><tr><td>10089</td><td>SLACKS</td><td>750</td><td>F03</td><td>20-OCT-08</td></tr></table> <p>Table: FABRIC</p> <table><tr><th>FCODE</th><th>TYPE</th></tr><tr><td>F04</td><td>POLYSTER</td></tr><tr><td>F02</td><td>COTTON</td></tr><tr><td>F03</td><td>SILK</td></tr><tr><td>F01</td><td>TERELENE</td></tr></table> <p>(i) To display GCODE and DESCRIPTION of each GARMENT in descending order of GCODE</p> <p>Ans. SELECT GCODE, DESCRIPTION FROM GARMENT ORDER BY GCODE DESC;</p> <p>(ii) To display the details of all the GARMENTS, which have READYDATE in between 08-DEC-07 and 16-JUN-08 (inclusive of both the dates).</p> <p>Ans. SELECT * FROM GARMENTWHERE READYDATE BETWEEN '08-DEC-07'AND '16-JUN-08';</p> <p>(iii) To display the average PRICE of all the GARMENTS, which are made up of FABRIC with FCODE as F03.</p> <p>Ans. SELECT AVG(PRICE) FROM GARMENTWHERE FCODE = 'F03';</p> <p>(iv) To display FABRICwise highest and lowest price of GARMENTS from GARMENT table. (Display FCODE of each GARMENT along with highest and lowest price).</p> <p>Ans. SELECT FCODE, MAX(PRICE), MIN(PRICE) FROM GARMENT GROUP BY FCODE;</p>	GCODE	DESCRIPTION	PRICE	FCODE	READYDATE	10023	PENCIL SKIRT	1150	F03	19-DEC-08	10001	FORMAL SHIRT	1250	F01	12-JAN-08	10012	INFORMAL SHIRT	1550	F02	06-JAN-08	10024	BABY TOP	750	F03	07-APR-07	10090	TULIP SKIRT	850	F02	31-MAR-07	10019	EVENING GOWN	850	F03	06-JUN-08	10009	INFORMAL PANT	1500	F02	20-OCT-08	10007	FORMAL PANT	1350	F01	09-MAR-08	10020	FROCK	850	F04	09-SEP-07	10089	SLACKS	750	F03	20-OCT-08	FCODE	TYPE	F04	POLYSTER	F02	COTTON	F03	SILK	F01	TERELENE
GCODE	DESCRIPTION	PRICE	FCODE	READYDATE																																																														
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F03	SILK																																																																	
F01	TERELENE																																																																	

(v) Ans.	SELECT SUM(PRICE) FROM DRESS WHERE MCODE = 'M001'; <u>SUM(PRICE)</u> 2700																																																
(vi) Ans.	SELECT DESCRIPTION, TYPE FROM DRESS, MATERIAL WHERE DRESS.MCODE=MATERIAL.MCODE AND DRESS.PRICE >= 1250; <table><tr><td>DESCRIPTION</td><td>TYPE</td></tr><tr><td>FORMAL SHIRT</td><td>TERELENE</td></tr><tr><td>INFORMAL SHIRT</td><td>COTTON</td></tr><tr><td>PENCIL SKIRT</td><td>SILK</td></tr><tr><td>FORMAL PANT</td><td>TERELENE</td></tr><tr><td>INFORMAL PANT</td><td>COTTON</td></tr></table>	DESCRIPTION	TYPE	FORMAL SHIRT	TERELENE	INFORMAL SHIRT	COTTON	PENCIL SKIRT	SILK	FORMAL PANT	TERELENE	INFORMAL PANT	COTTON																																				
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INFORMAL PANT	COTTON																																																
(vii) Ans.	SELECT MAX(MCODE) FROM MATERIAL; <u>MAX(MCODE)</u> M004																																																
(viii) Ans.	SELECT COUNT(DISTINCT PRICE) FROM DRESS; <u>COUNT(DISTINCT PRICE)</u> 6																																																
15.	<p>Consider the following tables Stationery and Consumer. Write SQL commands for the statement (i) to (iv) and give output for SQL queries (v) to (viii).</p> <p>Table : STATIONERY</p> <table><tr><th>S_ID</th><th>StationeryName</th><th>Company</th><th>Price</th></tr><tr><td>DP01</td><td>Dot Pen</td><td>ABC</td><td>10</td></tr><tr><td>PL02</td><td>Pencil</td><td>XYZ</td><td>6</td></tr><tr><td>ER05</td><td>Eraser</td><td>XYZ</td><td>7</td></tr><tr><td>PL01</td><td>Pencil</td><td>CAM</td><td>5</td></tr><tr><td>GP02</td><td>Gel Pen</td><td>ABC</td><td>15</td></tr></table> <p>Table : CONSUMER</p> <table><tr><th>C_ID</th><th>ConsumerName</th><th>Address</th><th>S_ID</th></tr><tr><td>01</td><td>Good Lerner</td><td>Delhi</td><td>PL01</td></tr><tr><td>06</td><td>Write Well</td><td>Mumbai</td><td>GP02</td></tr><tr><td>12</td><td>Topper</td><td>Delhi</td><td>DP01</td></tr><tr><td>15</td><td>Write & Draw</td><td>Delhi</td><td>PL02</td></tr><tr><td>16</td><td>Motivation</td><td>Banglore</td><td>PL01</td></tr></table> <p>(i) Ans.</p> <p>To display the details of those Consumers whose Address is Delhi. SELECT * FROM CONSUMER WHERE ADDRESS="DELHI";</p> <p>(ii) Ans.</p> <p>To display the details of Stationery whose Price is in the range of 8 to 15 (Both value included) SELECT * FROM STATIONERY WHERE PRICE BETWEEN 8 AND 15;</p> <p>(iii) Ans.</p> <p>To display the ConsumerName, Address from Tble Consumer, and Company and Price from table Stationery, with their corresponding matching S_ID SELECT CONSUMERNAME, ADDRESS, COMPANY, PRICE FROM CONSUMER, STATIONERY WHERE CONSUMER.S_ID=STATIONERY.S_ID;</p> <p>(iv) Ans.</p> <p>To increase the Price of all stationery by 2 UPDATE STATIONERY SET PRICE=PRICE+2;</p> <p>(v)</p> <p>SELECT DISTINCT Address FROM Consumer;</p>	S_ID	StationeryName	Company	Price	DP01	Dot Pen	ABC	10	PL02	Pencil	XYZ	6	ER05	Eraser	XYZ	7	PL01	Pencil	CAM	5	GP02	Gel Pen	ABC	15	C_ID	ConsumerName	Address	S_ID	01	Good Lerner	Delhi	PL01	06	Write Well	Mumbai	GP02	12	Topper	Delhi	DP01	15	Write & Draw	Delhi	PL02	16	Motivation	Banglore	PL01
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Ans.	<u>Address</u> Delhi Mumbai Banglore																				
(vi)	SELECT Company, MAX(Price),Min(Price),Count(*) FROM Stationery GROUP BY Company;																				
Ans.	<table><tr><td>Company</td><td>MAX(Price)</td><td>Min(Price)</td><td>Count(*)</td></tr><tr><td>ABC</td><td>17</td><td>12</td><td>2</td></tr><tr><td>CAM</td><td>7</td><td>7</td><td>1</td></tr><tr><td>XYZ</td><td>9</td><td>8</td><td>2</td></tr></table>			Company	MAX(Price)	Min(Price)	Count(*)	ABC	17	12	2	CAM	7	7	1	XYZ	9	8	2		
Company	MAX(Price)	Min(Price)	Count(*)																		
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CAM	7	7	1																		
XYZ	9	8	2																		
(vii)	SELECT Consumer.CnsunerName, stationery.stationeryName, Stationery.Price FROM Stationery, Consumer WHERE Consumer.S_Id=Stationery.S_Id																				
Ans.	<table><tr><td>ConsumerName</td><td>StationeryName</td><td>Price</td></tr><tr><td>Good Lerner</td><td>Pencil</td><td>7</td></tr><tr><td>Write Well</td><td>Gel Pen</td><td>17</td></tr><tr><td>Topper</td><td>Dot Pen</td><td>12</td></tr><tr><td>Write & Drow</td><td>Pencil</td><td>8</td></tr><tr><td>Motivation</td><td>Pencil</td><td>7</td></tr></table>			ConsumerName	StationeryName	Price	Good Lerner	Pencil	7	Write Well	Gel Pen	17	Topper	Dot Pen	12	Write & Drow	Pencil	8	Motivation	Pencil	7
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Motivation	Pencil	7																			
(viii)	SELECT StationeryName, Price * 3 FROM Stationery																				
Ans.	<table><tr><td><u>StationeryName</u></td><td><u>Price*3</u></td></tr><tr><td>Dot Pen</td><td>36</td></tr><tr><td>Pencil</td><td>24</td></tr><tr><td>Eraser</td><td>27</td></tr><tr><td>Pencil</td><td>21</td></tr><tr><td>Gel Pen</td><td>51</td></tr></table>			<u>StationeryName</u>	<u>Price*3</u>	Dot Pen	36	Pencil	24	Eraser	27	Pencil	21	Gel Pen	51						
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TYPE A : VERY SHORT ANSWER QUESTIONS

NOTE: “ ‘ ” is used instead of “ ~ ” .

1.	Name the person who developed Boolean algebra.												
Ans.	George Boole was developed Boolean algebra.												
2.	What is the other name of Boolean algebra? In which year was the Boolean algebra developed?												
Ans.	Other name of Boolean algebra is ‘Switching Algebra’. Boolean algebra was developed in 1854.												
3.	What is the binary decision? What do you mean by a binary valued variable?												
Ans.	✓ The decision which results into either YES (TRUE) or NO (FALSE) is called a Binary Decision. ✓ Variables which can store truth values TRUE or FALSE are called logical variables or binary valued variables.												
4.	What do you mean by tautology and fallacy?												
Ans.	If result of any logical statement or expression is always TRUE or 1, it is called Tautology and if the result is always FALSE or 0 it is called Fallacy.												
5.	What is a logic gate? Name the three basic logic gates.												
Ans.	A Gate is simply an electronic circuit which operates on one or more signals to produce an output signal. Three basic logic gates are as following 1. Inverter (NOT Gate) 2. OR Gate 3. AND Gate												
6.	Which gates implement logical addition, logical multiplication and complementation?												
Ans.	✓ OR gate implements logical addition ✓ AND gate implements logical multiplication ✓ Inverter(NOT gate) implements complementation												
7.	What is the other name of NOT gate?												
Ans.	The other name of NOT gate is Inverter gate.												
8.	What is a truth table? What is the other name of truth table?												
Ans.	Truth Table is a table which represents all the possible values of logical variables/statements along with all the possible results of the given combinations of values.												
9.	Write the dual of : $1 + 1 = 1$												
Ans :	The dual of $1 + 1 = 1$ is $0 \cdot 0 = 0$												
10.	Give the dual of the following in Boolean algebra :												
Ans.	(i) $X \cdot X' = 0$ for each X (ii) $X + 0 = X$ for each X (i) $X + X' = 1$ (ii) $X \cdot 1 = X$												
11.	Which of the following Boolean equation is/are incorrect? Write the correct forms of the incorrect ones :												
Ans.	<table><tr><td>(a) $A + A' = 1$</td><td>(b) $A + 0 = A$</td><td>(c) $A \cdot 1 = A$</td></tr><tr><td>(d) $AA' = 1$</td><td>(e) $A + AB = A$</td><td>(f) $A(A+B)' = A$</td></tr><tr><td>(g) $(A+B)' = A' + B$</td><td>(h) $(AB)' = A'B'$</td><td>(i) $A + 1 = 1$</td></tr><tr><td>(k) $A + A'B = A + B$</td><td>(l) $X + YZ = (X + Y)(X + Z)$</td><td>(j) $A + A = A$</td></tr></table> (a) Correct (b) Correct (c) Correct (d) Incorrect. Correct form is $A \cdot A' = 0$ (e) Correct (f) Correct (g) Incorrect. Correct form is $(A + B)' = A'B'$ (h) Incorrect. Correct form is $(AB)' = A' + B'$ (i) Correct (j) Correct (k) Correct (l) Incorrect. Correct form is $X + YZ = (X + Y)(X + Z)$	(a) $A + A' = 1$	(b) $A + 0 = A$	(c) $A \cdot 1 = A$	(d) $AA' = 1$	(e) $A + AB = A$	(f) $A(A+B)' = A$	(g) $(A+B)' = A' + B$	(h) $(AB)' = A'B'$	(i) $A + 1 = 1$	(k) $A + A'B = A + B$	(l) $X + YZ = (X + Y)(X + Z)$	(j) $A + A = A$
(a) $A + A' = 1$	(b) $A + 0 = A$	(c) $A \cdot 1 = A$											
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(g) $(A+B)' = A' + B$	(h) $(AB)' = A'B'$	(i) $A + 1 = 1$											
(k) $A + A'B = A + B$	(l) $X + YZ = (X + Y)(X + Z)$	(j) $A + A = A$											
12.	What is the significance of Principle of Duality?												
Ans.	Principle of Duality is a very important principle used in Boolean algebra. This states that starting with a Boolean relation, another Boolean relation can be derived by : 1. Changing each OR sign (+) to an AND sign(.). 2. Changing each AND sign (.) to an OR sign(+). 3. Replacing each 0 by 1 and each 1 by 0												

13.	How many input combination can be there in the truth table of a logic system having (N) input binary variables?
Ans.	There can be 2^N input combination in the truth table of a logic system having (N) input binary variables.
14.	Write dual of the following Boolean Expression :
Ans.	<p>(a) $(x + y')$ (b) $xy + xy' + x'y$ (c) $a + a'b + b'$ (d) $(x + y' + z)(x + y)$</p> <p>(a) xy' (b) $(x + y)(x + y')(x' + y)$</p> <p>(c) $a \cdot (a' + b) \cdot b'$ (d) $xy'z + xy$</p>
15.	Find the complement of the following functions applying De'Morgan's theorem
Ans.	<p>(a) $F(x,y,z) = x'yz' + x'y'z$ (b) $F(x,y,z) = x(y'z + yz)$</p> <p>(a) $x'yz' + x'y'z$ (b) $x(y'z + yz)$</p> <p>$= (x'yz' + x'y'z)'$ $= x' + (y'z + yz)'$</p> <p>$= (x'yz')'(x'y'z)'$ $= x' + (y'' + z')(y' + z')$</p> <p>$= (x'' + y' + z'')(x'' + y'' + z')$ $= x' + (y + z')(y' + z')$</p> <p>$= (x + y' + z)(x + y + z')$</p>
16.	What is the logical product of several variables called? What is the logical sum of several variables called?
Ans.	Logical product of several variables is called Minterm and logical sum of several variables is called Maxterm.
17.	What is the procedure "Break the line, change the sign"?
Ans.	The procedure "Break the line, change the sign" is called demorganization which is performed by following steps : <ol style="list-style-type: none"> 1. Complement the entire function 2. Change all ANDs (.) to ORs (+) and all the ORs (+) to ANDs (.) 3. Complement each of the individual variables.
18.	What is a logical product having all the variables of a function called?
Ans.	Logical product having all the variables of a function is called Minterm.
19.	What is a logical sum having all the variables of a function called?
Ans.	Logical sum having all the variables of a function is called Maxterm.
20.	What do you understand by a Minterm and Maxterm?
Ans.	<p><u>Minterm</u>: - Minterm is a product of all the literals within the logic system. Each literal may be with or without the bar (i.e. complemented).</p> <p><u>Maxterm</u>:- Maxterm is a product of all the literals within the logic system. Each literal may be with or without the bar (i.e. complemented).</p>
21.	Write the minterm and Maxterm for a function $F(x,y,z)$ when $x=0, y=1, z=0$.
Ans.	<p>Minterm : $x'yz'$</p> <p>Maxterm: $x + y' + z$</p>
22.	Write the minterm and Maxterm for a function $F(x,y,z)$ when $x=1, y=0, z=0$.
Ans.	<p>Minterm : $xy'z'$</p> <p>Maxterm: $x' + y + z$</p>
23.	Write short hand notation for the following minterms : $XYZ, X'YZ', X'YZ$
Ans.	Short hand notation for the minterms $XYZ, X'YZ', X'YZ$ is $F = \sum(2, 3, 7)$
24.	Write short hand notation for the following maxterms :
Ans.	<p>$X + Y + Z, X + Y' + Z, X' + Y + Z', X + Y' + Z'$</p> <p>Short hand notation for the maxterms $X + Y + Z, X + Y' + Z, X' + Y + Z', X + Y' + Z'$ is $F = \pi(0, 2, 3, 5)$</p>
25.	What is the Boolean expression, containing only the sum of minterms, called?
Ans.	The Boolean expression, containing only the sum of minterms, is called Canonical Sum- of –Product Form of an expression.
26.	What is the Boolean expression, containing only the product of Maxterms, called?
Ans.	The Boolean expression, containing only the product of Maxterms, is called Canonical Product- of –Sum Form of an expression.
27.	What is the other name of Karnaugh map? Who invented Karnaugh maps?
Ans.	The other name of Karnaugh map is Veitch diagrams. Maurice Karnaugh was invented Karnaugh maps.
28.	Why are NAND and NOR gates called Universal gates?
Ans :	Circuits using NAND and NOR are popular as they are easier to design and therefore cheaper. Functions of other gates can easily be implemented using NAND and NOR gates. For this reason they are called universal gates.
29.	Which gates are called Universal gates and why?
Ans.	NAND and NOR gates are called Universal gates because NAND and NOR gates are less expensive and easier to design. Also other functions (NOT, AND, OR) can easily be implemented using NAND/NOR gates.

		<table><tr><td>0</td><td>Y</td><td>R</td></tr><tr><td>0</td><td>0</td><td>0</td></tr><tr><td>0</td><td>1</td><td>0</td></tr></table>	0	Y	R	0	0	0	0	1	0																																																																									
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	From truth table it is prove that $0 \cdot Y$ is a fallacy.																																																																																			
4.	What is a truth table? What is its significance?																																																																																			
Ans.	Truth Table is a table which represents all the possible values of logical variables/ statements along with all the possible results of the given combinations of values. With the help of truth table we can know all the possible combinations of values and results of logical statements.																																																																																			
5.	In the Boolean Algebra, verify using truth table that $X + XY = X$ for each X, Y in $\{0, 1\}$.																																																																																			
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7.	Give truth table for the Boolean Expression $(X + Y)'$.																																																																																			
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9.	Using truth table, prove that $AB + BC + CA' = AB + CA'$.																																																																																			
Ans.	<table><tr><td>A</td><td>B</td><td>C</td><td>A'</td><td>AB</td><td>BC</td><td>CA'</td><td>$AB + BC + CA'$</td><td>$AB + CA'$</td></tr><tr><td>0</td><td>0</td><td>0</td><td>1</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td></tr><tr><td>0</td><td>0</td><td>1</td><td>1</td><td>0</td><td>0</td><td>1</td><td>1</td><td>1</td></tr><tr><td>0</td><td>1</td><td>0</td><td>1</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td></tr><tr><td>0</td><td>1</td><td>1</td><td>1</td><td>0</td><td>1</td><td>1</td><td>1</td><td>1</td></tr><tr><td>1</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td></tr><tr><td>1</td><td>0</td><td>1</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td></tr><tr><td>1</td><td>1</td><td>0</td><td>0</td><td>1</td><td>0</td><td>0</td><td>1</td><td>1</td></tr><tr><td>1</td><td>1</td><td>1</td><td>0</td><td>1</td><td>1</td><td>0</td><td>1</td><td>1</td></tr></table>			A	B	C	A'	AB	BC	CA'	$AB + BC + CA'$	$AB + CA'$	0	0	0	1	0	0	0	0	0	0	0	1	1	0	0	1	1	1	0	1	0	1	0	0	0	0	0	0	1	1	1	0	1	1	1	1	1	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	1	1	0	0	1	0	0	1	1	1	1	1	0	1	1	0	1	1
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	Both the columns $AB + BC + CA'$ and $AB + CA'$ are identical, hence proved.																																																																																			
10.	What are the basic postulates of Boolean algebra?																																																																																			

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From truth table it is prove that $X(Y+Z) = XY + XZ$

(b) $X + YZ = (X + Y)(X + Z)$

X	Y	Z	YZ	X + YZ	XZ	X + Y	X + Z	(X + Y)(X + Z)
0	0	0	0	0	0	0	0	0
0	0	1	0	0	0	0	1	0
0	1	0	0	0	0	1	0	0
0	1	1	1	1	0	1	1	1
1	0	0	0	1	0	1	1	1
1	0	1	0	1	1	1	1	1
1	1	0	0	1	0	1	1	1
1	1	1	1	1	1	1	1	1

From truth table it is prove that $X + YZ = (X + Y)(X + Z)$

17. Give algebraic proof of absorption law of Boolean algebra.

Ans. Absorption law states that (i) $X + XY = X$ and (ii) $X(X + Y) = X$

(i) $X + XY = X$

$$\text{LHS} = X + XY = X(1 + Y)$$

$$= X \cdot 1 \quad [\because 1 + Y = 1]$$

$$= X = \text{RHS. Hence proved.}$$

(ii) $X(X + Y) = X$

$$\text{LHS} = X(X + Y) = X \cdot X + XY$$

$$= X + XY$$

$$= X(1 + Y)$$

$$= X \cdot 1$$

$$= X = \text{RHS. Hence proved.}$$

18. Prove algebraically that $(X + Y)(X + Z) = X + YZ$.

Ans. L.H.S. = $(X + Y)(X + Z) = XX + XZ + XY + YZ$

$$= X + XZ + XY + YZ$$

($XX = X$ Idempotence law)

$$= X + XY + XZ + YZ = X(1 + Y) + Z(X + Y)$$

$$= X \cdot 1 + Z(X + Y)$$

($1 + Y = 1$ property of 0 and 1)

$$= X + XZ + YZ$$

($X \cdot 1 = X$ property of 0 and 1)

$$= X(1 + Z) + YZ$$

$$= X \cdot 1 + YZ$$

($1 + Z = 1$ property of 0 and 1)

$$= X \cdot 1 + YZ$$

($X \cdot 1 = X$ property of 0 and 1)

$$= \text{L.H.S. Hence proved.}$$

19. Prove algebraically that $X + X'Y = X + Y$.

Ans. L.H.S. = $X + X'Y$

$$= X \cdot 1 + X'Y$$

($X \cdot 1 = X$ property of 0 and 1)

$$= X(1 + Y) + X'Y$$

($1 + Y = 1$ property of 0 and 1)

$$= X + XY + X'Y$$

$$= X + Y(X + X')$$

$$= X + Y \cdot 1$$

($X + X' = 1$ complementarity law)

$$= X + Y$$

($Y \cdot 1 = Y$ property of 0 and 1)

$$= \text{R.H.S. Hence proved.}$$

20. What are DeMorgan's theorems? Prove algebraically the DeMorgan's theorem.

Ans. DeMorgan's theorems state that (i) $(X + Y)' = X' \cdot Y'$ (ii) $(X \cdot Y)' = X' + Y'$

(i) $(X + Y)' = X' \cdot Y'$

Now to prove DeMorgan's first theorem, we will use complementarity laws.

Let us assume that $P = X + Y$ where, P, X, Y are logical variables. Then, according to complementation law

$$P + P' = 1 \text{ and } P \cdot P' = 0$$

That means, if P, X, Y are Boolean variables then this complementarity law must hold for variables P. In other words, if P i.e., if $(X + Y)' = X' \cdot Y'$ then

$$(X + Y) + (X' \cdot Y') \text{ must be equal to } 1.$$

$$(\text{as } X + X' = 1)$$

$$(X + Y) \cdot (X' \cdot Y') \text{ must be equal to } 0.$$

$$(\text{as } X \cdot X' = 0)$$

Let us prove the first part, i.e.,

	$(X + Y) + (XY)' = 1$ $(X + Y) + (XY)' = ((X + Y) + X') \cdot ((X + Y) + Y')$ $= (X + X' + Y) \cdot (X + Y + Y')$ $= (1 + Y) \cdot (X + 1)$ $= 1 \cdot 1$ $= 1$ <p>So first part is proved.</p> <p>Now let us prove the second part i.e.,</p> $(X + Y) \cdot (XY)' = 0$ $(X + Y) \cdot (XY)' = (XY)' \cdot (X + Y)$ $= (XY)' \cdot X + (XY)' \cdot Y$ $= X(XY)' + X'YY'$ $= 0 \cdot Y + X' \cdot 0$ $= 0 + 0 = 0$ <p>So, second part is also proved, Thus: $X + Y = X' \cdot Y'$</p> <p>(ii) $(X \cdot Y)' = X' + Y'$</p> <p>Again to prove this theorem, we will make use of complementary law i.e.,</p> $X + X' = 1 \quad \text{and} \quad X \cdot X' = 0$ <p>If XY's complement is $X + Y$ then it must be true that</p> <p>(a) $XY + (X' + Y') = 1$ and (b) $XY(X' + Y') = 0$</p> <p>To prove the first part</p> $\text{L.H.S} = XY + (X' + Y')$ $= (X' + Y') + XY$ $= (X' + Y' + X) \cdot (X' + Y' + Y)$ $= (X + X' + Y') \cdot (X' + Y + Y')$ $= (1 + Y') \cdot (X' + 1)$ $= 1 \cdot 1$ $= 1 = \text{R.H.S}$ <p>Now the second part i.e.,</p> $XY \cdot (X' + Y') = 0$ $\text{L.H.S} = (XY)' \cdot (X' + Y')$ $= XYX' + XYY'$ $= XX'Y + XYY'$ $= 0 \cdot Y + X \cdot 0$ $= 0 + 0 = 0 = \text{R.H.S.}$ <p>$XY \cdot (X' + Y') = 0$ and $XY + (X' + Y') = 1$</p> <p>$(XY)' = X' + Y'$. Hence proved.</p>	$(\text{ref. } X + YZ = (X + Y)(X + Z))$ $(\text{ref. } X + X' = 1)$ $(\text{ref. } 1 + X = 1)$ $(\text{ref. } X(YZ) = (XY)Z)$ $(\text{ref. } X(Y + Z) = XY + XZ)$ $(\text{ref. } X \cdot X' = 0)$
21.	Use the duality theorem to derive another boolean relation from : $A + A'B = A + B$	
Ans.	$A \cdot (A' + B) = A \cdot B$	
22.	What would be the complement of the following: (a) $A'(BC' + B'C)$ (b) $xy + y'z + z'z$?	
Ans.	$(a) A'(BC' + B'C) = (A'(BC' + B'C))'$ $= ((A')'(BC' + B'C))'$ $= ((A')'((BC')' + (B'C)'))'$ $= ((A)((B' C) + (BC'))'$ $= A + (B' + C)(B + C')$	$(b) xy + y'z + z'z = (xy + y'z + z'z)'$ $= (xy)'(y'z)'(z'z)'$ $= (x' + y')(y'' + z')(z'' + z')$ $= (x' + y)(y + z')(z + z')$
23.	Prove (giving reasons) that $[(x + y)' + (x + y)']' = x + y$	
Ans.	$[(x + y)' + (x + y)']' = ((x + y)')' \cdot ((x + y)')'$ $= (x + y) \cdot (x + y)$ $= x + y$	<p>(Using De Morgan's first theorem i.e., $(A + B)' = A' \cdot B'$)</p> $(\because X' = X)$ $(X \cdot X = 1)$
24.	Find the complement of the following Boolean function : $F_1 = AB' + C'D'$	
Ans.	$(AB' + C'D')' = (AB')' \cdot (C'D')'$ $= (A' + B'') \cdot (C'' + D'')$	<p>(De Morgan's first theorem)</p> <p>(DeMorgan's second theorem i.e., $(A \cdot B)' = A' + B'$)</p>

	$= (A' + B').(C + D)$	$((X')' = X)$																																																																																																																																																																																																																																																																																																																											
25.	Prove the following : (i) $A(B + B'C + B'C') = A$ (ii) $A + A'B' = A + B'$ (iii) $(x + y + z).(x' + y + z) = y + z$ (iv) $A'B'C + A'BC + AB'C = A'C + B'C$																																																																																																																																																																																																																																																																																																																												
Ans.	(i) $A(B + B'C + B'C') = A$ <table><tr><th>A</th><th>B</th><th>C</th><th>$B'C$</th><th>$B'C'$</th><th>$B + B'C + B'C'$</th><th>$A(B + B'C + B'C')$</th></tr><tr><td>0</td><td>0</td><td>0</td><td>1</td><td>1</td><td>1</td><td>0</td></tr><tr><td>0</td><td>0</td><td>1</td><td>1</td><td>0</td><td>1</td><td>0</td></tr><tr><td>0</td><td>1</td><td>0</td><td>0</td><td>1</td><td>1</td><td>0</td></tr><tr><td>0</td><td>1</td><td>1</td><td>0</td><td>0</td><td>1</td><td>0</td></tr><tr><td>1</td><td>0</td><td>0</td><td>1</td><td>1</td><td>1</td><td>1</td></tr><tr><td>1</td><td>0</td><td>1</td><td>1</td><td>0</td><td>1</td><td>1</td></tr><tr><td>1</td><td>1</td><td>0</td><td>0</td><td>1</td><td>1</td><td>1</td></tr><tr><td>1</td><td>1</td><td>1</td><td>0</td><td>0</td><td>1</td><td>1</td></tr></table> <p>Both the columns $A(B + B'C + B'C')$ and A are identical, hence proved.</p> (ii) $A + A'B' = A + B'$ <table><tr><th>A</th><th>B</th><th>C</th><th>A'</th><th>B'</th><th>$A'B'$</th><th>$A + A'B'$</th><th>$A + B'$</th></tr><tr><td>0</td><td>0</td><td>0</td><td>1</td><td>1</td><td>1</td><td>1</td><td>1</td></tr><tr><td>0</td><td>0</td><td>1</td><td>1</td><td>1</td><td>1</td><td>1</td><td>1</td></tr><tr><td>0</td><td>1</td><td>0</td><td>1</td><td>0</td><td>0</td><td>0</td><td>0</td></tr><tr><td>0</td><td>1</td><td>1</td><td>1</td><td>0</td><td>0</td><td>0</td><td>0</td></tr><tr><td>1</td><td>0</td><td>0</td><td>0</td><td>1</td><td>0</td><td>1</td><td>1</td></tr><tr><td>1</td><td>0</td><td>1</td><td>0</td><td>1</td><td>0</td><td>1</td><td>1</td></tr><tr><td>1</td><td>1</td><td>0</td><td>0</td><td>0</td><td>0</td><td>1</td><td>1</td></tr><tr><td>1</td><td>1</td><td>1</td><td>0</td><td>0</td><td>0</td><td>1</td><td>1</td></tr></table> <p>Both the columns $A + A'B'$ and $A + B'$ are identical, hence proved.</p> (iii) $(x + y + z).(x' + y + z) = y + z$ <table><tr><th>x</th><th>y</th><th>z</th><th>X'</th><th>$x + y + z$</th><th>$x' + y + z$</th><th>$(x + y + z).(x' + y + z)$</th><th>$y + z$</th></tr><tr><td>0</td><td>0</td><td>0</td><td>1</td><td>0</td><td>1</td><td>0</td><td>0</td></tr><tr><td>0</td><td>0</td><td>1</td><td>1</td><td>1</td><td>1</td><td>1</td><td>1</td></tr><tr><td>0</td><td>1</td><td>0</td><td>1</td><td>1</td><td>1</td><td>1</td><td>1</td></tr><tr><td>0</td><td>1</td><td>1</td><td>1</td><td>1</td><td>1</td><td>1</td><td>1</td></tr><tr><td>1</td><td>0</td><td>0</td><td>0</td><td>1</td><td>0</td><td>0</td><td>0</td></tr><tr><td>1</td><td>0</td><td>1</td><td>0</td><td>1</td><td>1</td><td>1</td><td>1</td></tr><tr><td>1</td><td>1</td><td>0</td><td>0</td><td>1</td><td>1</td><td>1</td><td>1</td></tr><tr><td>1</td><td>1</td><td>1</td><td>0</td><td>1</td><td>1</td><td>1</td><td>1</td></tr></table> <p>Both the columns $(x + y + z).(x' + y + z)$ and $y + z$ are identical, hence proved.</p> (iv) $A'B'C + A'BC + AB'C = A'C + B'C$ <table><tr><th>A</th><th>B</th><th>C</th><th>A'</th><th>B'</th><th>$A'B'C$</th><th>$A'BC$</th><th>$AB'C$</th><th>$A'C$</th><th>$B'C$</th><th>$A'B'C + A'BC + AB'C$</th><th>$A'C + B'C$</th></tr><tr><td>0</td><td>0</td><td>0</td><td>1</td><td>1</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td></tr><tr><td>0</td><td>0</td><td>1</td><td>1</td><td>1</td><td>1</td><td>0</td><td>0</td><td>1</td><td>1</td><td>1</td><td>1</td></tr><tr><td>0</td><td>1</td><td>0</td><td>1</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td></tr><tr><td>0</td><td>1</td><td>1</td><td>1</td><td>0</td><td>0</td><td>1</td><td>0</td><td>1</td><td>0</td><td>1</td><td>1</td></tr><tr><td>1</td><td>0</td><td>0</td><td>0</td><td>1</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td></tr><tr><td>1</td><td>0</td><td>1</td><td>0</td><td>1</td><td>0</td><td>0</td><td>1</td><td>0</td><td>1</td><td>1</td><td>1</td></tr><tr><td>1</td><td>1</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td></tr><tr><td>1</td><td>1</td><td>1</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td></tr></table> <p>Both the columns $A'B'C + A'BC + AB'C$ and $A'C + B'C$ are identical, hence proved.</p>		A	B	C	$B'C$	$B'C'$	$B + B'C + B'C'$	$A(B + B'C + B'C')$	0	0	0	1	1	1	0	0	0	1	1	0	1	0	0	1	0	0	1	1	0	0	1	1	0	0	1	0	1	0	0	1	1	1	1	1	0	1	1	0	1	1	1	1	0	0	1	1	1	1	1	1	0	0	1	1	A	B	C	A'	B'	$A'B'$	$A + A'B'$	$A + B'$	0	0	0	1	1	1	1	1	0	0	1	1	1	1	1	1	0	1	0	1	0	0	0	0	0	1	1	1	0	0	0	0	1	0	0	0	1	0	1	1	1	0	1	0	1	0	1	1	1	1	0	0	0	0	1	1	1	1	1	0	0	0	1	1	x	y	z	X'	$x + y + z$	$x' + y + z$	$(x + y + z).(x' + y + z)$	$y + z$	0	0	0	1	0	1	0	0	0	0	1	1	1	1	1	1	0	1	0	1	1	1	1	1	0	1	1	1	1	1	1	1	1	0	0	0	1	0	0	0	1	0	1	0	1	1	1	1	1	1	0	0	1	1	1	1	1	1	1	0	1	1	1	1	A	B	C	A'	B'	$A'B'C$	$A'BC$	$AB'C$	$A'C$	$B'C$	$A'B'C + A'BC + AB'C$	$A'C + B'C$	0	0	0	1	1	0	0	0	0	0	0	0	0	0	1	1	1	1	0	0	1	1	1	1	0	1	0	1	0	0	0	0	0	0	0	0	0	1	1	1	0	0	1	0	1	0	1	1	1	0	0	0	1	0	0	0	0	0	0	0	1	0	1	0	1	0	0	1	0	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	1	1	1	0	0	0	0	0	0	0	0	0
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26.	What do you mean by canonical form of a Boolean expression? Which of the following are canonical? (i) $ab + bc$ (ii) $abc + a'bc' + ab'c'$ (iii) $(a + b)(a' + b')$ (iv) $(a + b + c)(a + b' + c)(a' + b + c')$ (v) $ab + bc + ca$																																																																																																																																																																																																																																																																																																																												
Ans.	Boolean Expression composed entirely either of Minterms or maxterms is referred to as canonical form of a Boolean expression.																																																																																																																																																																																																																																																																																																																												

	(i)Non canonical	(ii) canonical	(iii) canonical	(iv) canonical	(v) Non canonical																																			
27.	Give an example for each of the following : (i) a boolean expression in the sum of minterm form (ii) a boolean expression in the non canonical form.																																							
Ans.	For a function F(X, Y, Z) (i) Sum of minterms expression is $XYZ + X'Y'Z + X'Y'Z + XYZ'$ (ii) Non canonical form of Sum-of-products $XY + Y'Z + ZX' + X'Y'$																																							
28.	What are the fundamental products for each of the input words ABCD = 0010. ABCD = 1101, ABCD = 1110? The fundamental products for each of the input words ABCD = 0010. ABCD = 1101, ABCD = 1110 are as following :																																							
Ans.	$A'B'CD' + ABC'D + ABCD'$																																							
29.	A truth table has output 1's for each of these inputs : (a)ABCD = 0011 (b) ABCD = 0101 (c) ABCD = 1000, what are the fundamental products?																																							
Ans.	The fundamental products are $A'B'CD + A'BC'D + AB'C'D'$																																							
30.	Construct a boolean function of three variables p, q and r that has an output 1 when exactly two of p, q, r are having values 0, and an output 0 in all other cases.																																							
Ans.	<table><tr><th>p</th><th>q</th><th>r</th><th>F</th></tr><tr><td>0</td><td>0</td><td>0</td><td>0</td></tr><tr><td>0</td><td>0</td><td>1</td><td>1</td></tr><tr><td>0</td><td>1</td><td>0</td><td>1</td></tr><tr><td>0</td><td>1</td><td>1</td><td>0</td></tr><tr><td>1</td><td>0</td><td>0</td><td>1</td></tr><tr><td>1</td><td>0</td><td>1</td><td>0</td></tr><tr><td>1</td><td>1</td><td>0</td><td>0</td></tr><tr><td>1</td><td>1</td><td>1</td><td>0</td></tr></table> $F = p'q'r + p'qr' + pq'r'$				p	q	r	F	0	0	0	0	0	0	1	1	0	1	0	1	0	1	1	0	1	0	0	1	1	0	1	0	1	1	0	0	1	1	1	0
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31.	Write the Boolean expression for a logic network that will have a 1 output when X = 1, Y = 0, Z = 0; X = 1, Y = 0, Z = 1; X = 1, Y = 1, Z = 0; and X = 1, Y = 1, Z = 1.																																							
Ans.	$X = 1, Y = 0, Z = 0 \quad XY'Z'$ $X = 1, Y = 0, Z = 1 \quad XY'Z$ $X = 1, Y = 1, Z = 0 \quad XYZ'$ $X = 1, Y = 1, Z = 1 \quad XYZ$ The Boolean expression is $F = XY'Z' + XY'Z + XYZ' + XYZ$																																							
32.	Derive the Boolean algebra expression for a logic network that will have outputs 0 only output when X = 1, Y=1, Z = 1; X = 0, Y = 0, Z = 0; X = 1, Y = 0, Z = 0. The outputs are to be 1 for all other cases.																																							
Ans.	<table><tr><th>X</th><th>Y</th><th>Z</th><th>F</th></tr><tr><td>0</td><td>0</td><td>0</td><td>0</td></tr><tr><td>0</td><td>0</td><td>1</td><td>1</td></tr><tr><td>0</td><td>1</td><td>0</td><td>1</td></tr><tr><td>0</td><td>1</td><td>1</td><td>1</td></tr><tr><td>1</td><td>0</td><td>0</td><td>0</td></tr><tr><td>1</td><td>0</td><td>1</td><td>1</td></tr><tr><td>1</td><td>1</td><td>0</td><td>1</td></tr><tr><td>1</td><td>1</td><td>1</td><td>0</td></tr></table> $F = (X + Y + Z)(X' + Y + Z)(X' + Y' + Z')$				X	Y	Z	F	0	0	0	0	0	0	1	1	0	1	0	1	0	1	1	1	1	0	0	0	1	0	1	1	1	1	0	1	1	1	1	0
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33.	A Boolean function F defined on three input variables X, Y and Z is 1 if and only if number of 1(one) inputs is odd (e.g., F is 1 if x = 1, Y = 0, Z = 0). Draw the truth table for the above functions and express it in canonical sum-of-products form.																																							
Ans.	The output is 1, only if one of the inputs is odd. All the possible combinations when one of inputs is odd are $X = 1, Y = 0, Z = 0$ $X = 0, Y = 1, Z = 0$																																							

$$X = 0, Y = 0, Z = 1$$

For these combination output is 1, otherwise output is 0. Preparing the truth table for it, we get

X	Y	Z	F	Product Terms/ Minterms
0	0	0	0	$X'Y'Z'$
0	0	1	1	$X'Y'Z$
0	1	0	1	$X'YZ'$
0	1	1	0	$X'YZ$
1	0	0	1	$XY'Z'$
1	0	1	0	$XY'Z$
1	1	0	0	XYZ'
1	1	1	0	XYZ

Adding all the minterms for which output is 1, we get

$$X'Y'Z + X'YZ' + XY'Z' = F$$

This is desired Canonical Sum-of-Products form.

34. Output 1s appear in the truth table for these input conditions: ABCD = 0001, ABCD = 0110, and ABCD = 1110. What is the sum-of-products equation?

Ans. $ABCD = 0001 = A'B'C'D$

$$ABCD = 0110 = A'BCD'$$

$$ABCD = 1110 = ABCD'$$

The sum-of-products equation is as following :

$$F = A'B'C'D + A'BCD' + ABCD'$$

35. Convert the following expression to canonical Sum-of-Product form :

(a) $X + X'Y + X'Z'$ (b) $YZ + X'Y$ (c) $AB' (B' + C')$

Ans. (a) $X + X'Y + X'Y'$

$$= X(Y + Y')(Z + Z') + X'Y(Z + Z') + X'Z'(Y + Y')$$

$$= (XY + XY')(Z + Z') + X'YZ + X'YZ' + X'YZ' + X'Y'Z'$$

$$= Z(XY + XY') + Z'(XY + XY') + X'YZ + X'YZ' + X'YZ' + X'Y'Z'$$

$$= XYZ + XY'Z + XYZ' + XY'Z' + X'YZ + X'YZ' + X'YZ' + X'Y'Z'$$

By removing duplicate terms we get canonical Sum-of-Product form :

$$XYZ + XY'Z + XYZ' + XY'Z' + X'YZ + X'YZ' + X'Y'Z'$$

$$F = \sum(1, 2, 3, 4, 5, 6, 7)$$

$$F = m_1 + m_2 + m_3 + m_4 + m_5 + m_6 + m_7$$

(b) $YZ + X'Y$

$$= YZ(X + X') + X'Y(Z + Z')$$

$$= XYZ + X'YZ + X'YZ + X'YZ'$$

By removing duplicate terms we get canonical Sum-of-Product form :

$$XYZ + X'YZ + X'YZ'$$

$$F = \sum(2, 3, 7)$$

$$F = m_2 + m_3 + m_7$$

(c) $AB'(B' + C')$

Try by yourself.

36. Express in the Product of Sums form, the Boolean function $F(x, y, z)$, and the truth table for which is given below :

X	Y	Z	F
0	0	0	1
0	0	1	0
0	1	0	1
0	1	1	0
1	0	0	1
1	0	1	0
1	1	0	1
1	1	1	1

Add a new column containing Maxterms. Now the table is as follows :

Ans.

		<table><tr><th>X</th><th>Y</th><th>Z</th><th>F</th><th>Maxterms</th></tr><tr><td>0</td><td>0</td><td>0</td><td>1</td><td>$X + Y + Z$</td></tr><tr><td>0</td><td>0</td><td>1</td><td>0</td><td>$X + Y + Z'$</td></tr><tr><td>0</td><td>1</td><td>0</td><td>1</td><td>$X + Y' + Z$</td></tr><tr><td>0</td><td>1</td><td>1</td><td>0</td><td>$X + Y' + Z'$</td></tr><tr><td>1</td><td>0</td><td>0</td><td>1</td><td>$X' + Y + Z$</td></tr><tr><td>1</td><td>0</td><td>1</td><td>0</td><td>$X' + Y + Z'$</td></tr><tr><td>1</td><td>1</td><td>0</td><td>1</td><td>$X' + Y' + Z$</td></tr><tr><td>1</td><td>1</td><td>1</td><td>1</td><td>$X' + Y' + Z'$</td></tr></table> <p>Now by multiplying Maxterms for the output 0s, we get the desired product of sums expression which is $(X + Y + Z')(X + Y' + Z')(X' + Y + Z')$</p>	X	Y	Z	F	Maxterms	0	0	0	1	$X + Y + Z$	0	0	1	0	$X + Y + Z'$	0	1	0	1	$X + Y' + Z$	0	1	1	0	$X + Y' + Z'$	1	0	0	1	$X' + Y + Z$	1	0	1	0	$X' + Y + Z'$	1	1	0	1	$X' + Y' + Z$	1	1	1	1	$X' + Y' + Z'$																																													
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1	1	0	1	$X' + Y' + Z$																																																																																								
1	1	1	1	$X' + Y' + Z'$																																																																																								
37.	<p>Given the truth table of a function F(x, y, z). Write S-O-P and P-O-S expression from the following truth table :</p> <table><tr><th>X</th><th>Y</th><th>Z</th><th>F</th></tr><tr><td>0</td><td>0</td><td>0</td><td>0</td></tr><tr><td>0</td><td>0</td><td>1</td><td>0</td></tr><tr><td>0</td><td>1</td><td>0</td><td>0</td></tr><tr><td>0</td><td>1</td><td>1</td><td>1</td></tr><tr><td>1</td><td>0</td><td>0</td><td>1</td></tr><tr><td>1</td><td>0</td><td>1</td><td>0</td></tr><tr><td>1</td><td>1</td><td>0</td><td>0</td></tr><tr><td>1</td><td>1</td><td>1</td><td>1</td></tr></table> <p>Add a new column containing Minterms and Maxterms. Now the table is as follows :</p> <table><tr><th>X</th><th>Y</th><th>Z</th><th>F</th><th>Minterms</th><th>Maxterms</th></tr><tr><td>0</td><td>0</td><td>0</td><td>0</td><td>$X'Y'Z'$</td><td>$X + Y + Z$</td></tr><tr><td>0</td><td>0</td><td>1</td><td>0</td><td>$X'Y'Z$</td><td>$X + Y + Z'$</td></tr><tr><td>0</td><td>1</td><td>0</td><td>0</td><td>$X'YZ'$</td><td>$X + Y' + Z$</td></tr><tr><td>0</td><td>1</td><td>1</td><td>1</td><td>$X'YZ$</td><td>$X + Y' + Z'$</td></tr><tr><td>1</td><td>0</td><td>0</td><td>1</td><td>$XY'Z'$</td><td>$X' + Y + Z$</td></tr><tr><td>1</td><td>0</td><td>1</td><td>0</td><td>$XY'Z$</td><td>$X' + Y + Z'$</td></tr><tr><td>1</td><td>1</td><td>0</td><td>0</td><td>XYZ'</td><td>$X' + Y' + Z$</td></tr><tr><td>1</td><td>1</td><td>1</td><td>1</td><td>XYZ</td><td>$X' + Y' + Z'$</td></tr></table> <p>Now by adding all the minterms for which output is 1, we get desired sum-of-products expression which is $X'YZ + XY'Z' + XYZ$</p> <p>Now by multiplying Maxterms for the output 0s, we get the desired product of sums expression which is $(X + Y + Z)(X + Y + Z')(X + Y' + Z)(X' + Y + Z')(X' + Y' + Z)$</p>	X	Y	Z	F	0	0	0	0	0	0	1	0	0	1	0	0	0	1	1	1	1	0	0	1	1	0	1	0	1	1	0	0	1	1	1	1	X	Y	Z	F	Minterms	Maxterms	0	0	0	0	$X'Y'Z'$	$X + Y + Z$	0	0	1	0	$X'Y'Z$	$X + Y + Z'$	0	1	0	0	$X'YZ'$	$X + Y' + Z$	0	1	1	1	$X'YZ$	$X + Y' + Z'$	1	0	0	1	$XY'Z'$	$X' + Y + Z$	1	0	1	0	$XY'Z$	$X' + Y + Z'$	1	1	0	0	XYZ'	$X' + Y' + Z$	1	1	1	1	XYZ	$X' + Y' + Z'$	
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1	1	1	1	XYZ	$X' + Y' + Z'$																																																																																							
38.	<p>Convert the following expressions to canonical Product-of-Sum form</p> <p>(a) $(A + C)(C + D)$ (b) $A(B + C)(C' + D')$ (c) $(X + Y)(Y + Z)(X + Z)$</p>																																																																																											
Ans.	<p>(a) $(A + C)(C + D)$ $= (A + BB' + C + DD')(AA' + BB' + C + D)$ $= (A + B + C + D)(A + B' + C + D')(A + B + C + D)(A' + B' + C + D)$ By removing duplicate terms we get canonical Product-of-Sum form: $(A + B + C + D)(A + B' + C + D')(A' + B' + C + D)$ $F = \pi(0, 5, 12)$ $F = M_0 + M_5 + M_{12}$</p> <p>(b) $A(B + C)(C' + D')$ Try by yourself.</p> <p>(c) $(X + Y)(Y + Z)(X + Z)$ $= (X + Y + ZZ')(XX' + Y + Z)(X + YY' + Z)$ $= (X + Y + Z)(X + Y + Z')(X + Y + Z)(X' + Y + Z)(X + Y + Z)(X + Y' + Z)$ By removing duplicate terms we get canonical Product-of-Sum form: $(X + Y + Z)(X + Y + Z')(X' + Y + Z)(X + Y' + Z)$ $F = \pi(0, 1, 2, 4)$ $F = M_0 + M_1 + M_2 + M_4$</p>																																																																																											

39.	Simplify the following Boolean expression : (i) $AB + AB' + A'C + A'C'$ (ii) $XY + XYZ' + XYZ + XZY$ (iii) $XY(X'YZ' + XY'Z' + XY'Z')$																																																																				
Ans.	(i) $AB + AB' + A'C + A'C'$ = $A(B + B') + A'(C + C')$ $(B + B' = 1, C + C' = 1)$ = $A + A'$ $(A + A' = 1)$ = 1 (ii) $XY + XYZ' + XYZ + XZY$ = $XY(Z') + XY(Z' + Z)$ $(Z + Z' = 1)$ = $XY(Z') + XY$ = $XY(Z' + 1)$ $(Z' + 1 = 1)$ = XY (iii) $XY(X'YZ' + XY'Z' + XY'Z')$ = $XY[Z'(X'Y + XY' + XY')]$ = $XY[Z'(X'Y + XY'(1 + 1))]$ = $XY[Z'(X'Y + XY')]$ = $XYZ'(X'Y + XY')$																																																																				
40.	Develop sum of products and product of sums expressions for F_1 and F_2 from the following truth table : <table><tr><th colspan="3">Inputs</th><th colspan="2">Outputs</th></tr><tr><th>X</th><th>Y</th><th>Z</th><th>F_1</th><th>F_2</th></tr><tr><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td></tr><tr><td>0</td><td>0</td><td>1</td><td>0</td><td>1</td></tr><tr><td>0</td><td>1</td><td>0</td><td>1</td><td>1</td></tr><tr><td>0</td><td>1</td><td>1</td><td>1</td><td>0</td></tr><tr><td>1</td><td>0</td><td>0</td><td>1</td><td>0</td></tr><tr><td>1</td><td>0</td><td>1</td><td>0</td><td>0</td></tr><tr><td>1</td><td>1</td><td>0</td><td>0</td><td>1</td></tr><tr><td>1</td><td>1</td><td>1</td><td>1</td><td>1</td></tr></table>	Inputs			Outputs		X	Y	Z	F_1	F_2	0	0	0	0	0	0	0	1	0	1	0	1	0	1	1	0	1	1	1	0	1	0	0	1	0	1	0	1	0	0	1	1	0	0	1	1	1	1	1	1																		
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Ans.	Add a new column containing Minterms. Now the table is as follows : <table><tr><th colspan="3">Inputs</th><th colspan="2">Outputs</th><th rowspan="2">Minterms</th><th rowspan="2">Maxterms</th></tr><tr><th>X</th><th>Y</th><th>Z</th><th>F_1</th><th>F_2</th></tr><tr><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>$X'Y'Z'$</td><td>$X + Y + Z$</td></tr><tr><td>0</td><td>0</td><td>1</td><td>0</td><td>1</td><td>$X'Y'Z$</td><td>$X + Y + Z'$</td></tr><tr><td>0</td><td>1</td><td>0</td><td>1</td><td>1</td><td>$X'YZ'$</td><td>$X + Y' + Z$</td></tr><tr><td>0</td><td>1</td><td>1</td><td>1</td><td>0</td><td>$X'YZ$</td><td>$X + Y' + Z'$</td></tr><tr><td>1</td><td>0</td><td>0</td><td>1</td><td>0</td><td>$XY'Z'$</td><td>$X' + Y + Z$</td></tr><tr><td>1</td><td>0</td><td>1</td><td>0</td><td>0</td><td>$XY'Z$</td><td>$X' + Y + Z'$</td></tr><tr><td>1</td><td>1</td><td>0</td><td>0</td><td>1</td><td>XYZ'</td><td>$X' + Y' + Z$</td></tr><tr><td>1</td><td>1</td><td>1</td><td>1</td><td>1</td><td>XYZ</td><td>$X' + Y' + Z'$</td></tr></table> <p>Now by adding all the minterms for which output is 1 in F_1, we get desired sum-of-products expression which is $X'YZ' + X'YZ + XY'Z' + XYZ$</p> <p>Now by adding all the minterms for which output is 1 in F_2, we get desired sum-of-products expression which is $X'Y'Z + X'YZ' + XYZ' + XYZ$</p> <p>Now by multiplying Maxterms for the output 0s in F_1, we get the desired product of sums expression which is (X + Y + Z)(X + Y + Z')(X' + Y + Z')(X' + Y' + Z) (X</p> <p>Now by multiplying Maxterms for the output 0s in F_2, we get the desired product of sums expression which is (X + Y + Z)(X + Y' + Z')(X' + Y + Z)(X' + Y + Z') (X</p>	Inputs			Outputs		Minterms	Maxterms	X	Y	Z	F_1	F_2	0	0	0	0	0	$X'Y'Z'$	$X + Y + Z$	0	0	1	0	1	$X'Y'Z$	$X + Y + Z'$	0	1	0	1	1	$X'YZ'$	$X + Y' + Z$	0	1	1	1	0	$X'YZ$	$X + Y' + Z'$	1	0	0	1	0	$XY'Z'$	$X' + Y + Z$	1	0	1	0	0	$XY'Z$	$X' + Y + Z'$	1	1	0	0	1	XYZ'	$X' + Y' + Z$	1	1	1	1	1	XYZ	$X' + Y' + Z'$
Inputs			Outputs		Minterms	Maxterms																																																															
X	Y	Z	F_1	F_2																																																																	
0	0	0	0	0	$X'Y'Z'$	$X + Y + Z$																																																															
0	0	1	0	1	$X'Y'Z$	$X + Y + Z'$																																																															
0	1	0	1	1	$X'YZ'$	$X + Y' + Z$																																																															
0	1	1	1	0	$X'YZ$	$X + Y' + Z'$																																																															
1	0	0	1	0	$XY'Z'$	$X' + Y + Z$																																																															
1	0	1	0	0	$XY'Z$	$X' + Y + Z'$																																																															
1	1	0	0	1	XYZ'	$X' + Y' + Z$																																																															
1	1	1	1	1	XYZ	$X' + Y' + Z'$																																																															
41.	Obtain a simplified expression for a Boolean function $F(X, Y, Z)$, the Karnaugh map for which is given below : <table><tr><td></td><td>YZ</td><td>00</td><td>01</td><td>11</td><td>10</td></tr><tr><td>X</td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>0</td><td></td><td></td><td>1</td><td>1</td><td></td></tr><tr><td>1</td><td></td><td></td><td>1</td><td>1</td><td></td></tr></table>		YZ	00	01	11	10	X						0			1	1		1			1	1																																													
	YZ	00	01	11	10																																																																
X																																																																					
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Ans.	<div><div><div>YZ</div><div>X</div><table><tr><th></th><th>[00]Y'Z'</th><th>[01]Y'Z</th><th>[11]YZ</th><th>[10]YZ'</th></tr><tr><th>[0]X'</th><td>0₀</td><td>1₁</td><td>1₃</td><td>0₂</td></tr><tr><th>[1]X</th><td>0₄</td><td>1₅</td><td>1₇</td><td>0₆</td></tr></table></div><div>Completing the given K-map We have 1 group which is Quad i.e., $m_1 + m_3 + m_5 + m_7$ $= X'Y'Z + X'YZ + XY'Z + XYZ$ $= X'Z(Y' + Y) + XZ(Y' + Y)$ $= X'Z + XZ$ $= Z(X' + X)$ $= Z$ Simplified Boolean expression for given K-map is $F(X, Y, Z) = Z$.</div></div>		[00]Y'Z'	[01]Y'Z	[11]YZ	[10]YZ'	[0]X'	0 ₀	1 ₁	1 ₃	0 ₂	[1]X	0 ₄	1 ₅	1 ₇	0 ₆															
	[00]Y'Z'	[01]Y'Z	[11]YZ	[10]YZ'																											
[0]X'	0 ₀	1 ₁	1 ₃	0 ₂																											
[1]X	0 ₄	1 ₅	1 ₇	0 ₆																											
42.	<div>Using the Karnaugh technique obtain the simplified expression as sum of products for the following map.</div> <div><div><div>YZ</div><div>X</div><table><tr><th></th><th>00</th><th>01</th><th>11</th><th>10</th></tr><tr><th>0</th><td></td><td></td><td>1</td><td>1</td></tr><tr><th>1</th><td></td><td></td><td>1</td><td>1</td></tr></table></div><div><div><div>YZ</div><div>X</div><table><tr><th></th><th>[00]Y'Z'</th><th>[01]Y'Z</th><th>[11]YZ</th><th>[10]YZ'</th></tr><tr><th>[0]X'</th><td>0₀</td><td>0₁</td><td>1₃</td><td>1₂</td></tr><tr><th>[1]X</th><td>0₄</td><td>0₅</td><td>1₇</td><td>1₆</td></tr></table></div><div>Completing the given K-map We have 1 group which is Quad i.e., $m_2 + m_3 + m_6 + m_7$ $= X'YZ + X'YZ' + XYZ + XYZ'$ $= X'Y(Z + Z') + XY(Z + Z')$ $= X'Y + XY$ $= Y(X' + X)$ $= Y$ Simplified Boolean expression as sum of products for given K-map is $F(X, Y, Z) = Y$.</div></div></div>		00	01	11	10	0			1	1	1			1	1		[00]Y'Z'	[01]Y'Z	[11]YZ	[10]YZ'	[0]X'	0 ₀	0 ₁	1 ₃	1 ₂	[1]X	0 ₄	0 ₅	1 ₇	1 ₆
	00	01	11	10																											
0			1	1																											
1			1	1																											
	[00]Y'Z'	[01]Y'Z	[11]YZ	[10]YZ'																											
[0]X'	0 ₀	0 ₁	1 ₃	1 ₂																											
[1]X	0 ₄	0 ₅	1 ₇	1 ₆																											
43.	<div>Obtain the simplified expression in the sum of products form, for the Boolean function $F(X, Y, Z)$, Karnaugh map for which is given below :</div> <div><div><div>YZ</div><div>X</div><table><tr><th></th><th>00</th><th>01</th><th>11</th><th>10</th></tr><tr><th>0</th><td></td><td></td><td></td><td>1</td></tr><tr><th>1</th><td>1</td><td></td><td></td><td>1</td></tr></table></div><div><div><div>YZ</div><div>X</div><table><tr><th></th><th>[00]Y'Z'</th><th>[01]Y'Z</th><th>[11]YZ</th><th>[10]YZ'</th></tr><tr><th>[0]X'</th><td>0₀</td><td>0₁</td><td>0₃</td><td>1₂</td></tr><tr><th>[1]X</th><td>1₄</td><td>0₅</td><td>0₇</td><td>1₆</td></tr></table></div><div>Completing the given K-map We have 2 Pairs i.e., Pair-1 is $m_3 + m_6$ and Pair-2 is $m_4 + m_6$ $= X'YZ' + XYZ' + XY'Z' + XYZ'$ $= YZ'(X' + X) + XZ'(Y' + Y)$ $= YZ' + XZ'$ Simplified Boolean expression as sum of products for given K-map is $F(X, Y, Z) = YZ' + XZ'$.</div></div></div>		00	01	11	10	0				1	1	1			1		[00]Y'Z'	[01]Y'Z	[11]YZ	[10]YZ'	[0]X'	0 ₀	0 ₁	0 ₃	1 ₂	[1]X	1 ₄	0 ₅	0 ₇	1 ₆
	00	01	11	10																											
0				1																											
1	1			1																											
	[00]Y'Z'	[01]Y'Z	[11]YZ	[10]YZ'																											
[0]X'	0 ₀	0 ₁	0 ₃	1 ₂																											
[1]X	1 ₄	0 ₅	0 ₇	1 ₆																											
44.	<div>Minimize the following function using a Karnaugh map : $F(W, X, Y, Z) = \sum(0, 4, 8, 12)$.</div> <div><div><div>WX</div><div>YZ</div><table><tr><th></th><th>[00]Y'Z'</th><th>[01]Y'Z</th><th>[11]YZ</th><th>[10]YZ'</th></tr><tr><th>[00]W'X'</th><td>1₀</td><td>0₁</td><td>0₃</td><td>0₂</td></tr><tr><th>[01]W'X</th><td>1₄</td><td>0₅</td><td>0₇</td><td>0₆</td></tr><tr><th>[11]WX</th><td>1₁₂</td><td>0₁₃</td><td>0₁₅</td><td>0₁₄</td></tr><tr><th>[10]WX'</th><td>1₈</td><td>0₉</td><td>0₁₁</td><td>0₁₀</td></tr></table></div><div>Mapping the given function in a K-map, we get 1 Quad i.e., $m_0 + m_4 + m_8 + m_{12}$ $= W'X'Y'Z' + W'XY'Z' + WXY'Z' + WX'Y'Z'$ $= W'Y'Z'(X' + X) + WY'Z'(X + X')$ $= W'Y'Z' + WY'Z'$ $= Y'Z'(W' + W)$ $= Y'Z'$ Simplified Boolean expression for given K-map is , $F(W, X, Y, Z) = Y'Z'$</div></div>		[00]Y'Z'	[01]Y'Z	[11]YZ	[10]YZ'	[00]W'X'	1 ₀	0 ₁	0 ₃	0 ₂	[01]W'X	1 ₄	0 ₅	0 ₇	0 ₆	[11]WX	1 ₁₂	0 ₁₃	0 ₁₅	0 ₁₄	[10]WX'	1 ₈	0 ₉	0 ₁₁	0 ₁₀					
	[00]Y'Z'	[01]Y'Z	[11]YZ	[10]YZ'																											
[00]W'X'	1 ₀	0 ₁	0 ₃	0 ₂																											
[01]W'X	1 ₄	0 ₅	0 ₇	0 ₆																											
[11]WX	1 ₁₂	0 ₁₃	0 ₁₅	0 ₁₄																											
[10]WX'	1 ₈	0 ₉	0 ₁₁	0 ₁₀																											
45.	<div>Draw and simplify the Karnaugh Maps of X, Y, Z for :</div> <div>(a) $m_0 + m_1 + m_5 + m_7$ (b) $F = \sum(1, 3, 5, 4, 7)$ (c) $m_0 + m_2 + m_4 + m_6$</div> <div>Ans. (a) $m_0 + m_1 + m_5 + m_7$</div>																														

		YZ			
X		[00]Y'Z'	[01]Y'Z	[11]YZ	[10]YZ'
	[0]X'	1	1	0	0
	[1]X	0	1	1	0

Mapping the given function in a K-map, we get 2 Pairs i.e.,

Pair-1 is $m_0 + m_1$ and Pair-2 is $m_5 + m_7$

$$= X'Y'Z' + X'Y'Z + XY'Z + XYZ$$

$$= X'Y'(Z' + Z) + XZ(Y' + Y)$$

$$= X'Y' + XZ$$

Simplified Boolean expression for given K-map is $F(X, Y, Z) = X'Y' + XZ$.

(b) $F = \Sigma(1, 3, 5, 4, 7)$

		YZ			
X		[00]Y'Z'	[01]Y'Z	[11]YZ	[10]YZ'
	[0]X'	0	1	1	0
	[1]X	1	1	1	0

Mapping the given function in a K-map, we get 1 Pair and 1 Quad i.e.,

Pair is $m_4 + m_5$ and Quad is $m_1 + m_3 + m_5 + m_7$

$$= X'Y'Z + X'YZ + XY'Z + XYZ + XY'Z' + XY'Z$$

$$= X'Z(Y' + Y) + XZ(Y' + Y) + XY'(Z' + Z)$$

$$= X'Z + XZ + XY'$$

$$= Z(X' + X) + XY'$$

$$= Z + XY'$$

Simplified Boolean expression as for given K-map is $F(X, Y, Z) = Z + XY'$.

(c) $m_0 + m_2 + m_4 + m_6$

		YZ			
X		[00]Y'Z'	[01]Y'Z	[11]YZ	[10]YZ'
	[0]X'	1	0	0	1
	[1]X	1	0	0	1

Mapping the given function in a K-map, we get 2 Pairs i.e.,

Pair-1 is $m_0 + m_4$ and Pair-2 is $m_2 + m_6$

$$= X'Y'Z' + XY'Z' + X'YZ' + XYZ'$$

$$= Y'Z'(X' + X) + YZ'(X' + X)$$

$$= Y'Z' + YZ'$$

$$= Z'(Y' + Y)$$

$$= Z'$$

Simplified Boolean expression for given K-map is $F(X, Y, Z) = Z'$.

46. Using K-map, derive minimal product of sums expression for the $F(X, Y, Z)$ whose truth table is given below :

X	Y	Z	F
0	0	0	0
0	0	1	1
0	1	0	0
0	1	1	1
1	0	0	0
1	0	1	1
1	1	0	0
1	1	1	1

Ans.

		YZ			
X		[00]Y+Z	[01]Y+Z'	[11]Y'+Z	[10]Y'+Z'
	[0]X	0	1	1	0
	[1]X'	0	1	1	0

Completing the K-map by putting 0's where F produces 0, we get 2 Pairs i.e.,

Pair-1 is $M_0 \cdot M_4$ and Pair-2 is $M_2 \cdot M_6$

Reduced expression are as follows :

For Pair-1, $(Y + Z)$ (as X is eliminated : X changes to X')

For Pair-2, $(Y' + Z)$ (X changes to X; hence eliminated)

Hence final P-O-S expression will be

$$F(X, Y, Z) = (Y + Z)(Y' + Z)$$

47. Using map, simplify the following expression, using sum-of-products form :

(a) $A'B'C' + AB'C' + ABC + A'B'C$

(b) $ABCD + A'B'C'D + A'BCD + A'B'CD + ABCD'$

Ans. (a) $A'B'C' + AB'C' + ABC + A'B'C$

		BC			
A		[00]B'C'	[01]B'C	[11]BC	[10]BC'
	[0]A'	1	1	0	0
	[1]A	1	0	1	0

Mapping the given function in a K-map, we get 2 Pairs i.e.,

Pair-1 is $m_0 + m_1$ and Pair-2 is $m_0 + m_4$

$$= A'B'C' + A'B'C + A'B'C' + AB'C' + ABC$$

$$= A'B'(C' + C) + B'C'(A' + A) + ABC$$

$$= A'B' + B'C' + ABC$$

Simplified Boolean expression as sum of products for given K-map is

$$F(A, B, C) = A'B' + B'C' + ABC.$$

(b) $ABCD + A'B'C'D + A'BCD + A'B'CD + ABCD'$

AB \ CD				
	[00]C'D'	[01]C'D	[11]CD	[10]CD'
[00]A'B'	1 ₀	1 ₁	1 ₃	0 ₂
[01]A'B	0 ₄	0 ₅	1 ₇	0 ₆
[11]AB	0 ₁₂	0 ₁₃	0 ₁₅	1 ₁₄
[10]AB'	0 ₈	0 ₉	0 ₁₁	0 ₁₀

Mapping the given function in a K-map, we get 2 Pairs i.e.,

Pair-1 is $m_0 + m_1$ and Pair-2 is $m_0 + m_4$

You notice that there is a single 1 in a m_{14} because it has no adjacent 1 so it is not possible to make a pair.

$$= A'B'C'D' + A'B'C'D + A'B'CD + A'BCD + ABCD'$$

$$= A'B'C'(D' + D) + A'CD(B' + B) + ABCD'$$

$$= A'B'C' + A'CD + ABCD'$$

Simplified Boolean expression as sum of products for given K-map is $F(A, B, C, D) = A'B'C' + A'CD + ABCD'$.

48. A truth table has output is for these inputs ;

$ABCD = 0011$, $ABCD = 0110$, $ABCD = 1001$, and $ABCD = 1110$. Draw the Karnaugh map showing the fundamental products.

Ans.

AB \ CD				
	[00]C'D'	[01]C'D	[11]CD	[10]CD'
[00]A'B'	0 ₀	0 ₁	1 ₃	0 ₂
[01]A'B	0 ₄	0 ₅	0 ₇	1 ₆
[11]AB	0 ₁₂	0 ₁₃	0 ₁₅	1 ₁₄
[10]AB'	0 ₈	1 ₉	0 ₁₁	0 ₁₀

$$ABCD = 0011 = A'B'CD = m_3 \text{ and } ABCD = 0110 = A'BCD' = m_6$$

$$ABCD = 1001 = AB'C'D = m_9 \text{ and } ABCD = 1110 = ABCD' = m_{14}$$

Mapping the given outputs in a K-map, we get 1 Pairs i.e.,

$$m_3 + m_{14}$$

You notice that there are a single 1 in a m_3 and m_9 because it have no adjacent 1 so it is not possible to make a pair.

$$= A'B'CD + A'BCD' + ABCD' + AB'C'D$$

$$= A'B'CD + BCD'(A' + A) + AB'C'D'$$

$$= A'B'CD + BCD' + AB'C'D$$

Simplified Boolean expression as sum of products for given K-map is $F(A, B, C, D) = A'B'CD + BCD' + AB'C'D$.

49. A truth table has four input variables. The first eight outputs are 0s, and the last eight outputs are 1s. Draw the Karnaugh map.

Ans.

AB \ CD				
	[00]C'D'	[01]C'D	[11]CD	[10]CD'
[00]A'B'	0 ₀	0 ₁	0 ₃	0 ₂
[01]A'B	0 ₄	0 ₅	0 ₇	0 ₆
[11]AB	1 ₁₂	1 ₁₃	1 ₁₅	1 ₁₄
[10]AB'	1 ₈	1 ₉	1 ₁₁	1 ₁₀

Last eight outputs are 1s i.e.,

$$m_8 + m_9 + m_{10} + m_{11} + m_{12} + m_{13} + m_{14} + m_{15}$$

$$= ABC'D' + ABC'D + ABCD + ABCD' + AB'C'D' + AB'C'D + AB'CD + AB'CD'$$

$$= ABC'(D' + D) + ABC(D + D') + AB'C'(D' + D) + AB'C(D + D')$$

$$= ABC' + ABC + AB'C' + AB'C$$

Simplified Boolean expression for given K-map is

$$F(A, B, C, D) = ABC' + ABC + AB'C' + AB'C$$

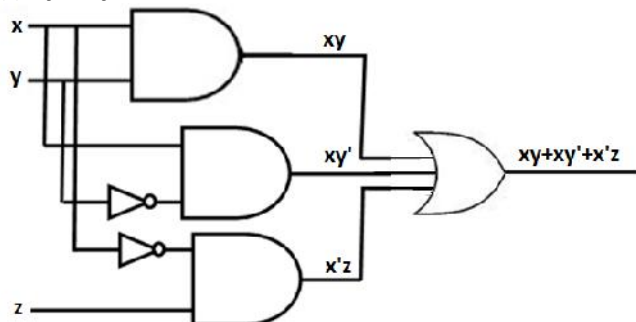
50. Draw logic circuit diagrams for the following :

(i) $xy + xy' + x'z$ (ii) $(A + B)(B + C)(C' + A')$

(iii) $A'B + BC$

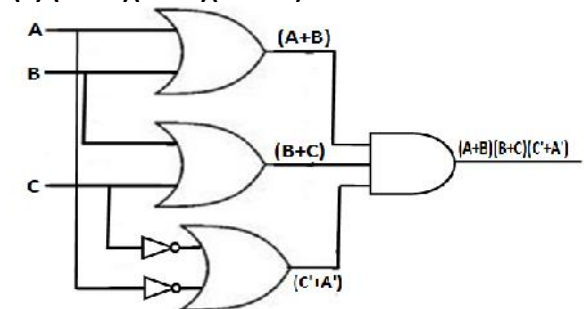
(iv) $xyz + x'yz'$

Ans.

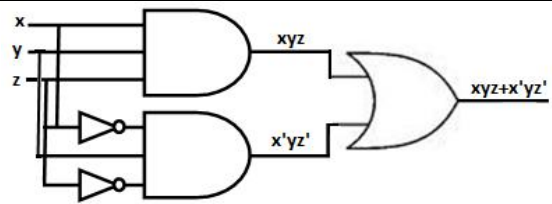
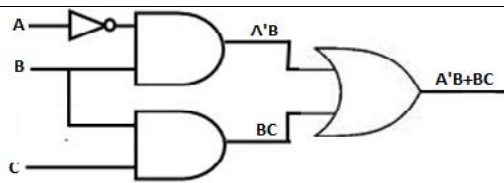


(iii) $A'B + BC$

(ii) $(A + B)(B + C)(C' + A')$



(iv) $xyz + x'yz'$



51. Design a circuit (3 input) which gives a high input, when there is even number of low inputs.

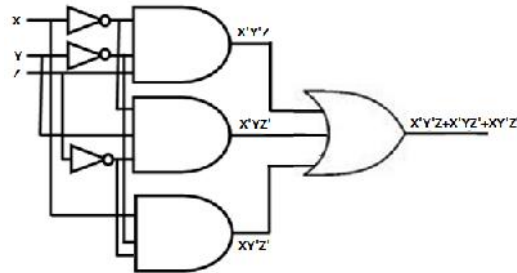
Ans. Following truth table gives a high input, when there is even number of low inputs :

X	Y	Z	F
0	0	0	0
0	0	1	1
0	1	0	1
0	1	1	0
1	0	0	1
1	0	1	0
1	1	0	0
1	1	1	0

From truth table we get following function :

$$F = X'Y'Z + X'YZ' + XY'Z'$$

Logic circuit for the function F is as following :



52. Design a circuit (3 input) which gives a high input only when there is even number of low or high inputs.

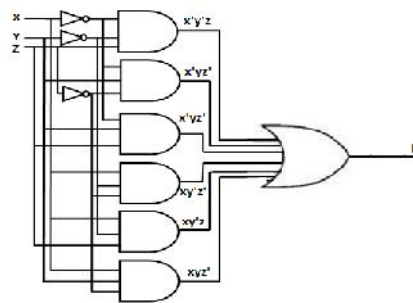
Ans. Following truth table gives a high input, only when there is even number of low or high inputs:

X	Y	Z	F
0	0	0	0
0	0	1	1
0	1	0	1
0	1	1	0
1	0	0	1
1	0	1	0
1	1	0	0
1	1	1	0

From truth table we get following function :

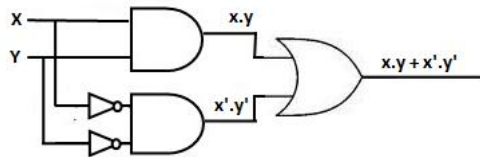
$$F = X'Y'Z + X'YZ' + X'YZ + XY'Z' + XY'Z + XYZ'$$

Logic circuit for the function F is as following :



53. Design a logic circuit to realize the Boolean function $f(x, y) = x \cdot y + x' \cdot y'$

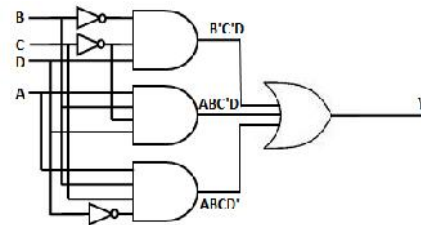
Ans. The circuit diagram for above expression will be as follows:



54. Draw the logic circuit for this Boolean equation : $y = A'B'C'D + AB'C'D + ABC'D + ABCD'$

$$\begin{aligned} &= A'B'C'D + AB'C'D + ABC'D + ABCD' \\ &= B'C'D(A'+A) + ABC'D + ABCD' \\ &= B'C'D + ABC'D + ABCD' \end{aligned}$$

The logic circuit for above Boolean equation will be as follows:



55. Draw logic circuit for the following using k-maps :

(i) $F(A, B, C, D) = \sum(1, 3, 5, 9, 10)$

(ii) $F(A, B, C) = \pi(0, 2, 4, 5)$

(iii) $F(A, B, C) = \sum(1, 2, 4, 6, 7)$

(iv) $F(A, B, C) = \pi(1, 3, 5, 7)$

Ans. (i) $F(A, B, C, D) = \sum(1, 3, 5, 9, 10)$

AB \ CO	[00]C'O	[01]C'O	[11]CO	[10]CO'
[00]A'B'	0	1	1	0
[01]A'B	0	1	0	0
[11]AB	0	0	0	0
[10]AB'	0	1	0	1

There are three pairs that reduces as given below:

Pair-1($m_1 + m_3$) reduces to $A'B'O$

Pair-2($m_1 + m_5$) reduces to $A'C'O$

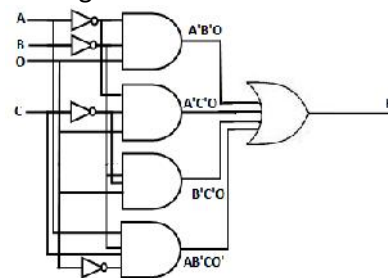
Pair-3($m_1 + m_9$) reduces to $B'C'O$

And single 1 in m_{10} is $AB'CO'$

Simplified Boolean expression for given K-map is

$$F(A,B,C,O) = A'B'O + A'C'O + B'C'O + AB'CO'$$

The logic circuit will be as follows:



(ii) $F(A, B, C) = \pi(0, 2, 4, 5)$

A \ BC	[00]B+C	[01]B+C'	[11]B'+C	[10]B+C
[0]A	0	1	1	0
[1]A'	0	0	1	1

There are two pairs that reduces as given below:

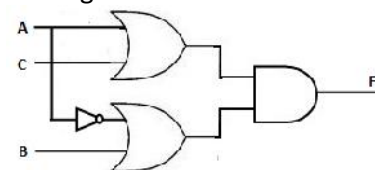
Pair-1($M_0.M_2$) reduces to $(A + C)$

Pair-2($M_4.M_5$) reduces to $(A' + B)$

Simplified Boolean expression for given K-map is

$$F(A,B,C) = (A + C) \cdot (A' + B)$$

The logic circuit will be as follows:



(iii) $F(A, B, C) = \Sigma(1, 2, 4, 6, 7)$

A \ BC	[00]B'C'	[01]B'C	[11]BC	[10]BC'
[0]A'	0	1	0	1
[1]A	1	0	1	1

There are three pairs that reduces as given below:

Pair-1($m_2 + m_6$) reduces to BC'

Pair-2($m_6 + m_7$) reduces to AB

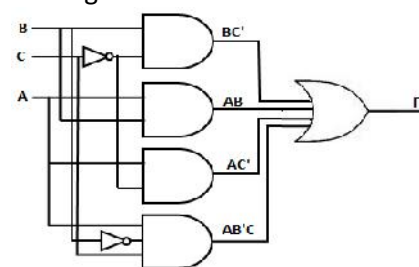
Pair-2($m_4 + m_6$) reduces to AC'

And single 1's in m_1 is $AB'C$

Simplified Boolean expression for given K-map is

$$F(A,B,C) = BC' + AB + AC' + AB'C$$

The logic circuit will be as follows:



(iv) $F(A, B, C) = \pi(1, 3, 5, 7)$

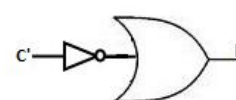
A \ BC	[00]B+C	[01]B+C'	[11]B'+C	[10]B+C
[0]A	1	0	0	1
[1]A'	1	0	0	1

There is Quad that reduces as given below:

Pair-1($M_1.M_3.M_5.M_7$) reduces to C'

Simplified Boolean expression for given K-map is C' .

The logic circuit will be as follows:



56. Draw the AND-OR circuit for : $y = AB'C'D' + ABC'D' + ABCD$

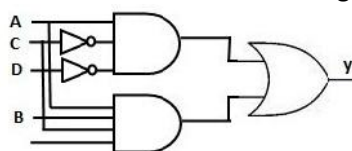
Ans. Reduced expression for given expression is as follows :

$$= AB'C'D' + ABC'D' + ABCD$$

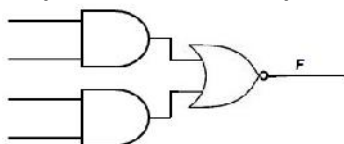
$$= AC'D'(B' + B) + ABCD$$

$$= AC'D' + ABCD$$

AND-OR circuit is as following :



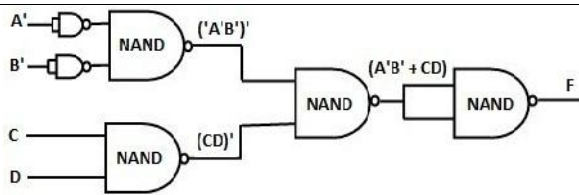
57. Derive a Boolean expression for the output F at the network shown below :



Ans. Boolean expression for the output F is $(A'B' + CD)'$

58. Convert the above circuit into NAND-to-NAND logic circuit.

Ans. The given Boolean expression can be written as $= (\text{NOT}((\text{NOT } A) \text{ NAND } (\text{NOT } B)) \text{ NAND } (C \text{ NAND } D))$



59. Why are NAND and NOR gates more popular?

Ans. NAND and NOR gates are more popular as these are less expensive and easier to design. Also other functions (NOT, AND, OR) can easily be implemented using NAND/NOR gates. Thus NAND, NOR gates are also referred to as Universal Gates.

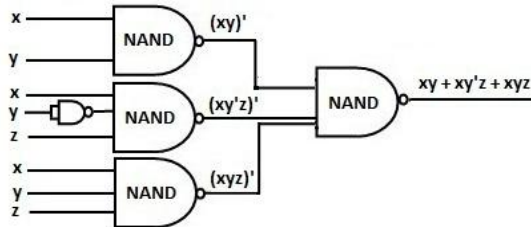
60. Draw the logical circuits for the following using NAND gates only :

(i) $xy + xy'z + xyz$

(ii) $ABC + AB'C' + ABC$

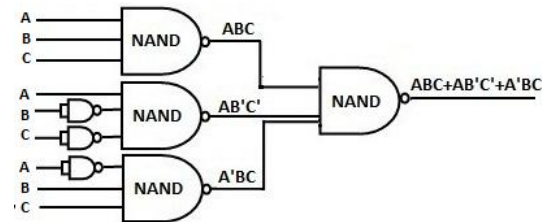
Ans. (i) $xy + xy'z + xyz$

The given Boolean expression can be written as
 $= (x \text{ NAND } y) \text{ NAND } (x \text{ NAND } (\text{NOT } y) \text{ NAND } z)$
 $\text{NAND } (x \text{ NAND } y \text{ NAND } z)$



(ii) $ABC + AB'C' + ABC$

The given Boolean expression can be written as
 $= (A \text{ NAND } B \text{ NAND } C) \text{ NAND } (A \text{ NAND } (\text{NOT } B) \text{ NAND } (\text{NOT } C)) \text{ NAND } (A \text{ NAND } B \text{ NAND } C)$



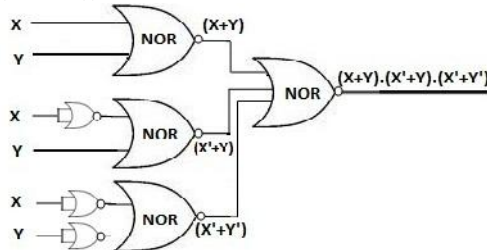
61. Draw the logical circuits for the following using NOR gates only :

(i) $(X + Y) \cdot (X' + Y) \cdot (X' + Y')$

(ii) $(X + Y + Z) \cdot (X + Y' + Z')$

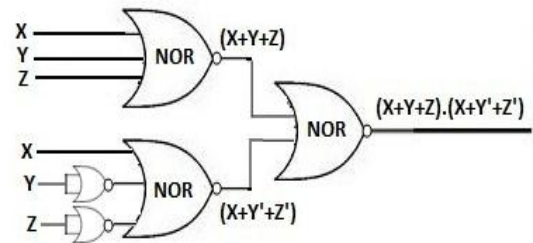
Ans. (i) $(X + Y) \cdot (X' + Y) \cdot (X' + Y')$

The given Boolean expression can be written as
 $= (X \text{ NOR } Y) \text{ NOR } ((\text{NOT } X) \text{ NOR } Y) \text{ NOR } ((\text{NOT } X) \text{ NOR } (\text{NOT } Y))$



(ii) $(X + Y + Z) \cdot (X + Y' + Z')$

The given Boolean expression can be written as
 $= (X \text{ NOR } Y \text{ NOR } Z) \text{ NOR } (X \text{ NOR } (\text{NOT } Y) \text{ NOR } (\text{NOT } Z))$



62. Draw the logical circuit for the following function using NAND gates only $F(a, b, c) = \sum(0, 3, 4, 7)$

Ans.

	bc	[00]b'c'	[01]b'c	[11]bc	[10]bc'
a					
[0]a'	1	0	1	0	2
[1]a	1	0	1	0	6

There are two pairs that reduces as given below:

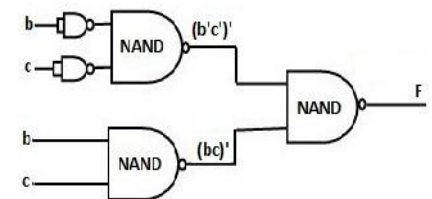
Pair-1($m_0 + m_4$) reduces to $b'c'$

Pair-2($m_3 + m_7$) reduces to bc

Simplified Boolean expression for given K-map is

$$F(A,B,C) = b'c' + bc$$

The logic circuit will be as follows:



63. Draw the simplified logic diagram using only NAND gates to implement the three input function F denoted by the expression : $F = \sum(0, 1, 2, 5)$.

Ans.

	bc	[00]b'c'	[01]b'c	[11]bc	[10]bc'
a					
[0]a'	1	1	0	1	2
[1]a	0	1	0	0	6

There are two pairs that reduces as given below:

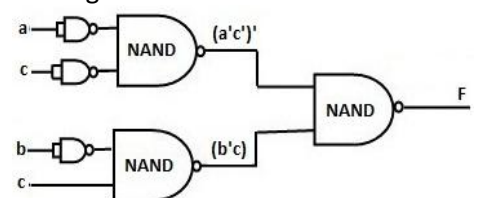
Pair-1($m_0 + m_2$) reduces to $a'c'$

Pair-2($m_1 + m_5$) reduces to $b'c$

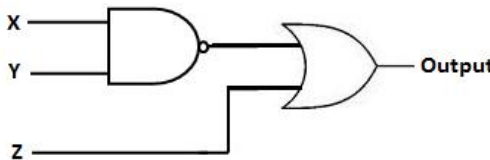
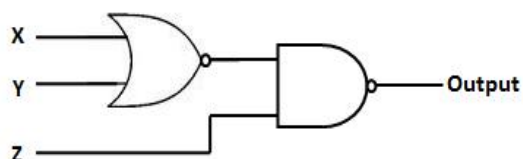
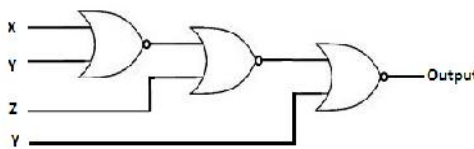
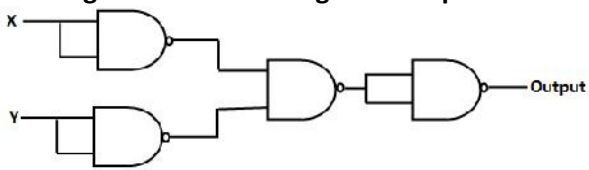
Simplified Boolean expression for given K-map is

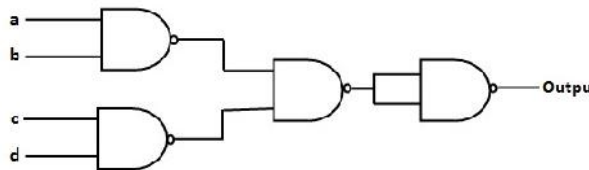
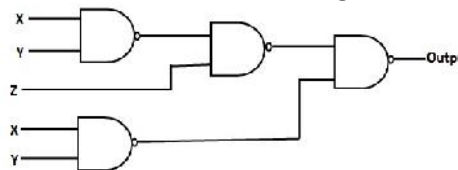
$$F(A,B,C) = a'c' + b'c$$

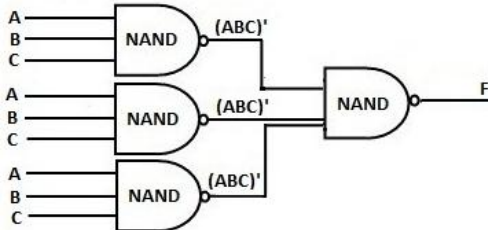
The logic circuit will be as follows:



64. Give an example for each of the following :

Ans.	<p>(i) a boolean expression in the sum of minterm form (ii) a boolean expression in the non canonical form.</p> <p>For a function $F(X, Y, Z)$</p> <p>(i) Sum of minterms expression is $XYZ + \bar{X}\bar{Y}Z + X\bar{Y}Z + XY\bar{Z}$</p> <p>(ii) Non canonical form of Sum-of-products $\bar{Y}Z + Z\bar{X} + \bar{X}\bar{Y}$ $XY + \dots$ by the circuit sh</p>
65.	<p>What function is implemented by the circuit shown</p>  <p>(a) $x'y' + z$ (b) $(x' + y')z$ (c) $x'y'z$ (d) $x' + y' + z$ (e) none of these</p>
Ans.	(e) is correct answer
66.	<p>What function is implemented by the circuit shown</p>  <p>(a) $x + y + z$ (b) $x + y + z'$ (c) $x'y'z$ (d) $x' + y' + z'$ (e) none of these</p>
Ans.	(b) is correct answer
67.	<p>What function is implemented by the circuit shown</p>  <p>(a) $xz' + y$ (b) $xz + y$ (c) $x'z + y'$ (d) $x'y' + y'z'$ (e) $x'y' + y'z$</p>
Ans.	(e) is correct answer
68.	<p>Which gate is the following circuit equivalent to ?</p>  <p>(a) AND (b) OR (c) NAND (d) NOR (e) None of these</p>
Ans.	(c) is correct answer
69.	<p>Which of the following functions equals the function : $f = x + yz'$?</p> <p>(a) $x(y' + z)$ (b) $(y + x)(z' + x)$ (c) $(y + x')(x' + z')$ (d) None of these</p>
Ans.	(b) is correct answer
70.	<p>Any possible binary logic function can be implemented using only.</p> <p>(a) AND (b) OR (c) NOT (d) AA (anyone is sufficient) (e) NAND</p>
Ans.	Try by Yourself.
71.	<p>The function in the following circuit is:</p>

Ans.	 <p>(a) $abcd$ (b) $ab + cd$ (c) $(a + b)(c + d)$ (d) $a + b + c + d$ (e) $(a' + b') + (c' + d')$</p> <p>(e) is correct answer</p>
72.	<p>Given $F = A'B + (C' + E)(D + F')$, use de Morgan's theorem to find F'.</p> <p>(a) $ACE' + BCE' + D'F$ (b) $(A + B')(CE' + D'F)$ (c) $A + B + CE'D'F$</p> <p>(d) $ACE' + AD'F + B'CE' + B'CE' + B'D'F$ (e) NA</p>
Ans.	$A'B + (C' + E)(D + F') = (A'B)' + ((C' + E)(D + F'))'$ $= (AB') + (C' + E)'(D + F')'$ $= (AB') + (C + E')(D' + F)$ $= (A + B')(CE' + D'F)$ <p>So, $F' = (A + B')(CE' + D'F)$</p>
73.	<p>The function in the following circuit is :</p>  <p>(a) $x' + y' + z'$ (b) $x + y + z$ (c) $x'z' + y'z'$ (d) $xy + z$ (e) z</p>
Ans.	<p>(c) is correct.</p>
74.	<p>Try Harder Simplify the following: $\{[(AB)'C]D\}'$</p> <p>(a) $(A' + B')C + D$ (b) $(A + B')C' + D'$ (c) $A' + (B' + C')D$ (d) $A' + B' + C' + D'$ (e) $A + B + C + D$</p>
Ans.	<p>Try by Yourself.</p>
75.	<p>Give the relationship that represents the dual of the Boolean property $A + 1 = 1$?</p> <p>[Note. * = AND, + = OR and ' = NOT]</p> <p>(a) $A . 1 = 1$ (b) $A . 0 = 0$ (c) $A + 0 = 0$ (d) $A . A = A$ (e) $A . 1 = 1$</p>
Ans.	<p>The relationship that represents the dual of the Boolean property $A + 1 = 1$ is $A . 0 = 0$</p>
76.	<p>Simplify the Boolean expression $(A + B + C)(D + E)' + (A + B + C)(D + E)$ and choose the best answer.</p> <p>(a) $A + B + C$ (b) $D + E$ (c) $A'B'C'$ (d) $D'E'$ (e) None of these</p>
Ans.	$(A+B+C)(D+E)' + (A+B+C)(D+E) = (A+B+C)((D+E) + (D+E)')$ <p style="text-align: center;">(Distributive Law)</p> $= (A+B+C).(1)$ <p style="text-align: center;">($X+X'=1$)</p> $= A+B+C$ <p>So, simplification of the Boolean expression $(A + B + C)(D + E)' + (A + B + C)(D + E)$ yields $A+B+C$</p>
77.	<p>Which of the following relationship represents the dual of the Boolean property $x + x'y = x + y$?</p> <p>(a) $x'(x + y) = x'y'$ (b) $x(x'y) = xy$ (c) $x * x' + y = xy$ (d) $x'(xy') = x'y'$ (e) $x(x' + y) = xy$</p>
Ans.	<p>The relationship $x * x' + y = xy$ represents the dual of the Boolean property $x + x'y = x + y$</p>
78.	<p>Given the function $F(X, Y, Z) = XZ + Z(X' + XY)$, the equivalent most simplified Boolean representation for F is :</p> <p>(a) $Z + YZ$ (b) $Z + XYZ$ (c) XZ (d) $X + YZ$ (e) None of these</p>
Ans.	$XZ + Z(X' + XY) = XZ + X'Z + XYZ$ <p style="text-align: center;">(distributive Law)</p> $= Z(X + X') + XYZ$ <p style="text-align: center;">(distributive Law)</p> $= Z(1) + XYZ$ <p style="text-align: center;">(Complementarity Law)</p> $= Z + XYZ$ <p style="text-align: center;">(Identity Law)</p> <p>The equivalent most simplified Boolean representation for F is $Z + XYZ$</p>
79.	<p>Simplification of the Boolean expression $(A + B)'(C + D + E)' + (A + B)'$ yields which of the following results?</p> <p>(a) $A + B$ (b) $A'B'$ (c) $C + D + E$ (d) $C'D'E'$ (e) $A'B'C'D'E'$</p>
Ans.	$(A + B)'(C + D + E)' + (A + B)' = (A+B)'((C+D+E)+1)$ <p style="text-align: center;">(Distb. Law)</p> $= (A+B)'.1$ <p style="text-align: center;">(Identity Law)</p> $= (A+B)'$ <p style="text-align: center;">(Identity Law)</p> $= A'B'$ <p style="text-align: center;">(DeMorgan's Law)</p> <p>So, simplification of the Boolean expression $(A + B)'(C + D + E)' + (A + B)'$ yields $A'B'$</p>
80.	<p>Given that $F = A'B' + C + D' + E'$, Which of the following represents the only correct expression for F'?</p>

	(a) $F' = A + B + C + D + E$ (b) $F' = ABCDE$ (c) $F' = AB(C + D + E)$ (d) $F' = AB + C' + D' + E'$ (e) $F' = (A + B)CDE$																																																																																																		
Ans.	$F = A'B' + C' + D' + E'$ Taking complement on both sides: $F' = (A'B' + C' + D' + E')'$ $= (A'B')' \cdot (C')' \cdot (D')' \cdot (E')'$ $= (A+B) \cdot C \cdot D \cdot E$ So, $(A + B)CDE$ represents correct expression for F'																																																																																																		
81.	An equivalent representation for the Boolean expression $A' + 1$ is (a) A (b) A' (c) 1 (d) 0																																																																																																		
Ans.	An equivalent representation for the Boolean expression $A' + 1$ is 1																																																																																																		
82.	Simplification of the Boolean expression $AB + ABCD + ABCDE + ABCDEF$ yields which of the following results? (a) $ABCDEF$ (b) AB (c) $AB + CD + EF$ (d) $A + B + C + D + E + F$ (e) $A + B(C + D(E + F))$																																																																																																		
Ans.	$AB + ABC + ABCD + ABCDE + ABCDEF$ $= (AB + ABC) + (ABCD + ABCDE) + ABCDEF$ (Commutative Law Law) $= AB + ABCD + ABCDEF$ (Absorption Law) $= AB + (ABCD + ABCDEF)$ (Commutative Law Law) $= AB + ABCD$ (Absorption Law) $= AB$ So, simplification of the Boolean expression $AB + ABCD + ABCDE + ABCDEF$ yields AB																																																																																																		
83.	Given the following Boolean function $F = A*BC* + A*BC + AB*C$ (a) Develop an equivalent expression using only NAND operations, and the logic diagram. (b) Develop an equivalent expression using only NOR operations, and the logic diagram.																																																																																																		
Ans.	(a) Develop an equivalent expression using only NAND operations, and the logic diagram. The given Boolean expression can be written as $= (A \text{ NAND } B \text{ NAND } C) \text{ NAND } (A \text{ NAND } B \text{ NAND } C) \text{ NAND } (A \text{ NAND } B \text{ NAND } C)$ The logic diagram is as following : 																																																																																																		
	(b) Develop an equivalent expression using only NOR operations, and the logic diagram. Try by Yourself.																																																																																																		
84.	For the logic function of $F(A, B, C, D) = \sum(0, 1, 3, 4, 5, 7, 8, 10, 12, 14, 15)$. (a) Show the truth table (b) Write the SOP form (c) Write the POS form (d) Simplify by K-map.																																																																																																		
Ans.	(a) Show the truth table Truth table for the given function is as following : <table><tr><th>A</th><th>B</th><th>C</th><th>D</th><th>F</th><th>Minterms</th><th>Maxterms</th></tr><tr><td>0</td><td>0</td><td>0</td><td>0</td><td>1</td><td>$A'B'C'D'$</td><td>$A+B+C+D$</td></tr><tr><td>0</td><td>0</td><td>0</td><td>1</td><td>1</td><td>$A'B'C'D$</td><td>$A+B+C+D'$</td></tr><tr><td>0</td><td>0</td><td>1</td><td>0</td><td></td><td>$A'B'CD'$</td><td>$A+B+C'+D$</td></tr><tr><td>0</td><td>0</td><td>1</td><td>1</td><td>1</td><td>$A'B'CD$</td><td>$A+B+C'+D'$</td></tr><tr><td>0</td><td>1</td><td>0</td><td>0</td><td>1</td><td>$A'BC'D'$</td><td>$A+B'+C+D$</td></tr><tr><td>0</td><td>1</td><td>0</td><td>1</td><td>1</td><td>$A'BC'D$</td><td>$A+B'+C+D'$</td></tr><tr><td>0</td><td>1</td><td>1</td><td>0</td><td></td><td>$A'BCD'$</td><td>$A+B'+C'+D$</td></tr><tr><td>0</td><td>1</td><td>1</td><td>1</td><td>1</td><td>$A'BCD$</td><td>$A+B'+C'+D'$</td></tr><tr><td>1</td><td>0</td><td>0</td><td>0</td><td>1</td><td>$AB'C'D'$</td><td>$A'+B+C+D$</td></tr><tr><td>1</td><td>0</td><td>0</td><td>1</td><td></td><td>$AB'C'D$</td><td>$A'+B+C+D'$</td></tr><tr><td>1</td><td>0</td><td>1</td><td>0</td><td>1</td><td>$AB'CD'$</td><td>$A'+B+C'+D$</td></tr><tr><td>1</td><td>0</td><td>1</td><td>1</td><td></td><td>$AB'CD$</td><td>$A'+B+C'+D'$</td></tr><tr><td>1</td><td>1</td><td>0</td><td>0</td><td>1</td><td>$ABC'D'$</td><td>$A'+B'+C+D$</td></tr></table>	A	B	C	D	F	Minterms	Maxterms	0	0	0	0	1	$A'B'C'D'$	$A+B+C+D$	0	0	0	1	1	$A'B'C'D$	$A+B+C+D'$	0	0	1	0		$A'B'CD'$	$A+B+C'+D$	0	0	1	1	1	$A'B'CD$	$A+B+C'+D'$	0	1	0	0	1	$A'BC'D'$	$A+B'+C+D$	0	1	0	1	1	$A'BC'D$	$A+B'+C+D'$	0	1	1	0		$A'BCD'$	$A+B'+C'+D$	0	1	1	1	1	$A'BCD$	$A+B'+C'+D'$	1	0	0	0	1	$AB'C'D'$	$A'+B+C+D$	1	0	0	1		$AB'C'D$	$A'+B+C+D'$	1	0	1	0	1	$AB'CD'$	$A'+B+C'+D$	1	0	1	1		$AB'CD$	$A'+B+C'+D'$	1	1	0	0	1	$ABC'D'$	$A'+B'+C+D$
A	B	C	D	F	Minterms	Maxterms																																																																																													
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1	1	0	0	1	$ABC'D'$	$A'+B'+C+D$																																																																																													

1	1	0	1		$ABC'D$	$A'+B'+C+D'$
1	1	1	0	1	$ABCD'$	$A'+B'+C'+D$
1	1	1	1	1	$ABCD$	$A'+B'+C'+D'$

(b) Write the SOP form

Adding all the minterms for which output is 1, we get

$$A'B'C'D' + A'B'C'D + A'B'CD + A'BC'D' + A'BC'D + A'BCD + AB'C'D' + AB'CD' + ABC'D' + ABCD' + ABCD$$

This is desired Canonical Sum-of-Product form.

(c) Write the POS form

By multiplying Maxterms for the output 0s, we get

$$(A+B+C'+D)(A+B'+C'+D)(A'+B+C+D')(A'+B+C'+D')(A'+B'+C+D')$$

This is desired Canonical Product-of-Sum form.

(d) Simplify by K-map

		CD			
		[00]C'D'	[01]C'D	[11]CD	[10]CD'
AB	[00]A'B'	1	1	1	0
	[01]A'B	1	1	1	0
	[11]AB	1	0	1	1
	[10]AB'	1	0	0	1

Mapping the given function in a K-map, we get 2 pairs and 2 Quads.

Pair-1($m_{14} + m_{15}$) reduces to ABC as D removed.

Pair-2($m_3 + m_7$) reduces to ACD' as B removed.

Quad-1($m_0 + m_4 + m_8 + m_{12}$) reduces to $C'D'$ as A and B removed.

Quad-1($m_1 + m_3 + m_5 + m_7$) reduces to $A'D$ as B and C removed.

Simplified Boolean expression for given K-map is

$$F(A,B,C) = ABC + ACD' + C'D' + A'D$$

85. (a) Implement the following Boolean expression using only NAND gates.

$$F = (A' + B + C')(A + B)(A' + C)$$

(b) Construction a NOR function by only NAND gates.

Ans. Try by Yourself.

TYPE C : LONG ANSWER QUESTION

1(a) State and verify De Morgan's law in Boolean Algebra.

Ans. DeMorgan's theorems state that (i) $(X + Y)' = X' \cdot Y'$ (ii) $(X \cdot Y)' = X' + Y'$

(i) $(X + Y)' = X' \cdot Y'$

Now to prove DeMorgan's first theorem, we will use complementarity laws.

Let us assume that $P = X + Y$ where, P, X, Y are logical variables. Then, according to complementation law

$$P + P' = 1 \text{ and } P \cdot P' = 0$$

That means, if P, X, Y are Boolean variables then this complementarity law must hold for variables P . In other words, if P i.e., if $(X + Y)' = X' \cdot Y'$ then

$$(X + Y) + (X' \cdot Y') \text{ must be equal to } 1. \quad (\text{as } X + X' = 1)$$

$$(X + Y) \cdot (X' \cdot Y') \text{ must be equal to } 0. \quad (\text{as } X \cdot X' = 0)$$

Let us prove the first part, i.e.,

$$(X + Y) + (X' \cdot Y') = 1$$

$$(X + Y) + (X' \cdot Y') = ((X + Y) + X') \cdot ((X + Y) + Y') \quad (\text{ref. } X + YZ = (X + Y)(X + Z))$$

$$= (X + X' + Y) \cdot (X + Y + Y')$$

$$= (1 + Y) \cdot (X + 1) \quad (\text{ref. } X + X' = 1)$$

$$= 1 \cdot 1 \quad (\text{ref. } 1 + X = 1)$$

$$= 1$$

So first part is proved.

Now let us prove the second part i.e.,

$$(X + Y) \cdot (X' \cdot Y') = 0$$

$$(X + Y) \cdot (X' \cdot Y') = (X' \cdot Y') \cdot (X + Y) \quad (\text{ref. } X(YZ) = (XY)Z)$$

$$= (X' \cdot Y') \cdot X + (X' \cdot Y') \cdot Y \quad (\text{ref. } X(Y + Z) = XY + XZ)$$

$$= X(X' \cdot Y') + X'(Y' \cdot Y)$$

$$= 0 \cdot Y + X' \cdot 0 \quad (\text{ref. } X \cdot X' = 0)$$

$$= 0 + 0 = 0$$

So, second part is also proved, Thus: $X + Y = X' \cdot Y'$

(ii) $(X.Y)' = X' + Y'$

Again to prove this theorem, we will make use of complementary law i.e.,

$$X + X' = 1 \quad \text{and} \quad X \cdot X' = 0$$

If XY 's complement is $X + Y$ then it must be true that

$$(a) XY + (X' + Y') = 1 \quad \text{and} \quad (b) XY(X' + Y') = 0$$

To prove the first part

$$\begin{aligned} \text{L.H.S} &= XY + (X' + Y') \\ &= (X' + Y') + XY && (\text{ref. } X + Y = Y + X) \\ &= (X' + Y' + X) \cdot (X' + Y' + Y) && (\text{ref. } (X + Y)(X + Z) = X + YZ) \\ &= (X + X' + Y') \cdot (X' + Y + Y') \\ &= (1 + Y') \cdot (X' + 1) && (\text{ref. } X + X' = 1) \\ &= 1 \cdot 1 && (\text{ref. } 1 + X = 1) \\ &= 1 = \text{R.H.S} \end{aligned}$$

Now the second part i.e.,

$$\begin{aligned} XY \cdot (\overline{X} + \overline{Y}) &= 0 \\ \text{L.H.S} &= (XY)' \cdot (X' + Y') \\ &= XYX' + XYY' && (\text{ref. } X(Y + Z) = XY + XZ) \\ &= XX'Y + XYY' \\ &= 0 \cdot Y + X \cdot 0 && (\text{ref. } X \cdot X' = 0) \\ &= 0 + 0 = 0 = \text{R.H.S.} \end{aligned}$$

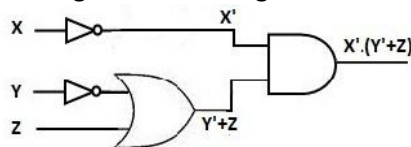
$$XY \cdot (X' + Y') = 0 \quad \text{and} \quad XY + (X' + Y') = 1$$

$(XY)' = X' + Y'$. Hence proved.

1(b). Draw a Logical Circuit Diagram for the following Boolean Expression

$$X' \cdot (Y' + Z)$$

Ans. The Logical Circuit Diagram for the Boolean Expression is as following:

**1(c) Convert the following Boolean expression into its equivalent Canonical Sum of Product Form (SOP).**

$$(X' + Y + Z') \cdot (X' + Y + Z) \cdot (X' + Y' + Z')$$

Ans. Given $(X' + Y + Z') \cdot (X' + Y + Z) \cdot (X' + Y' + Z')$

$$(1 + 0 + 1) (1 + 0 + 0) (1 + 1 + 1)$$

$$= M_4 \cdot M_5 \cdot M_6 \cdot M_7$$

$$= \pi(4, 5, 6, 7)$$

\Rightarrow SOP is equal to (excluding position of minterms)

$$= \sum(0, 1, 2, 3)$$

$$= m_0 + m_1 + m_2 + m_3$$

$$= X'Y'Z + X'YZ + X'YZ' + X'YZ$$

1(d) Reduce the following Boolean expression using K-map

$$F(A, B, C, D) = \sum(0, 2, 3, 4, 5, 6, 7, 8, 10, 12)$$

Ans.

AB \ CD	[00]C'D'	[01]C'D	[11]CD	[10]CD'
[00]A'B'	1 ₀	0 ₁	1 ₃	1 ₂
[01]A'B	1 ₄	0 ₅	1 ₇	1 ₆
[11]AB	1 ₁₂	0 ₁₃	0 ₁₅	0 ₁₄
[10]AB'	1 ₈	0 ₉	0 ₁₁	1 ₁₀

There are 1 Pair and 2 Quads that reduce as given below:

Pair($m_8 + m_{10}$) reduces to $AB'D'$

Quad-1($m_0 + m_4 + m_{12} + m_8$) reduces to $C'D'$

Quad-2($m_2 + m_3 + m_6 + m_7$) reduces to $A'C$

Simplified Boolean expression for given K-map is

$$F(A, B, C, D) = AB'D' + C'D' + A'C$$

2(a). State De Morgan's Theorems and verify the same using truth table.

Ans. De Morgan's First theorem. It states that $(X+Y)' = X' \cdot Y'$

Truth Table for first theorem.

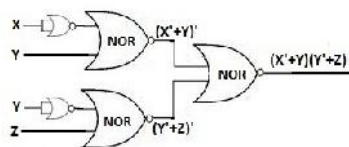
X	Y	X'	Y'	X+Y	(X+Y)'	X' · Y'
0	0	1	1	0	1	1
0	1	1	0	1	0	0

De Morgan's Second theorem. It states that $(X.Y)' = X' + Y'$

Truth Table for second theorem.

X	Y	X'	Y'	X.Y	(X.Y)'	X' + Y'
0	0	1	1	0	1	1
0	1	1	0	0	1	1

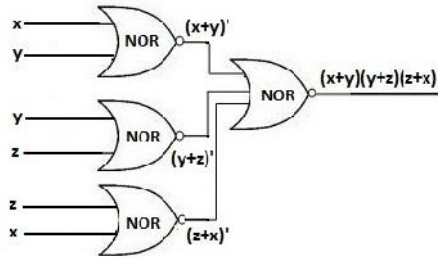
	<table><tr><td>1</td><td>0</td><td>0</td><td>1</td><td>1</td><td>0</td><td>0</td></tr><tr><td>1</td><td>1</td><td>0</td><td>0</td><td>1</td><td>0</td><td>0</td></tr></table> <p>From Truth Table it is proved that $(X+Y)' = X'.Y'$</p>	1	0	0	1	1	0	0	1	1	0	0	1	0	0	<table><tr><td>1</td><td>0</td><td>0</td><td>1</td><td>0</td><td>1</td><td>1</td></tr><tr><td>1</td><td>1</td><td>0</td><td>0</td><td>1</td><td>0</td><td>0</td></tr></table> <p>From Truth Table it is proved that $(X.Y)' = X' + Y'$</p>	1	0	0	1	0	1	1	1	1	0	0	1	0	0																																										
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2(b).	Write the equivalent Canonical Product of Sum Expression for the following Sum of Product Expression : $F(X, Y, Z) = \sum(0, 2, 4, 5)$																																																																							
Ans.	Given SOP expression : $F(X, Y, Z) = \sum(0, 2, 4, 5)$ Equivalent POS expression : $\pi(1, 3, 6, 7)$ Equivalent POS expression will be = $M_1.M_3.M_6.M_7$ $M_1 = (0 + 0 + 1)'$ 'S Maxterm = $(X + Y + Z)$ $M_3 = (0 + 1 + 1)'$ 'S Maxterm = $(X + Y' + Z')$ $M_6 = (1 + 1 + 0)'$ 'S Maxterm = $(X' + Y' + Z)$ $M_7 = (1 + 1 + 1)'$ 'S Maxterm = $(X' + Y' + Z')$ Equivalent POS will be $F(X, Y, Z) = (X + Y + Z). (X + Y' + Z'). (X' + Y' + Z). (X' + Y' + Z')$																																																																							
2(c).	Write the equivalent Boolean expression for the following Logic Circuit.																																																																							
Ans.	The equivalent Boolean expression for the given Logic Circuit is: $F = AB' + C'D$																																																																							
2(d).	Reduce the following Boolean expression using K-map :																																																																							
Ans.	$F(A, B, C, D) = \prod(5, 6, 7, 8, 9, 12, 13, 14, 15)$ <table><tr><td>CD \ AB</td><td>[00]C+D</td><td>[01]C+D'</td><td>[11]C'+D'</td><td>[10]C'+D</td></tr><tr><td>[00]A+B</td><td>1 0</td><td>1 1</td><td>1 3</td><td>1 2</td></tr><tr><td>[01]A+B'</td><td>1 4</td><td>0 5</td><td>0 7</td><td>0 6</td></tr><tr><td>[11]A'+B'</td><td>0 12</td><td>0 13</td><td>0 15</td><td>0 14</td></tr><tr><td>[10]A'+B</td><td>0 8</td><td>0 9</td><td>1 11</td><td>1 10</td></tr></table> <p>There are 1 Pair and 2 Quads that reduce as given below: Pair($M_5 . M_7$) reduces to $(A + B' + D')$ Quad-1($M_6 . M_7 . M_{14} . M_{15}$) reduces to $(B' + C')$ Quad- 2($M_8 . M_9 . M_{12} . M_{13}$) reduces to $(A' + C)$ Simplified Boolean expression for given K-map is $F(A,B,C,D) = (A + B' + D'). (B' + C'). (A' + C)$</p>		CD \ AB	[00]C+D	[01]C+D'	[11]C'+D'	[10]C'+D	[00]A+B	1 0	1 1	1 3	1 2	[01]A+B'	1 4	0 5	0 7	0 6	[11]A'+B'	0 12	0 13	0 15	0 14	[10]A'+B	0 8	0 9	1 11	1 10																																													
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3(a).	State DeMorgan's Laws. Verify them using truth tables.																																																																							
Ans.	<p>De Morgan's First theorem. It states that $(X+Y)'=X'.Y'$</p> <p>Truth Table for first theorem.</p> <table><tr><th>X</th><th>Y</th><th>X'</th><th>Y'</th><th>X+Y</th><th>(X+Y)'</th><th>X'.Y'</th></tr><tr><td>0</td><td>0</td><td>1</td><td>1</td><td>0</td><td>1</td><td>1</td></tr><tr><td>0</td><td>1</td><td>1</td><td>0</td><td>1</td><td>0</td><td>0</td></tr><tr><td>1</td><td>0</td><td>0</td><td>1</td><td>1</td><td>0</td><td>0</td></tr><tr><td>1</td><td>1</td><td>0</td><td>0</td><td>1</td><td>0</td><td>0</td></tr></table> <p>From Truth Table it is proved that $(X+Y)' = X'.Y'$</p>	X	Y	X'	Y'	X+Y	(X+Y)'	X'.Y'	0	0	1	1	0	1	1	0	1	1	0	1	0	0	1	0	0	1	1	0	0	1	1	0	0	1	0	0	<p>De Morgan's Second theorem. It states that $(X.Y)'=X'+Y'$</p> <p>Truth Table for second theorem.</p> <table><tr><th>X</th><th>Y</th><th>X'</th><th>Y'</th><th>X.Y</th><th>(X.Y)'</th><th>X'+Y'</th></tr><tr><td>0</td><td>0</td><td>1</td><td>1</td><td>0</td><td>1</td><td>1</td></tr><tr><td>0</td><td>1</td><td>1</td><td>0</td><td>0</td><td>1</td><td>1</td></tr><tr><td>1</td><td>0</td><td>0</td><td>1</td><td>0</td><td>1</td><td>1</td></tr><tr><td>1</td><td>1</td><td>0</td><td>0</td><td>1</td><td>0</td><td>0</td></tr></table> <p>From Truth Table it is proved that $(X.Y)' = X' + Y'$</p>	X	Y	X'	Y'	X.Y	(X.Y)'	X'+Y'	0	0	1	1	0	1	1	0	1	1	0	0	1	1	1	0	0	1	0	1	1	1	1	0	0	1	0	0
X	Y	X'	Y'	X+Y	(X+Y)'	X'.Y'																																																																		
0	0	1	1	0	1	1																																																																		
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X	Y	X'	Y'	X.Y	(X.Y)'	X'+Y'																																																																		
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1	1	0	0	1	0	0																																																																		
3(b).	Prove $(A + B).(A' + C)=(A + B + C).(A + B + C').(A' + B + C).(A' + B' + C)$ algebraically.																																																																							
Ans.	RHS = $(A + B + C).(A + B + C').(A' + B + C).(A' + B' + C)$ = $(A + B)(C + C').(A' + C)(B + B')$ ($C + C'=1, B + B'=1$) = $(A + B).(A' + C)$ = LHS																																																																							
3(c).	Obtain a simplified form for a Boolean expression :																																																																							
	$F(X, Y, Z, W) = \sum(0, 1, 4, 5, 7, 8, 9, 12, 13, 15)$ using K-map method.																																																																							
Ans.	<table><tr><td>ZW \ XY</td><td>[00]Z'W'</td><td>[01]Z'W</td><td>[11]ZW</td><td>[10]ZW'</td></tr><tr><td>[00]X'Y'</td><td>1 0</td><td>1 1</td><td>0 3</td><td>0 2</td></tr><tr><td>[01]X'Y</td><td>1 4</td><td>1 5</td><td>1 7</td><td>0 6</td></tr><tr><td>[11]XY</td><td>1 12</td><td>1 13</td><td>1 15</td><td>0 14</td></tr><tr><td>[10]XY'</td><td>1 8</td><td>1 9</td><td>0 11</td><td>0 10</td></tr></table> <p>There are 1 Pair and 1 Octet that reduce as given below: Pair($m_7 + m_{15}$) reduces to YZW Octet($m_0 + m_1 + m_4 + m_5 + m_8 + m_9 + m_{12} + m_{13}$) reduces to Z' Simplified Boolean expression for given K-map is $F(X,Y,Z,W) = YZW + Z'$</p>		ZW \ XY	[00]Z'W'	[01]Z'W	[11]ZW	[10]ZW'	[00]X'Y'	1 0	1 1	0 3	0 2	[01]X'Y	1 4	1 5	1 7	0 6	[11]XY	1 12	1 13	1 15	0 14	[10]XY'	1 8	1 9	0 11	0 10																																													
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[11]XY	1 12	1 13	1 15	0 14																																																																				
[10]XY'	1 8	1 9	0 11	0 10																																																																				
3(d).	Draw the circuit diagram for the Boolean function $F(X, Y, Z) = (X' + Y)(Y' + Z)$ using NOR gates only.																																																																							

Ans.	<p>The circuit diagram for the given Boolean function is as following:</p> 																																																																																																																																																									
3(e).	<p>Express in the POS form, the Boolean function $F(A, B, C)$, the truth table for which is given below :</p> <table><tr><th>A</th><th>B</th><th>C</th><th>F</th></tr><tr><td>0</td><td>0</td><td>0</td><td>0</td></tr><tr><td>0</td><td>0</td><td>1</td><td>1</td></tr><tr><td>0</td><td>1</td><td>0</td><td>0</td></tr><tr><td>0</td><td>1</td><td>1</td><td>1</td></tr><tr><td>1</td><td>0</td><td>0</td><td>0</td></tr><tr><td>1</td><td>0</td><td>1</td><td>1</td></tr><tr><td>1</td><td>1</td><td>0</td><td>0</td></tr><tr><td>1</td><td>1</td><td>1</td><td>1</td></tr></table>	A	B	C	F	0	0	0	0	0	0	1	1	0	1	0	0	0	1	1	1	1	0	0	0	1	0	1	1	1	1	0	0	1	1	1	1																																																																																																																					
A	B	C	F																																																																																																																																																							
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Ans.	<p>The desired Canonical Product-of-Sum form is as following; $F = \pi(0, 2, 4, 6) = (A + B + C)(A + B' + C)(A' + B + C)(A' + B' + C)$</p>																																																																																																																																																									
4(a).	<p>State the distributive law. Verify the law using truth table.</p>																																																																																																																																																									
Ans.	<p>Distributive law state that (a) $X(Y + Z) = XY + XZ$ (b) $X + YZ = (X + Y)(X + Z)$ (a) $X(Y + Z) = XY + XZ$ To prove this law, we will make a following truth table :</p> <table><tr><th>X</th><th>Y</th><th>Z</th><th>Y + Z</th><th>XY</th><th>XZ</th><th>X(Y + Z)</th><th>XY + XZ</th></tr><tr><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td></tr><tr><td>0</td><td>0</td><td>1</td><td>1</td><td>0</td><td>0</td><td>0</td><td>0</td></tr><tr><td>0</td><td>1</td><td>0</td><td>1</td><td>0</td><td>0</td><td>0</td><td>0</td></tr><tr><td>0</td><td>1</td><td>1</td><td>1</td><td>0</td><td>0</td><td>0</td><td>0</td></tr><tr><td>1</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td></tr><tr><td>1</td><td>0</td><td>1</td><td>1</td><td>0</td><td>1</td><td>1</td><td>1</td></tr><tr><td>1</td><td>1</td><td>0</td><td>1</td><td>1</td><td>0</td><td>1</td><td>1</td></tr><tr><td>1</td><td>1</td><td>1</td><td>1</td><td>1</td><td>1</td><td>1</td><td>1</td></tr></table> <p>From truth table it is prove that $X(Y + Z) = XY + XZ$ (b) $X + YZ = (X + Y)(X + Z)$</p> <table><tr><th>X</th><th>Y</th><th>Z</th><th>YZ</th><th>X + YZ</th><th>XZ</th><th>X + Y</th><th>X + Z</th><th>(X + Y)(X + Z)</th></tr><tr><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td></tr><tr><td>0</td><td>0</td><td>1</td><td>0</td><td>0</td><td>0</td><td>0</td><td>1</td><td>0</td></tr><tr><td>0</td><td>1</td><td>0</td><td>0</td><td>0</td><td>0</td><td>1</td><td>0</td><td>0</td></tr><tr><td>0</td><td>1</td><td>1</td><td>1</td><td>1</td><td>0</td><td>1</td><td>1</td><td>1</td></tr><tr><td>1</td><td>0</td><td>0</td><td>0</td><td>1</td><td>0</td><td>1</td><td>1</td><td>1</td></tr><tr><td>1</td><td>0</td><td>1</td><td>0</td><td>1</td><td>1</td><td>1</td><td>1</td><td>1</td></tr><tr><td>1</td><td>1</td><td>0</td><td>0</td><td>1</td><td>0</td><td>1</td><td>1</td><td>1</td></tr><tr><td>1</td><td>1</td><td>1</td><td>1</td><td>1</td><td>1</td><td>1</td><td>1</td><td>1</td></tr></table> <p>From truth table it is prove that $X + YZ = (X + Y)(X + Z)$</p>	X	Y	Z	Y + Z	XY	XZ	X(Y + Z)	XY + XZ	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	1	0	1	0	0	0	0	0	1	1	1	0	0	0	0	1	0	0	0	0	0	0	0	1	0	1	1	0	1	1	1	1	1	0	1	1	0	1	1	1	1	1	1	1	1	1	1	X	Y	Z	YZ	X + YZ	XZ	X + Y	X + Z	(X + Y)(X + Z)	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	1	0	0	0	0	1	0	0	0	1	1	1	1	0	1	1	1	1	0	0	0	1	0	1	1	1	1	0	1	0	1	1	1	1	1	1	1	0	0	1	0	1	1	1	1	1	1	1	1	1	1	1	1
X	Y	Z	Y + Z	XY	XZ	X(Y + Z)	XY + XZ																																																																																																																																																			
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X	Y	Z	YZ	X + YZ	XZ	X + Y	X + Z	(X + Y)(X + Z)																																																																																																																																																		
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4(b).	<p>Prove $x + x'y = x + y$ algebraically.</p>																																																																																																																																																									
Ans.	<p>LHS = $x + x'y$ $= (x + x')(x + y)$ $= x + y$ $=$ RHS</p> <p>($X + YZ = (X + Y)(X + Z)$ Distributive law) ($x + x' = 1$)</p>																																																																																																																																																									
4(c).	<p>Write the dual of the Boolean expression $(x + y).(x' + y')$</p>																																																																																																																																																									
Ans.	<p>The dual of the given Boolean expression is $xy + x'y'$</p>																																																																																																																																																									
4(d).	<p>Minimize $F(w, x, y, z)$ using Karnaugh map</p>																																																																																																																																																									
Ans.	<p>$F(w, x, y, z) = \sum(0, 4, 8, 12)$</p>																																																																																																																																																									

wx \ yz	[00]y'z'	[01]y'z	[11]yz	[10]yz'
[00]w'x'	1	0	0	0
[01]w'x	1	0	0	0
[11]wx	1	0	0	0
[10]wx'	1	0	0	0

There is 1 Quad($m_0 + m_4 + m_8 + m_{12}$) that reduces to $y'z'$
Simplified Boolean expression for given K-map is
 $F(w, x, y, z) = y'z'$

4(e). **Ans.** Represent the Boolean expression $(x + y)(y + z)(z + x)$ with the help of NOR gates only.



4(f). **Ans.** Write sum of products form of function $F(x, y, z)$. The truth table representation for the function F is given below :

x	y	z	F
0	0	0	0
0	0	1	0
0	1	0	1
0	1	1	0
1	0	0	1
1	0	1	0
1	1	0	0
1	1	1	1

Ans. The desired Canonical Sum-of-Product form is as following;
 $F = \sum(2, 4, 7) = x'yz' + xy'z' + xyz$

5(a). **Ans:** State and prove DeMorgan's Theorem (Any One) algebraically.

DeMorgan's theorems state that (i) $(X + Y)' = X' \cdot Y'$ (ii) $(X \cdot Y)' = X' + Y'$

(i) $(X + Y)' = X' \cdot Y'$

Now to prove DeMorgan's first theorem, we will use complementarity laws.

Let us assume that $P = X + Y$ where, P, X, Y are logical variables. Then, according to complementation law

$$P + P' = 1 \text{ and } P \cdot P' = 0$$

That means, if P, X, Y are Boolean variables then this complementarity law must hold for variables P . In other words, if P i.e., if $(X + Y)' = X' \cdot Y'$ then

$$(X + Y) + (XY)' \text{ must be equal to } 1. \quad (\text{as } X + X' = 1)$$

$$(X + Y) \cdot (XY)' \text{ must be equal to } 0. \quad (\text{as } X \cdot X' = 0)$$

Let us prove the first part, i.e.,

$$(X + Y) + (XY)' = 1$$

$$(X + Y) + (XY)' = ((X + Y) + X') \cdot ((X + Y) + Y') \quad (\text{ref. } X + YZ = (X + Y)(X + Z))$$

$$= (X + X' + Y) \cdot (X + Y + Y')$$

$$= (1 + Y) \cdot (X + 1) \quad (\text{ref. } X + X' = 1)$$

$$= 1 \cdot 1 \quad (\text{ref. } 1 + X = 1)$$

$$= 1$$

So first part is proved.

Now let us prove the second part i.e.,

$$(X + Y) \cdot (XY)' = 0$$

$$(X + Y) \cdot (XY)' = (XY)' \cdot (X + Y) \quad (\text{ref. } X(YZ) = (XY)Z)$$

$$= (XY)'X + (XY)'Y \quad (\text{ref. } X(Y + Z) = XY + XZ)$$

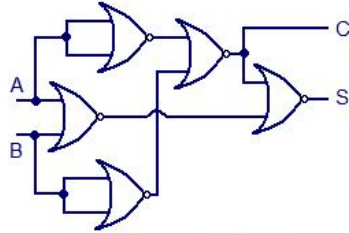
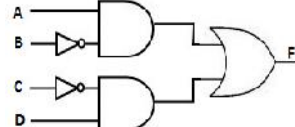
$$= X(XY)' + X'(YY)'$$

$$= 0 \cdot Y + X' \cdot 0 \quad (\text{ref. } X \cdot X' = 0)$$

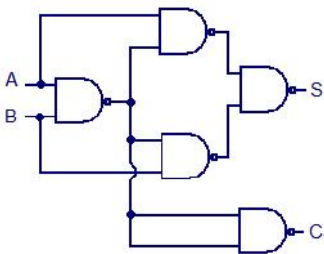
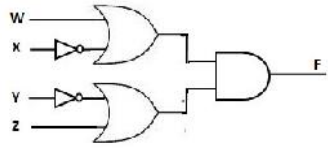
$$= 0 + 0 = 0$$

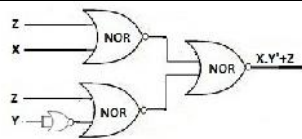
So, second part is also proved, Thus: $X + Y = X' \cdot Y'$

5(b). **Given the following truth table, driven a Sum of Product (SOP) and Product of Sum (POS) form of Boolean**

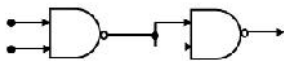
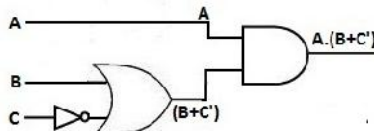
	expression from it :	<table><tr><th>X</th><th>Y</th><th>Z</th><th>G(X, Y, Z)</th></tr><tr><td>0</td><td>0</td><td>0</td><td>0</td></tr><tr><td>0</td><td>0</td><td>1</td><td>1</td></tr><tr><td>0</td><td>1</td><td>0</td><td>1</td></tr><tr><td>0</td><td>1</td><td>1</td><td>0</td></tr><tr><td>1</td><td>0</td><td>0</td><td>0</td></tr><tr><td>1</td><td>0</td><td>1</td><td>1</td></tr><tr><td>1</td><td>1</td><td>0</td><td>0</td></tr><tr><td>1</td><td>1</td><td>1</td><td>1</td></tr></table>	X	Y	Z	G(X, Y, Z)	0	0	0	0	0	0	1	1	0	1	0	1	0	1	1	0	1	0	0	0	1	0	1	1	1	1	0	0	1	1	1	1
X	Y	Z	G(X, Y, Z)																																			
0	0	0	0																																			
0	0	1	1																																			
0	1	0	1																																			
0	1	1	0																																			
1	0	0	0																																			
1	0	1	1																																			
1	1	0	0																																			
1	1	1	1																																			
Ans.	The desired Canonical Sum-of-Product form is as following; $G = \sum(1, 2, 5, 7) = X'Y'Z + X'YZ' + XY'Z + XYZ$ The desired Canonical Product-of-Sum form is as following; $G = \pi(0, 3, 4, 6) = (X + Y + Z)(X + Y' + Z')(X' + Y + Z)(X' + Y' + Z)$																																					
5(c).	Obtain a simplified form for the following Boolean Expression using Karnaugh's Map :																																					
Ans.	$F(u, v, w, z) = \sum(0, 3, 4, 5, 7, 11, 13, 15).$ <table><tr><td></td><td colspan="4">wz</td></tr><tr><td>uv</td><td>[00]w'z'</td><td>[01]w'z</td><td>[11]wz</td><td>[10]wz'</td></tr><tr><td>[00]u'v'</td><td>1₀</td><td>0₁</td><td>1₃</td><td>0₂</td></tr><tr><td>[01]u'v</td><td>1₄</td><td>1₅</td><td>1₇</td><td>0₆</td></tr><tr><td>[11]uv</td><td>0₁₂</td><td>1₁₃</td><td>1₁₅</td><td>0₁₄</td></tr><tr><td>[10]uv'</td><td>0₈</td><td>0₉</td><td>1₁₁</td><td>0₁₀</td></tr></table> <p>There are 2 Pairs and 1 Quad that reduce as given below: Pair-1($m_0 + m_4$) reduces to $u'w'z'$ Pair-2($m_5 + m_{13}$) reduces to $vw'z$ Quad($m_3 + m_7 + m_{11} + m_{15}$) reduces to wz Simplified Boolean expression for given K-map is $F(u, v, w, z) = u'w'z' + vw'z + wz$</p>		wz				uv	[00]w'z'	[01]w'z	[11]wz	[10]wz'	[00]u'v'	1 ₀	0 ₁	1 ₃	0 ₂	[01]u'v	1 ₄	1 ₅	1 ₇	0 ₆	[11]uv	0 ₁₂	1 ₁₃	1 ₁₅	0 ₁₄	[10]uv'	0 ₈	0 ₉	1 ₁₁	0 ₁₀							
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uv	[00]w'z'	[01]w'z	[11]wz	[10]wz'																																		
[00]u'v'	1 ₀	0 ₁	1 ₃	0 ₂																																		
[01]u'v	1 ₄	1 ₅	1 ₇	0 ₆																																		
[11]uv	0 ₁₂	1 ₁₃	1 ₁₅	0 ₁₄																																		
[10]uv'	0 ₈	0 ₉	1 ₁₁	0 ₁₀																																		
5(d).	Draw the logic circuit for a Half Adder using NOR gates only.																																					
Ans.	 <p>Half adder using NOR logic</p>																																					
5(e).	Interpret the following Logic Circuit as Boolean Expression :																																					
																																						
Ans.	The equivalent Boolean expression for the given Logic Circuit is: $F = (W + X')(Y' + Z)$																																					
6(a).	State DeMorgan's Laws. Verify one of the DeMorgan's laws using truth tables.																																					
Ans.	De Morgan's First theorem. It states that $(X+Y)'=X'.Y'$ De Morgan's Second theorem. It states that $(X.Y)'=X'+Y'$ Truth Table for first theorem.																																					
	<table><tr><th>X</th><th>Y</th><th>X'</th><th>Y'</th><th>X+Y</th><th>(X+Y)'</th><th>X'.Y'</th></tr><tr><td>0</td><td>0</td><td>1</td><td>1</td><td>0</td><td>1</td><td>1</td></tr><tr><td>0</td><td>1</td><td>1</td><td>0</td><td>1</td><td>0</td><td>0</td></tr><tr><td>1</td><td>0</td><td>0</td><td>1</td><td>1</td><td>0</td><td>0</td></tr><tr><td>1</td><td>1</td><td>0</td><td>0</td><td>1</td><td>0</td><td>0</td></tr></table>	X	Y	X'	Y'	X+Y	(X+Y)'	X'.Y'	0	0	1	1	0	1	1	0	1	1	0	1	0	0	1	0	0	1	1	0	0	1	1	0	0	1	0	0		
X	Y	X'	Y'	X+Y	(X+Y)'	X'.Y'																																
0	0	1	1	0	1	1																																
0	1	1	0	1	0	0																																
1	0	0	1	1	0	0																																
1	1	0	0	1	0	0																																
	From Truth Table it is proved that $(X+Y)' = X'.Y'$																																					
6(b).	Prove $X + Y'Z = (X + Y' + Z')(X + Y' + Z)(X + Y + Z)$ algebraically.																																					
Ans.	Try by Yourself.																																					
6(c).	Write the dual of the Boolean expression $(U + W)(V'U + W)$																																					
Ans.	The dual of the given Boolean expression is $UW + (V' + U)W$																																					
6(d).	Obtain a simplified form for a Boolean expression :																																					
	$F(u, v, w, z) = \sum(0, 1, 3, 5, 7, 9, 10, 11, 12, 13, 14, 15)$ (using Karnaugh Map.																																					

Ans.	<div><div><div>uv</div><div>wz</div><table><tr><td></td><td>[00]w'z'</td><td>[01]w'z</td><td>[11]wz</td><td>[10]wz'</td></tr><tr><td>[00]u'v'</td><td>1₀</td><td>1₁</td><td>1₃</td><td>0₂</td></tr><tr><td>[01]u'v</td><td>0₄</td><td>1₅</td><td>1₇</td><td>0₆</td></tr><tr><td>[11]uv</td><td>1₁₂</td><td>1₁₃</td><td>1₁₅</td><td>1₁₄</td></tr><tr><td>[10]uv'</td><td>0₈</td><td>1₉</td><td>1₁₁</td><td>1₁₀</td></tr></table></div><div><p>There are 3 Pairs and 1 Octet that reduce as given below:</p><p>Pair-1($m_0 + m_1$) reduces to $u'v'w'$</p><p>Pair-2($m_{12} + m_{13}$) reduces to uvw'</p><p>Pair-3($m_{10} + m_{14}$) reduces to uwz'</p><p>Octet($m_1 + m_3 + m_5 + m_7 + m_9 + m_{11} + m_{13} + m_{15}$) reduces to z</p><p>Simplified Boolean expression for given K-map is</p><p>$F(u, v, w, z) = u'v'w' + uvw' + uwz' + z$</p></div></div>		[00]w'z'	[01]w'z	[11]wz	[10]wz'	[00]u'v'	1 ₀	1 ₁	1 ₃	0 ₂	[01]u'v	0 ₄	1 ₅	1 ₇	0 ₆	[11]uv	1 ₁₂	1 ₁₃	1 ₁₅	1 ₁₄	[10]uv'	0 ₈	1 ₉	1 ₁₁	1 ₁₀											
	[00]w'z'	[01]w'z	[11]wz	[10]wz'																																	
[00]u'v'	1 ₀	1 ₁	1 ₃	0 ₂																																	
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[11]uv	1 ₁₂	1 ₁₃	1 ₁₅	1 ₁₄																																	
[10]uv'	0 ₈	1 ₉	1 ₁₁	1 ₁₀																																	
6(e). Ans.	<p>Represent the Boolean expression $X + Y \cdot Z'$ with the help of NOR gates only.</p>																																				
6(f). Ans.	<p>Write the Product of Sum form of the function $H(U, V, W)$, truth table representation of H is as follows :</p> <table><tr><th>U</th><th>V</th><th>W</th><th>H</th></tr><tr><td>0</td><td>0</td><td>0</td><td>1</td></tr><tr><td>0</td><td>0</td><td>1</td><td>0</td></tr><tr><td>0</td><td>1</td><td>0</td><td>1</td></tr><tr><td>0</td><td>1</td><td>1</td><td>0</td></tr><tr><td>1</td><td>0</td><td>0</td><td>0</td></tr><tr><td>1</td><td>0</td><td>1</td><td>1</td></tr><tr><td>1</td><td>1</td><td>0</td><td>0</td></tr><tr><td>1</td><td>1</td><td>1</td><td>1</td></tr></table> <p>The desired Canonical Product-of-Sum form is as following;</p> <p>$H = \pi(1, 3, 4, 6) = (U + V + W')(U + V' + W')(U' + V + W')(U' + V' + W)$</p>	U	V	W	H	0	0	0	1	0	0	1	0	0	1	0	1	0	1	1	0	1	0	0	0	1	0	1	1	1	1	0	0	1	1	1	1
U	V	W	H																																		
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7(a). Ans.	<p>State and prove the absorption law algebraically.</p> <p>Absorption law states that (i) $X + XY = X$ and (ii) $X(X + Y) = X$</p> <div><div><p>(i) $X + XY = X$</p><p>LHS = $X + XY = X(1 + Y)$</p><p>$= X \cdot 1$ [$1 + Y = 1$]</p><p>$= X = \text{RHS. Hence proved.}$</p></div><div><p>(ii) $X(X + Y) = X$</p><p>LHS = $X(X + Y) = X \cdot X + XY$</p><p>$= X + XY$</p><p>$= X(1 + Y)$</p><p>$= X \cdot 1$</p><p>$= X = \text{RHS. Hence proved.}$</p></div></div>																																				
7(b). Ans.	<p>Given the following truth table, derive a sum of product (SOP) and Product of Sum (POS) form of Boolean expression from it :</p> <table><tr><th>A</th><th>B</th><th>C</th><th>G(A, B, C)</th></tr><tr><td>0</td><td>0</td><td>0</td><td>0</td></tr><tr><td>0</td><td>0</td><td>1</td><td>1</td></tr><tr><td>0</td><td>1</td><td>0</td><td>1</td></tr><tr><td>0</td><td>1</td><td>1</td><td>0</td></tr><tr><td>1</td><td>0</td><td>0</td><td>0</td></tr><tr><td>1</td><td>0</td><td>1</td><td>1</td></tr><tr><td>1</td><td>1</td><td>0</td><td>0</td></tr><tr><td>1</td><td>1</td><td>1</td><td>1</td></tr></table> <p>The desired Canonical Sum-of-Product form is as following;</p> <p>$G = \sum(1, 2, 5, 7) = A'B'C + A'BC' + AB'C + ABC$</p> <p>The desired Canonical Product-of-Sum form is as following;</p> <p>$G = \pi(0, 3, 4, 6) = (A + B + C)(A + B' + C')(A' + B + C)(A' + B' + C)$</p>	A	B	C	G(A, B, C)	0	0	0	0	0	0	1	1	0	1	0	1	0	1	1	0	1	0	0	0	1	0	1	1	1	1	0	0	1	1	1	1
A	B	C	G(A, B, C)																																		
0	0	0	0																																		
0	0	1	1																																		
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1	1	0	0																																		
1	1	1	1																																		
7(c). Ans.	<p>Obtain a simplified form for the following Boolean Expression using Karnaugh's Map :</p> <p>$F(a, b, c, d) = \sum(0, 1, 2, 4, 5, 7, 8, 9, 10, 11, 14)$</p>																																				

	<div><div><div><div><div>cd</div><div>ab</div></div><div><div>[00]c'd'</div><div>[01]c'd</div><div>[11]cd</div><div>[10]cd'</div></div></div><div><div>[00]a'b'</div><div>[01]a'b</div><div>[11]ab</div><div>[10]ab'</div></div><div><table><tr><td>1</td><td>0</td><td>1</td><td>0</td><td>1</td></tr><tr><td>1</td><td>1</td><td>1</td><td>0</td><td></td></tr><tr><td>0</td><td>0</td><td>0</td><td>1</td><td></td></tr><tr><td>1</td><td>1</td><td>1</td><td>1</td><td></td></tr></table></div></div></div> <div><div>There are 3 Pairs and 2 Quads that reduce as given below: Pair-1($m_0 + m_2$) reduces to $a'b'd'$ Pair-2($m_5 + m_7$) reduces to $a'b'd$ Pair-3($m_{12} + m_{14}$) reduces to acd' Quad-1($m_0 + m_1 + m_4 + m_5$) reduces to $a'c'$ Quad-2($m_8 + m_9 + m_{10} + m_{11}$) reduces to ab' Simplified Boolean expression for given K-map is $F(a, b, c, d) = a'b'd' + a'b'd + acd' + a'c' + ab'$</div></div>	1	0	1	0	1	1	1	1	0		0	0	0	1		1	1	1	1	
1	0	1	0	1																	
1	1	1	0																		
0	0	0	1																		
1	1	1	1																		
7(d). Ans.	<div><div>Draw the logic circuit for a Half Adder using NAND gates only.</div><div><div></div><div>Half adder using NAND logic</div></div></div>																				
7(e). Ans.	<div><div>Interpret the following Logic Circuit as Boolean Expression :</div><div><div></div><div>The equivalent Boolean expression for the given Logic Circuit is: $F = (W + X').(Y' + Z)$</div></div></div>																				
8(a). Ans.	<div><div>State Absorption Laws. Verify one of the Absorption Law using truth table.</div><div>Absorption law states that (i) $X + XY = X$ and (ii) $X(X + Y) = X$ Truth Table for $X + XY = X$<table><tr><th>X</th><th>Y</th><th>XY</th><th>X + XY</th></tr><tr><td>0</td><td>0</td><td>0</td><td>0</td></tr><tr><td>0</td><td>1</td><td>0</td><td>0</td></tr><tr><td>1</td><td>0</td><td>0</td><td>1</td></tr><tr><td>1</td><td>1</td><td>1</td><td>1</td></tr></table><div>From Truth Table it is proved that $X + XY = X$</div></div></div>	X	Y	XY	X + XY	0	0	0	0	0	1	0	0	1	0	0	1	1	1	1	1
X	Y	XY	X + XY																		
0	0	0	0																		
0	1	0	0																		
1	0	0	1																		
1	1	1	1																		
8(b). Ans.	<div><div>Verify $X.Y' + Y'.Z = X.Y'.Z + X.Y'.Z' + X'.Y'.Z$ algebraically.</div><div><div>RHS = $X.Y'.Z + X.Y'.Z' + X'.Y'.Z$ $= X.Y'(Z + Z') + X'.Y'.Z$ $= X.Y' + X'.Y'.Z$ $= X.Y' + Y'(X + X'.Z)$ ($X + X' = 1$) $= X.Y' + Y'.Z$ $= \text{LHS}$</div></div></div>																				
8(c). Ans.	<div><div>Write the dual of the Boolean expression $A + B' \cdot C$</div><div>The dual of the given Boolean expression is $A.(B' + C)$</div></div>																				
8(d). Ans.	<div><div>Obtain a simplified form for a boolean expression $F(U, V, W, Z) = \sum(0, 1, 3, 4, 5, 6, 7, 9, 10, 11, 13, 15)$ using Karnaugh Map.</div><div><div><div><div><div>wz</div><div>uv</div></div><div><div>[00]w'z'</div><div>[01]w'z</div><div>[11]wz</div><div>[10]wz'</div></div></div><div><div>[00]u'v'</div><div>[01]u'v</div><div>[11]uv</div><div>[10]uv'</div></div><div><table><tr><td>1</td><td>1</td><td>1</td><td>0</td></tr><tr><td>1</td><td>1</td><td>1</td><td>1</td></tr><tr><td>0</td><td>1</td><td>1</td><td>0</td></tr><tr><td>0</td><td>1</td><td>1</td><td>1</td></tr></table></div></div></div><div><div>There are 3 Pairs and 1 Octet that reduce as given below: Pair-1($m_0 + m_4$) reduces to $U'W'Z'$ Pair-2($m_6 + m_7$) reduces to $U'VW$ Pair-3($m_{10} + m_{11}$) reduces to $UV'W$ Octet ($m_1 + m_3 + m_5 + m_7 + m_9 + m_{11} + m_{13} + m_{15}$) reduces to Z Simplified Boolean expression for given K-map is $F(U, V, W, Z) = U'W'Z' + U'VW + UV'W + Z$</div></div></div>	1	1	1	0	1	1	1	1	0	1	1	0	0	1	1	1				
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0	1	1	1																		
8(e).	<div><div>Represent the Boolean expression $X \cdot Y' + Z$ with the help of NOR gates only.</div></div>																				

Ans.																																																																																																																																																										
8(f).	<p>Write the Product of Sum form of the function $H(U, V, W)$, truth table representation of H is as follows :</p> <table><tr><th>U</th><th>V</th><th>W</th><th>H</th></tr><tr><td>0</td><td>0</td><td>0</td><td>1</td></tr><tr><td>0</td><td>0</td><td>1</td><td>1</td></tr><tr><td>0</td><td>1</td><td>0</td><td>0</td></tr><tr><td>0</td><td>1</td><td>1</td><td>1</td></tr><tr><td>1</td><td>0</td><td>0</td><td>0</td></tr><tr><td>1</td><td>0</td><td>1</td><td>1</td></tr><tr><td>1</td><td>1</td><td>0</td><td>0</td></tr><tr><td>1</td><td>1</td><td>1</td><td>0</td></tr></table>	U	V	W	H	0	0	0	1	0	0	1	1	0	1	0	0	0	1	1	1	1	0	0	0	1	0	1	1	1	1	0	0	1	1	1	0																																																																																																																					
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Ans.	<p>The desired Canonical Product-of-Sum form is as following; $H = \pi(2, 4, 6, 7) = (U + V' + W)(U' + V + W)(U' + V' + W)(U' + V' + W')$</p>																																																																																																																																																									
9(a).	<p>State the distributive law and verify the law using truth table.</p>																																																																																																																																																									
Ans.	<p>Distributive law state that (a) $X(Y + Z) = XY + XZ$ (b) $X + YZ = (X + Y)(X + Z)$ (a) $X(Y + Z) = XY + XZ$ To prove this law, we will make a following truth table :</p> <table><tr><th>X</th><th>Y</th><th>Z</th><th>Y + Z</th><th>XY</th><th>XZ</th><th>X(Y + Z)</th><th>XY + XZ</th></tr><tr><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td></tr><tr><td>0</td><td>0</td><td>1</td><td>1</td><td>0</td><td>0</td><td>0</td><td>0</td></tr><tr><td>0</td><td>1</td><td>0</td><td>1</td><td>0</td><td>0</td><td>0</td><td>0</td></tr><tr><td>0</td><td>1</td><td>1</td><td>1</td><td>0</td><td>0</td><td>0</td><td>0</td></tr><tr><td>1</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td></tr><tr><td>1</td><td>0</td><td>1</td><td>1</td><td>0</td><td>1</td><td>1</td><td>1</td></tr><tr><td>1</td><td>1</td><td>0</td><td>1</td><td>1</td><td>0</td><td>1</td><td>1</td></tr><tr><td>1</td><td>1</td><td>1</td><td>1</td><td>1</td><td>1</td><td>1</td><td>1</td></tr></table> <p>From truth table it is prove that $X(Y + Z) = XY + XZ$ (b) $X + YZ = (X + Y)(X + Z)$</p> <table><tr><th>X</th><th>Y</th><th>Z</th><th>YZ</th><th>X + YZ</th><th>XZ</th><th>X + Y</th><th>X + Z</th><th>(X + Y)(X + Z)</th></tr><tr><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td></tr><tr><td>0</td><td>0</td><td>1</td><td>0</td><td>0</td><td>0</td><td>0</td><td>1</td><td>0</td></tr><tr><td>0</td><td>1</td><td>0</td><td>0</td><td>0</td><td>0</td><td>1</td><td>0</td><td>0</td></tr><tr><td>0</td><td>1</td><td>1</td><td>1</td><td>1</td><td>0</td><td>1</td><td>1</td><td>1</td></tr><tr><td>1</td><td>0</td><td>0</td><td>0</td><td>1</td><td>0</td><td>1</td><td>1</td><td>1</td></tr><tr><td>1</td><td>0</td><td>1</td><td>0</td><td>1</td><td>1</td><td>1</td><td>1</td><td>1</td></tr><tr><td>1</td><td>1</td><td>0</td><td>0</td><td>1</td><td>0</td><td>1</td><td>1</td><td>1</td></tr><tr><td>1</td><td>1</td><td>1</td><td>1</td><td>1</td><td>1</td><td>1</td><td>1</td><td>1</td></tr></table> <p>From truth table it is prove that $X + YZ = (X + Y)(X + Z)$</p>	X	Y	Z	Y + Z	XY	XZ	X(Y + Z)	XY + XZ	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	1	0	1	0	0	0	0	0	1	1	1	0	0	0	0	1	0	0	0	0	0	0	0	1	0	1	1	0	1	1	1	1	1	0	1	1	0	1	1	1	1	1	1	1	1	1	1	X	Y	Z	YZ	X + YZ	XZ	X + Y	X + Z	(X + Y)(X + Z)	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	1	0	0	0	0	1	0	0	0	1	1	1	1	0	1	1	1	1	0	0	0	1	0	1	1	1	1	0	1	0	1	1	1	1	1	1	1	0	0	1	0	1	1	1	1	1	1	1	1	1	1	1	1
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9(b).	<p>Prove $XY + YZ + Y'Z = XY + Z$, algebraically.</p>																																																																																																																																																									
Ans.	<p>LHS = $XY + YZ + Y'Z$ $= XY + Z(Y + Y')$ ($Y + Y' = 1$) $= XY + Z$</p>																																																																																																																																																									
9(c).	<p>Obtain the simplified form of a boolean expression using Karnaugh map “</p>																																																																																																																																																									
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	<div><div><div>yz</div><div>wx</div><table><tr><td></td><td>[00]y'z'</td><td>[01]y'z</td><td>[11]yz</td><td>[10]yz'</td></tr><tr><td>[00]w'x'</td><td>0₀</td><td>0₁</td><td>1₃</td><td>1₂</td></tr><tr><td>[01]w'x</td><td>0₄</td><td>0₅</td><td>0₇</td><td>1₆</td></tr><tr><td>[11]wx</td><td>0₁₂</td><td>0₁₃</td><td>0₁₅</td><td>1₁₄</td></tr><tr><td>[10]wx'</td><td>0₈</td><td>0₉</td><td>1₁₁</td><td>1₁₀</td></tr></table></div><div>There are 1 Pair and 1 Quad that reduce as given below: Pair ($m_3 + m_{11}$) reduces to $x'yz$ Quad ($m_2 + m_6 + m_{10} + m_{14}$) reduces to yz' Simplified Boolean expression for given K-map is $F(w, x, y, z) = x'yz + yz'$</div></div>		[00]y'z'	[01]y'z	[11]yz	[10]yz'	[00]w'x'	0 ₀	0 ₁	1 ₃	1 ₂	[01]w'x	0 ₄	0 ₅	0 ₇	1 ₆	[11]wx	0 ₁₂	0 ₁₃	0 ₁₅	1 ₁₄	[10]wx'	0 ₈	0 ₉	1 ₁₁	1 ₁₀											
	[00]y'z'	[01]y'z	[11]yz	[10]yz'																																	
[00]w'x'	0 ₀	0 ₁	1 ₃	1 ₂																																	
[01]w'x	0 ₄	0 ₅	0 ₇	1 ₆																																	
[11]wx	0 ₁₂	0 ₁₃	0 ₁₅	1 ₁₄																																	
[10]wx'	0 ₈	0 ₉	1 ₁₁	1 ₁₀																																	
9(d). Ans.	<div>Represent the Boolean expression $(X + Y)(Y + Z)(X + Z)$ with help of NOR gate only.</div> <div></div>																																				
9(e). Ans.	<div>Given the following truth table, write the products of sums form of the function $F(x, y, z)$:</div> <table><tr><th>x</th><th>y</th><th>z</th><th>F</th></tr><tr><td>0</td><td>0</td><td>0</td><td>0</td></tr><tr><td>0</td><td>0</td><td>1</td><td>1</td></tr><tr><td>0</td><td>1</td><td>0</td><td>1</td></tr><tr><td>0</td><td>1</td><td>1</td><td>0</td></tr><tr><td>1</td><td>0</td><td>0</td><td>0</td></tr><tr><td>1</td><td>0</td><td>1</td><td>1</td></tr><tr><td>1</td><td>1</td><td>0</td><td>0</td></tr><tr><td>1</td><td>1</td><td>1</td><td>1</td></tr></table> <div>The desired Canonical Product-of-Sum form is as following; $F = \pi(0, 3, 4, 6) = (x + y + z)(x + y' + z')(x' + y + z')(x' + y' + z)$</div>	x	y	z	F	0	0	0	0	0	0	1	1	0	1	0	1	0	1	1	0	1	0	0	0	1	0	1	1	1	1	0	0	1	1	1	1
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10(a). Ans.	<div>State and verify Duality principle.</div> <div>The principle of duality states that starting with a Boolean relation, another Boolean relation can be derived by : 1. Changing each OR sign(+) to an AND sign(.). 2. Changing each AND sign(.) to an OR sign(+). 3. Replacing each 0 by 1 and each 1 by 0. For example postulate II states (a) $0 + 0 = 0$ (b) $0 + 1 = 1$ (c) $1 + 0 = 1$ (d) $1 + 1 = 1$ Now according to principle of duality we changed '+' to '.' and 0 to 1. These become (i) $1 . 1 = 1$ (ii) $1 . 0 = 0$ (iii) $0 . 1 = 0$ (iv) $0 . 0 = 0$,which are same as postulate III. So i, ii, iii, iv are duals of a, b, c, d.</div>																																				
10(b). Ans.	<div>Prove algebraically $x'y'z' + x'y'z + x'yz + x'yz' + xy'z' + xy'z = x' + y'$</div> <div>LHS = $x'y'z' + x'y'z + x'yz + x'yz' + xy'z' + xy'z$ $= x'y'(z' + z) + x'y(z + z') + xy'(z' + z)$ ($z' + z = 1, z + z' = 1$) $= x'y' + x'y + xy'$ $= x'(y' + y) + xy'$ $= x' + xy'$ ($y' + y = 1$) $= x' + (x')'y'$ ($x = (x')'$) $= x' + y'$ ($a + a'b = a + b$ $x' + xy' = x' + y'$) $= \text{RHS}$</div>																																				
10(c). Ans.	<div>If $F(a, b, c, d) = \sum(0, 1, 3, 4, 5, 7, 8, 9, 11, 12, 13, 15)$, obtain the simplified form using K-Map.</div> <div><div><div>cd</div><div>ab</div><table><tr><td></td><td>[00]c'd'</td><td>[01]c'd</td><td>[11]cd</td><td>[10]cd'</td></tr><tr><td>[00]a'b'</td><td>1₀</td><td>1₁</td><td>1₃</td><td>0₂</td></tr><tr><td>[01]a'b</td><td>1₄</td><td>1₅</td><td>1₇</td><td>0₆</td></tr><tr><td>[11]ab</td><td>1₁₂</td><td>1₁₃</td><td>1₁₅</td><td>0₁₄</td></tr><tr><td>[10]ab'</td><td>1₈</td><td>1₉</td><td>1₁₁</td><td>0₁₀</td></tr></table></div><div>There are 1 Quad and 1 Octet that reduce as given below: Pair ($m_3 + m_7 + m_{11} + m_{15}$) reduces to cd Quad ($m_0 + m_1 + m_4 + m_5 + m_8 + m_9 + m_{12} + m_{13}$) reduces to c' Simplified Boolean expression for given K-map is $F(a, b, c, d) = cd + c'$</div></div>		[00]c'd'	[01]c'd	[11]cd	[10]cd'	[00]a'b'	1 ₀	1 ₁	1 ₃	0 ₂	[01]a'b	1 ₄	1 ₅	1 ₇	0 ₆	[11]ab	1 ₁₂	1 ₁₃	1 ₁₅	0 ₁₄	[10]ab'	1 ₈	1 ₉	1 ₁₁	0 ₁₀											
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[00]a'b'	1 ₀	1 ₁	1 ₃	0 ₂																																	
[01]a'b	1 ₄	1 ₅	1 ₇	0 ₆																																	
[11]ab	1 ₁₂	1 ₁₃	1 ₁₅	0 ₁₄																																	
[10]ab'	1 ₈	1 ₉	1 ₁₁	0 ₁₀																																	
10(d).	<div>Seven inverters are cascaded one after another. What is the output if the input is 1?</div>																																				

Ans.	0																																																																
10(e).	<p>Given the following circuit :</p> <div></div> <p>What is the output if (i) both inputs are FALSE (ii) one is FALSE and the other is TRUE ?</p>																																																																
Ans.	(i) FALSE (ii) FALSE																																																																
11(a).	<p>State and verify Absorption law in Boolean Algebra.</p>																																																																
Ans.	<p>Absorption law states that (i) $X + XY = X$ and (ii) $X(X + Y) = X$</p> <table><tr><th colspan="4">Truth Table for $X + XY = X$</th><th colspan="4">Truth Table for $X(X + Y) = X$</th></tr><tr><th>X</th><th>Y</th><th>XY</th><th>$X + XY$</th><th>X</th><th>Y</th><th>$X + Y$</th><th>$X(X + Y)$</th></tr><tr><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td></tr><tr><td>0</td><td>1</td><td>0</td><td>0</td><td>0</td><td>1</td><td>1</td><td>0</td></tr><tr><td>1</td><td>0</td><td>0</td><td>1</td><td>1</td><td>0</td><td>1</td><td>1</td></tr><tr><td>1</td><td>1</td><td>1</td><td>1</td><td>1</td><td>1</td><td>1</td><td>1</td></tr></table> <p>From Truth Table it is proved that $X + XY = X$</p> <p>From Truth Table it is proved that $X(X + Y) = X$</p>	Truth Table for $X + XY = X$				Truth Table for $X(X + Y) = X$				X	Y	XY	$X + XY$	X	Y	$X + Y$	$X(X + Y)$	0	0	0	0	0	0	0	0	0	1	0	0	0	1	1	0	1	0	0	1	1	0	1	1	1	1	1	1	1	1	1	1																
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0	0	0	0	0	0	0	0																																																										
0	1	0	0	0	1	1	0																																																										
1	0	0	1	1	0	1	1																																																										
1	1	1	1	1	1	1	1																																																										
11(b).	<p>Draw a Logical Circuit Diagram for the following Boolean Expression : $A \cdot (B + C')$</p>																																																																
Ans.	<div></div>																																																																
11(c).	<p>Convert the following Boolean expression into its equivalent Canonical Product of Sum Form(POS) :</p> <p>$A \cdot B' \cdot C + A' \cdot B \cdot C + A' \cdot B \cdot C'$</p>																																																																
Ans.	<p>Given $A \cdot B' \cdot C + A' \cdot B \cdot C + A' \cdot B \cdot C'$</p> <p>$(1\ 0\ 1)\ (0\ 1\ 1)\ (0\ 1\ 0)$</p> <p>$= m_5 + m_3 + m_2$</p> <p>$= \sum(2, 3, 5)$</p> <p>$\Rightarrow$ POS is equal to (excluding positions of minterms)</p> <p>$= \pi(0, 1, 4, 6, 7)$</p> <p>$= M_0 \cdot M_1 \cdot M_4 \cdot M_6 \cdot M_7$</p> <p>$= (A + B + C) \cdot (A + B + C') \cdot (A' + B + C) \cdot (A' + B' + C) \cdot (A' + B' + C')$</p>																																																																
11(d).	<p>Reduce the following Boolean expression using K-map:</p> <p>$F(A, B, C, D) = \sum(0, 1, 2, 4, 5, 8, 9, 10, 11)$</p>																																																																
Ans.	<div><table><tr><th>AB \ CD</th><th>[00]C'D'</th><th>[01]C'D</th><th>[11]CD</th><th>[10]CD'</th></tr><tr><th>[00]A'B'</th><td>1₀</td><td>1₁</td><td>0₃</td><td>1₂</td></tr><tr><th>[01]A'B</th><td>1₄</td><td>1₅</td><td>0₇</td><td>0₆</td></tr><tr><th>[11]AB</th><td>0₁₂</td><td>0₁₃</td><td>0₁₅</td><td>0₁₄</td></tr><tr><th>[10]AB'</th><td>1₈</td><td>1₉</td><td>1₁₁</td><td>1₁₀</td></tr></table><p>There are 1 Pair and 2 Quad that reduce as given below: Pair ($m_2 + m_{10}$) reduces to $B'CD'$ Quad-1 ($m_0 + m_1 + m_4 + m_5$) reduces to $A'C'$ Quad-2 ($m_8 + m_9 + m_{10} + m_{11}$) reduces to AB' Simplified Boolean expression for given K-map is $F(A, B, C, D) = B'CD' + A'C' + AB'$</p></div>	AB \ CD	[00]C'D'	[01]C'D	[11]CD	[10]CD'	[00]A'B'	1 ₀	1 ₁	0 ₃	1 ₂	[01]A'B	1 ₄	1 ₅	0 ₇	0 ₆	[11]AB	0 ₁₂	0 ₁₃	0 ₁₅	0 ₁₄	[10]AB'	1 ₈	1 ₉	1 ₁₁	1 ₁₀																																							
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12(a).	<p>State and verify Distributive law in Boolean Algebra.</p>																																																																
Ans.	<p>Distributive law state that (a) $X(Y + Z) = XY + XZ$ (b) $X + YZ = (X + Y)(X + Z)$</p> <p>(a) $X(Y + Z) = XY + XZ$</p> <p>To prove this law, we will make a following truth table :</p> <table><tr><th>X</th><th>Y</th><th>Z</th><th>$Y + Z$</th><th>XY</th><th>XZ</th><th>$X(Y + Z)$</th><th>$XY + XZ$</th></tr><tr><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td></tr><tr><td>0</td><td>0</td><td>1</td><td>1</td><td>0</td><td>0</td><td>0</td><td>0</td></tr><tr><td>0</td><td>1</td><td>0</td><td>1</td><td>0</td><td>0</td><td>0</td><td>0</td></tr><tr><td>0</td><td>1</td><td>1</td><td>1</td><td>0</td><td>0</td><td>0</td><td>0</td></tr><tr><td>1</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td></tr><tr><td>1</td><td>0</td><td>1</td><td>1</td><td>0</td><td>1</td><td>1</td><td>1</td></tr><tr><td>1</td><td>1</td><td>0</td><td>1</td><td>1</td><td>0</td><td>1</td><td>1</td></tr></table>	X	Y	Z	$Y + Z$	XY	XZ	$X(Y + Z)$	$XY + XZ$	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	1	0	1	0	0	0	0	0	1	1	1	0	0	0	0	1	0	0	0	0	0	0	0	1	0	1	1	0	1	1	1	1	1	0	1	1	0	1	1
X	Y	Z	$Y + Z$	XY	XZ	$X(Y + Z)$	$XY + XZ$																																																										
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1	1	1	1	1	1	1	1
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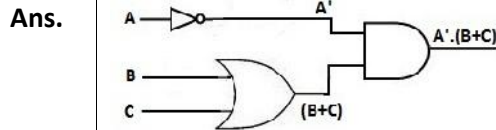
From truth table it is prove that $X(Y + Z) = XY + XZ$

(b) $X + YZ = (X + Y)(X + Z)$

X	Y	Z	YZ	X + YZ	XZ	X + Y	X + Z	(X + Y)(X + Z)
0	0	0	0	0	0	0	0	0
0	0	1	0	0	0	0	1	0
0	1	0	0	0	0	1	0	0
0	1	1	1	1	0	1	1	1
1	0	0	0	1	0	1	1	1
1	0	1	0	1	1	1	1	1
1	1	0	0	1	0	1	1	1
1	1	1	1	1	1	1	1	1

From truth table it is prove that $X + YZ = (X + Y)(X + Z)$

12(b). Draw a Logical Circuit Diagram for the following Boolean Expression: $A' \cdot (B + C)$



12(c). Convert the following Boolean expression into its equivalent Canonical Sum of Product Form(SOP).

$$(U' + V' + W') \cdot (U + V' + W') \cdot (U + V + W)$$

Ans. Given $(U' + V' + W') \cdot (U + V' + W') \cdot (U + V + W)$

$$(1 + 1 + 1) (0 + 1 + 1) (0 + 0 + 0)$$

$$= M_0 \cdot M_3 \cdot M_7$$

$$= \pi(0, 3, 7)$$

\Rightarrow SOP is equal to(excluding position of Maxterms)

$$= \sum(1, 2, 4, 5, 6)$$

$$= m_1 + m_2 + m_4 + m_5 + m_6$$

$$= U'V'W + U'VW' + UV'W' + UVW + UVW'$$

12(d). Reduce the following Boolean expression using K-map:

$$F(A, B, C, D) = \sum(0, 3, 4, 5, 7, 9, 11, 12, 13, 14)$$

Ans. There are 4 Pair and 1 Quad that reduce as given below:

AB \ CD	[00]C'D'	[01]C'D	[11]CD	[10]CD'
[00]A'B'	0	1	1	0
[01]A'B	1	1	1	0
[11]AB	1	1	0	1
[10]AB'	0	1	1	0

Pair-1($m_4 + m_5$) reduces to $A'BC'$

Pair-2($m_7 + m_{13}$) reduces to $A'CD$

Pair-3($m_9 + m_{11}$) reduces to $AB'D$

Pair-4($m_{12} + m_{14}$) reduces to ABD'

Quad($m_1 + m_5 + m_9 + m_{13}$) reduces to $C'D$

Simplified Boolean expression for given K-map is

$$F(A, B, C, D) = A'BC' + A'CD + AB'D + ABD' + C'D$$

13(a). Verify the following algebraically: $X' \cdot Y + X \cdot Y' = (X' + Y') \cdot (X + Y)$

Ans. RHS = $(X' + Y') \cdot (X + Y)$

$$= (X' + Y') \cdot X + (X' + Y') \cdot Y$$

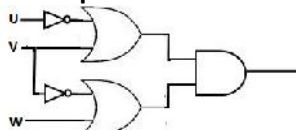
$$= X' \cdot X + X \cdot Y' + X' \cdot Y + Y' \cdot Y$$

$$= 0 + X \cdot Y' + X' \cdot Y + 0$$

$$= X \cdot Y' + X' \cdot Y$$

$$= \text{LHS (Verified)}$$

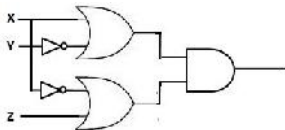
13(b). Write the equivalent Boolean Expression for the following Logic Circuit.

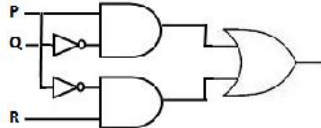
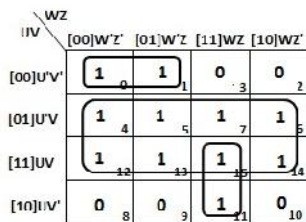


Ans. The equivalent Boolean Expression for the given Logic Circuit is: $F = (U' + V) \cdot (V' + W)$

13(c). Write the SOP form of a Boolean function G, which is represented in a truth table as follows:

P	Q	R	G
0	0	0	0

		<table><tr><td>0</td><td>0</td><td>1</td><td>0</td></tr><tr><td>0</td><td>1</td><td>0</td><td>1</td></tr><tr><td>0</td><td>1</td><td>1</td><td>1</td></tr><tr><td>1</td><td>0</td><td>0</td><td>1</td></tr><tr><td>1</td><td>0</td><td>1</td><td>0</td></tr><tr><td>1</td><td>1</td><td>0</td><td>1</td></tr><tr><td>1</td><td>1</td><td>1</td><td>1</td></tr></table>	0	0	1	0	0	1	0	1	0	1	1	1	1	0	0	1	1	0	1	0	1	1	0	1	1	1	1	1																					
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Ans.	The desired Canonical Sum-of-Product form is as following; $G = \sum(2, 3, 4, 6, 7) = P'QR' + P'QR + PQ'R' + PQR' + PQR$																																																		
13(d). Ans.	<div>Reduce the following Boolean expression using K-map: $F(A, B, C, D) = \sum(3, 4, 5, 6, 7, 13, 15)$</div> <div><table><tr><td>AB \ CD</td><td>00</td><td>01</td><td>11</td><td>10</td></tr><tr><td>00</td><td>0</td><td>0</td><td>1</td><td>0</td></tr><tr><td>01</td><td>1</td><td>1</td><td>1</td><td>1</td></tr><tr><td>11</td><td>0</td><td>1</td><td>1</td><td>0</td></tr><tr><td>10</td><td>0</td><td>0</td><td>0</td><td>0</td></tr></table><p>There are 2 Pair and 1 Quad that reduce as given below: Pair-1($m_3 + m_7$) reduces to $A'CD$ Pair-2($m_4 + m_6$) reduces to $A'BD'$ Quad($m_1 + m_5 + m_9 + m_{13}$) reduces to BD Simplified Boolean expression for given K-map is $F(A, B, C, D) = A'CD + A'BD' + BD$</p></div>			AB \ CD	00	01	11	10	00	0	0	1	0	01	1	1	1	1	11	0	1	1	0	10	0	0	0	0																							
AB \ CD	00	01	11	10																																															
00	0	0	1	0																																															
01	1	1	1	1																																															
11	0	1	1	0																																															
10	0	0	0	0																																															
14(a). Ans.	<div>Verify $X'Y + XY' + X'Y' = (X' + Y')$ using truth table.</div> <table><tr><th>X</th><th>Y</th><th>X'</th><th>Y'</th><th>X'Y</th><th>XY'</th><th>X'Y'</th><th>X'Y + XY' + X'Y'</th><th>X' + Y'</th></tr><tr><td>0</td><td>0</td><td>1</td><td>1</td><td>0</td><td>0</td><td>1</td><td>1</td><td>1</td></tr><tr><td>0</td><td>1</td><td>1</td><td>0</td><td>1</td><td>0</td><td>0</td><td>1</td><td>1</td></tr><tr><td>1</td><td>0</td><td>0</td><td>1</td><td>0</td><td>1</td><td>0</td><td>1</td><td>1</td></tr><tr><td>1</td><td>1</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td></tr></table> <p>From Truth Table it is proved that $X'Y + XY' + X'Y' = (X' + Y')$</p>			X	Y	X'	Y'	X'Y	XY'	X'Y'	X'Y + XY' + X'Y'	X' + Y'	0	0	1	1	0	0	1	1	1	0	1	1	0	1	0	0	1	1	1	0	0	1	0	1	0	1	1	1	1	0	0	0	0	0	0	0			
X	Y	X'	Y'	X'Y	XY'	X'Y'	X'Y + XY' + X'Y'	X' + Y'																																											
0	0	1	1	0	0	1	1	1																																											
0	1	1	0	1	0	0	1	1																																											
1	0	0	1	0	1	0	1	1																																											
1	1	0	0	0	0	0	0	0																																											
14(b). Ans.	<div>Write the equivalent Boolean Expression for the following Logic Circuit.</div> <div></div> <p>The equivalent Boolean Expression for the given Logic Circuit is: $F = (X + Y).(X' + Z)$</p>																																																		
14(c). Ans.	<div>Write the POS form of a Boolean function H, which is represented in a truth table as follows:</div> <table><tr><th>A</th><th>B</th><th>C</th><th>H</th></tr><tr><td>0</td><td>0</td><td>0</td><td>0</td></tr><tr><td>0</td><td>0</td><td>1</td><td>1</td></tr><tr><td>0</td><td>1</td><td>0</td><td>1</td></tr><tr><td>0</td><td>1</td><td>1</td><td>1</td></tr><tr><td>1</td><td>0</td><td>0</td><td>1</td></tr><tr><td>1</td><td>0</td><td>1</td><td>0</td></tr><tr><td>1</td><td>1</td><td>0</td><td>0</td></tr><tr><td>1</td><td>1</td><td>1</td><td>1</td></tr></table> <p>The desired Canonical Product-of-Sum form is as following; $H = \pi(0, 5, 6) = (A + B + C).(A' + B + C').(A' + B' + C)$</p>			A	B	C	H	0	0	0	0	0	0	1	1	0	1	0	1	0	1	1	1	1	0	0	1	1	0	1	0	1	1	0	0	1	1	1	1												
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14(d). Ans.	<div>Reduce the following Boolean expression using K-map:</div> <div>$F(P, Q, R, S) = \sum(1, 2, 3, 4, 5, 6, 7, 9, 11, 12, 13, 15)$</div> <div><table><tr><td>PQ \ RS</td><td>00</td><td>01</td><td>11</td><td>10</td></tr><tr><td>00</td><td>0</td><td>1</td><td>1</td><td>1</td></tr><tr><td>01</td><td>1</td><td>1</td><td>1</td><td>1</td></tr><tr><td>11</td><td>1</td><td>1</td><td>1</td><td>0</td></tr><tr><td>10</td><td>0</td><td>1</td><td>1</td><td>0</td></tr></table><p>There are 2 Pair and 1 Octet that reduce as given below: Pair-1($m_2 + m_6$) reduces to $QR'S'$ Pair-2($m_4 + m_{12}$) reduces to $P'RS'$ Octet ($m_1 + m_3 + m_5 + m_7 + m_9 + m_{11} + m_{13} + m_{15}$) reduces to S Simplified Boolean expression for given K-map is $F(P, Q, R, S) = QR'S' + P'RS' + S$</p></div>			PQ \ RS	00	01	11	10	00	0	1	1	1	01	1	1	1	1	11	1	1	1	0	10	0	1	1	0																							
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15(a). Ans.	<div>State and verify absorption law using truth table.</div> <p>Absorption law states that (i) $X + XY = X$ and (ii) $X(X + Y) = X$</p> <table><tr><th colspan="4">Truth Table for $X + XY = X$</th><th colspan="4">Truth Table for $X(X + Y) = X$</th></tr><tr><th>X</th><th>Y</th><th>XY</th><th>X + XY</th><th>X</th><th>Y</th><th>X + Y</th><th>X(X + Y)</th></tr><tr><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td></tr><tr><td>0</td><td>1</td><td>0</td><td>0</td><td>0</td><td>1</td><td>1</td><td>0</td></tr><tr><td>1</td><td>0</td><td>0</td><td>1</td><td>1</td><td>0</td><td>1</td><td>1</td></tr><tr><td>1</td><td>1</td><td>1</td><td>1</td><td>1</td><td>1</td><td>1</td><td>1</td></tr></table>			Truth Table for $X + XY = X$				Truth Table for $X(X + Y) = X$				X	Y	XY	X + XY	X	Y	X + Y	X(X + Y)	0	0	0	0	0	0	0	0	0	1	0	0	0	1	1	0	1	0	0	1	1	0	1	1	1	1	1	1	1	1	1	1
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Ans.	<p>The desired Canonical Product-of-Sum form is as following; $G = \pi(2, 3, 6) = (U + V' + W).(U + V' + W').(U' + V' + W)$</p>																																					
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Ans.		<p>There are 2 Pair and 1 Octet that reduce as given below: Pair-1($m_0 + m_1$) reduces to $U'V'W'$ Pair-2($m_{11} + m_{15}$) reduces to UWZ Octet ($m_4 + m_5 + m_6 + m_7 + m_{12} + m_{13} + m_{14} + m_{15}$) reduces to V Simplified Boolean expression for given K-map is $F(U, V, W, Z) = U'V'W' + UWZ + V$</p>																																				

NOTE: “ ‘ ” is used instead of “ ” .

COMMUNICATION AND NETWORK CONCEPTS

TYPE A: VERY SHORT ANSWER QUESTION

1. Ans.	Define a network. What is its need? A network is an interconnected collection of autonomous computer that can share and exchange information. Need for networking: <ul style="list-style-type: none">• Resource sharing (Processing, Peripherals, Information and software)• Communication between computers
2. Ans.	Write two advantage and disadvantage of networks. Advantage: <ul style="list-style-type: none">• We can share resources such as printers and scanners.• Can share data and access file from any computer. Disadvantage: <ul style="list-style-type: none">• Server faults stop applications from being available.• Network faults can cause loss of data.
3. Ans.	What is ARPAnet ? What is NSFnet ? ARPAnet (Advanced Research Project Agency Network) is a project sponsored by U. S. Department of Defense. NSFnet was developed by the National Science Foundation which was high capacity network and strictly used for academic and engineering research.
4. Ans.	What do you understand by InterSpace? Interspace is a client/server software program that allows multiple users to communicate online with real-time audio, video and text chat in dynamic 3D environments.
5. Ans.	Name two switching circuits and explain any one. The two switching circuits are <ul style="list-style-type: none">• Circuit Switching• Message Switching Circuit Switching - In this technique, first the complete physical connection between two computers is established and then data are transmitted from the source computer to the destination computer.
6. Ans.	What is communication channel? Name the basic types of communication channels available. Communication channel means the connecting cables that link various workstations. Following are three basic types of communication channels available: <ul style="list-style-type: none">a) Twisted-Pair Cablesb) Coaxial Cablesc) Fiber-optic Cables
7. Ans.	Define baud, bps and Bps. How are these interlinked? Baud is a unit of measurement for the information carrying capacity of a communication channel. bps - bits per second. It refers to a thousand bits transmitted per second. Bps - Bytes per second. It refers to a thousand bytes transmitted per second. All these terms are measurement units used to refer to the amount of information travelling through a single channel at any one point of time.
8. Ans.	What are the various types of networks? There are three types of networks : <ul style="list-style-type: none">i. Local Area Networks (LANs)ii. Metropolitan Area Network (MAN)iii. Wide Area Networks (WAN)
9. Ans.	What is the difference between MAN and WAN? <ul style="list-style-type: none">✓ MANs are the networks that link computer facilities within a city.✓ WANs are the networks spread over large distances.
10. Ans.	What is meant by topology? Name some popular topologies. Topology refers to the way in which the workstations attached to the network are interconnected. The most popular topologies are :

	(a) Bus or Linear Topology (b) Ring Topology (c) Star Topology (d) Tree Topology						
11. Ans.	What are the factors that must be considered before making a choice for the topology? There are number of factors to consider in before making a choice for the topology, the most important of which are as following : (a) Cost. (b) Flexibility (c) Reliability						
12. Ans.	What are the similarities and differences between bus and tree topologies? Similarities : ✓ In both Bus and Tree topologies transmission can be done in both the directions, and can be received by all other stations. ✓ In both cases, there is no need to remove packets from the medium. Differences : ✓ Bus topology is slower as compared to tree topology of network. ✓ Tree topology is expensive as compared to Bus Topology						
13. Ans.	What are the limitations of star topology? ✓ Requires more cable length than a linear topology. ✓ If the hub, switch, or concentrator fails, nodes attached are disabled. ✓ More expensive than linear bus topologies because of the cost of the hubs, etc.						
14. Ans.	When do you think, ring topology becomes the best choice for a network? Ring topology becomes the best choice for a network when, ✓ Short amount of cable is required. ✓ No wiring closet space requires.						
15. Ans.	Write the two advantages and two disadvantages of Bus Topology in network. Advantage: ✓ Easy to connect a computer or peripheral to a linear bus. ✓ Requires less cable length than a star topology. Disadvantage : ✓ Slower as compared to tree and star topologies of network ✓ Breakage of wire at any point disturbs the entire network						
16. Ans.	Briefly mention two advantages and two disadvantages of Star Topology in network. Advantage: ✓ Easy to install and wire. ✓ No disruptions to the network when connecting or removing devices. Disadvantage : ✓ Requires more cable length than a linear topology. ✓ If the hub, switch, or concentrator fails, nodes attached are disabled.						
17. Ans.	Give two advantages and two disadvantages of following network topologies : (i)Star (ii)Tree <table border="1"> <thead> <tr> <th><u>Star Topology</u></th><th><u>Tree Topology</u></th></tr> </thead> <tbody> <tr> <td> Advantage : ✓ Easy to install and wire. ✓ No disruptions to the network when connecting or removing devices. </td><td> Advantage : ✓ Faster as compared to Bus Topology. ✓ Easier to set-up for multi-floor plans of network. </td></tr> <tr> <td> Disadvantage : ✓ Requires more cable length than a linear topology. ✓ Expensive as compared to Bus Topology </td><td> Disadvantage : ✓ Slower as compared to Star Topology. ✓ Expensive as compared to Bus Topology. </td></tr> </tbody> </table>	<u>Star Topology</u>	<u>Tree Topology</u>	Advantage : ✓ Easy to install and wire. ✓ No disruptions to the network when connecting or removing devices.	Advantage : ✓ Faster as compared to Bus Topology. ✓ Easier to set-up for multi-floor plans of network.	Disadvantage : ✓ Requires more cable length than a linear topology. ✓ Expensive as compared to Bus Topology	Disadvantage : ✓ Slower as compared to Star Topology. ✓ Expensive as compared to Bus Topology.
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18.	Give two advantages and two disadvantages of following network topologies : (i)Bus (ii)Tree																				
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19.	Write two advantages and disadvantages of following : (i)Optical fibers (ii) Satellites (iii) Microwaves.																				
Ans.	Advantage : <table><tr><th>Optical fibers</th><th>Satellites</th><th>Microwaves</th></tr><tr><td>It is guarantees secure transmission.</td><td>Large area coverage of earth.</td><td>Free from land acquisition rights.</td></tr><tr><td>It is very high transmission capacity</td><td>Inexpensive compare to cable.</td><td>Ability to communicate over oceans.</td></tr></table> Disadvantage : <table><tr><th>Optical fibers</th><th>Satellites</th><th>Microwaves</th></tr><tr><td>Expensive.</td><td>Require high investment in case off failure.</td><td>Insecure Communication.</td></tr><tr><td>Hard to install.</td><td>Requires legal permissions.</td><td>Limited bandwidth.</td></tr></table>			Optical fibers	Satellites	Microwaves	It is guarantees secure transmission.	Large area coverage of earth.	Free from land acquisition rights.	It is very high transmission capacity	Inexpensive compare to cable.	Ability to communicate over oceans.	Optical fibers	Satellites	Microwaves	Expensive.	Require high investment in case off failure.	Insecure Communication.	Hard to install.	Requires legal permissions.	Limited bandwidth.
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20.	Write two disadvantages of twisted pair cables.																				
Ans.	Disadvantage : ✓ It is not capable to carrying signal to long distance. ✓ It connects only up to 100 meters.																				
21.	What is modem? Name two categories of modems.																				
Ans.	Modem is a device that converts digital communication signals to analog communication digital signals and vice versa. Following are the two categories of modems. 1) Internal Modem (Fixed with computer) 2) External Modem (Connect externally to computer).																				
22.	Define the following : (i)RJ-45 (ii)Ethernet (iii) Ethernet card (iv)hub (v)Switch																				
Ans.	(i) RJ-45: RJ45 is a standard type of connector for network cables and networks. It is an 8-pin connector usually used with Ethernet cables. (ii) Ethernet: Ethernet is a LAN architecture developed by Xerox Corp along with DEC and Intel. It uses a Bus or Star topology and supports data transfer rates of up to 10 Mbps. (iii) Ethernet card: The computers parts of Ethernet are connected through a special card called Ethernet card. It contains connections for either coaxial or twisted pair cables. (iv) Hub: In computer networking, a hub is a small, simple, low cost device that joins multiple computers together. (v) Switch: A Switch is a small hardware device that joins multiple computers together within one local area network (LAN).																				
23.	Define the following : (i)Protocol (ii) Host (iii) Repeater (iv) Bridge (v) Router (vi) Gateway.																				

Ans.	<p>(i)Protocol: A protocol is a description of the rules and message formats that computers must follow to communicate with each other.</p> <p>(ii)Host: The computer system providing the web-hosting is known as the web host. It allows their customers to place web documents onto a special type of computer called a web server.</p> <p>(iii)Repeater: It is a device that amplifies and restores the power of a signal being transmitted on the network..</p> <p>(iv)Bridge: A bridge is a device designed to connect two LAN segments. The purpose of a bridge is to filter traffic on a LAN.</p> <p>(v)Router: A router is a networking device whose software and hardware are usually tailored to the tasks of routing and forwarding information.</p> <p>(vi)Gateway: A network gateway is a computer which has internetworking capability of joining together two networks that use different base protocols.</p>
24. Ans.	<p>What is remote login? What is Telnet?</p> <p>Remote login: Remote login is the process of accessing a network from a remote place without actually being at the actual place of working.</p> <p>Telnet: Telnet is an Internet utility that lets you log onto remote computer system.</p>
25. Ans.	<p>Briefly explain file transfer protocol.</p> <ul style="list-style-type: none"> ✓ FTP stands for File Transfer Protocol. ✓ FTP can transfer any type of file between two computers. ✓ Also used as a command such as FTP ftp.cbsecsnip.in
26. Ans.	<p>What is Internet? What is E-mail?</p> <p>Internet: The Internet is a worldwide network of computer networks around the globe.</p> <p>E-mail: E-mail or electronic mail is sending and receiving of messages by a computer.</p>
27. Ans.	<p>What are the advantages of E-mail? What are the disadvantages of E-mail?</p> <p>Advantage:</p> <ul style="list-style-type: none"> ✓ Low cost. ✓ Speed. ✓ Waste reduction. <p>Disadvantage:</p> <ul style="list-style-type: none"> ✓ Computer literacy. ✓ Sent mail can be changed or deleted. ✓ Easy to sent a message that you latter regret. ✓ Hard to express emotions.
28. Ans.	<p>What is structure of an E-mail message?</p> <p>An electronic mail messages is structured very much like a paper letter.</p> <p>In mail message, there are three parts :</p> <ul style="list-style-type: none"> ✓ The header – is the envelope, ✓ The body – is the actual message, ✓ The signature – comes at the end. <p>Some common header lines include :</p> <ul style="list-style-type: none"> ✓ To: The recipient(s) of the message. ✓ Date: The date the message was sent. ✓ From: The person who sent the message. ✓ Cc: The people who were mailed copies of the message.
29. Ans.	<p>What is HTML? Where it is used?</p> <p>HTML (Hyper Text Markup Language) which is used to create Hypertext documents (web pages) for websites. HTML is the static markup language.</p> <ul style="list-style-type: none"> ✓ It is used to create Web Pages. ✓ Tells the browser how to display text, pictures and other support media. ✓ Support multimedia and new page layout features. ✓ Provides may tags for control the presentation of information on the web pages, such as <body>, , <hr> etc.

30. Ans.	<p>What is URL? What is WWW?</p> <p>URL: URL (Universal Resource Locator) specifies the distinct address for each resource on the Internet, such as ftp, http etc.</p> <p>WWW: WWW (World Wide Web) is a set of protocol that allows you to access any document on the Internet through a naming system based on URL's.</p>
31. Ans.	<p>What is protocol? Name some commonly used protocols.</p> <p>A protocol means the rules that are applicable for a network or we can say that the common set of rules used for communication in network.</p> <p>Different types of protocols are :</p> <ul style="list-style-type: none"> (i) HTTP : Hyper Text Transfer Protocol (ii) FTP : File Transfer Protocol (iii) SLIP : Serial Line Internet Protocol (iv) PPP : Point to Point Protocol (v) TCP/IP : Transmission Control Protocol/ Internet Protocol (vi) NTP : Network Time Protocol (vii) SMTP : Simple Mail Transfer Protocol (viii) POP : Post Office Protocol (ix) IMAP : Internet Mail Access Protocol
32. Ans.	<p>What is TCP/IP? What is HTTP?</p> <p>TCP/IP (Transmission Control Protocol / Internet Protocol): A protocol for communication between computers used as a standard for transmitting data over networks and is the basis for standard Internet protocols.</p> <p>HTTP(Hyper Text Transfer Protocol) : An application level protocol with the lightness and speed necessary for distributed, shared, hypermedia information systems</p>
33. Ans.	<p>Define Mobile Communication and Wireless Communication.</p> <p>Mobile Communication essentially refers to a computing device that is not continuously connected to the base or central network. This may include laptops, newly created smart phones and also PDA's.</p> <p>Wireless Communication is simply data communication without the use of a landline. This may involve a cellular telephone, a two way radio, a fixed wireless connection, a laser, or satellite communications.</p>
34. Ans.	<p>Define GSM, CDMA, and WLL.</p> <p>GSM: GSM (Global system for mobile communication) is a wide area wireless communications System that uses digital radio transmission to provide voice data and multimedia communication services. A GSM system coordinates the communication between mobile telephones, base stations, and switching systems.</p> <p>CDMA: CDMA (Code Division Multiple Access) is a digital wireless telephony transmission technique, which allows multiple frequencies to be used simultaneously – Spread Spectrum.</p> <p>WLL: WLL (Wireless in Local Loop) is a system that connects subscriber to the public switched telephone network (PSTN) using radio signal as alternate for other connecting media.</p>
35. Ans.	<p>Define the following: (i)3G (ii)EDGE (iii)SMS (iv)TDMA</p> <p>(i) 3G: 3G (Third Generation) mobile communication technology is a broadband, packet-based transmission of text, digitized voice, video and multimedia at data rates up to 2 mbps, offering a consistent set of services to mobile computer and phone users no matter where they are located in the world.</p> <p>(ii)EDGE: EDGE (Enhanced Data rates for Global Evolution) is radio based high-speed of mobile data standard, developed specifically to meet the bandwidth needs of 3G.</p> <p>(iii)SMS: SMS (Short Message Service) is the transmission of short text messages to and from a mobile phone, fax machine and IP address.</p> <p>(iv)TDMA: TDMA (Time Division Multiple Access) is a technology for delivering digital wireless service using time-division multiplexing (TDM).</p>
36. Ans.	<p>What is Voice-Mail? What is Chatting?</p> <p>Voice-Mail: The voice-mail refers to e-mail system that support audio. User can leave spoken message for one another and listen to the messages by executing the appropriate command in the e-mail system.</p> <p>Chatting: It is an application to communicate with a person, a group, or a site on the Internet in real time by typing text. The text appears on the screen(s) of all the other participants in the "chat".</p>
37.	What is Video conferencing?

Ans.	It is a conference between two or more participants at different locations over the Internet or a private network. Each user has a video camera, microphone, and speakers mounted on his or her computer. As the participants speak to one another, they hear each other's voices and see a video image of the other participant(s).															
38. Ans.	Define web browser and web server. Web Browser: A Web Browser is software which used for displaying the content on web page(s). It is used by client to view web sites. Example of Web browser – Google Chrome, Fire Fox, Internet Explorer, Safari, Opera, etc. Web Server: A Web Server is software which fulfills the request(s) done by web browser. Web server have different ports to handle different request from web browser like generally FTP request is handle at Port 110 and HTTP request is handle at Port 80. Example of Web server are – Apache, IIS															
39. Ans.	What is web hosting? Web Hosting is a means of hosting web-server application on a computer system through which electronic content on the Internet is readily available to any web- browser client.															
40. Ans.	What is hacking? Hacking is process of accessing of a computer system or network without knowing the access authorization credential of that system. Hacking can be illegal or ethical depending on the intention of the hacker.															
41. (a) Ans.	What is purpose of using a gateway in context of networking? In network gateway is used to connect dissimilar networks. It establishes an intelligent connection between a local network and external networks with completely different structures.															
(b) Ans.	Write an advantage and a disadvantage of using Optical fiber cable. <table><tr><td><u>Advantages :</u></td><td><u>Disadvantages :</u></td></tr><tr><td>✓ Secure transmission.</td><td>✓ Expensive.</td></tr><tr><td>✓ Low attenuation.</td><td>✓ Difficult to connect to fibers.</td></tr><tr><td>✓ No EMI interference.</td><td>✓ Hard to install.</td></tr><tr><td>✓ Very high transmission capacity.</td><td>✓ Noise exception.</td></tr><tr><td>✓ Used for broadband transmission and possible to mix data transmission channels with cannels for telescope, TV etc.</td><td>✓ Connection loss.</td></tr><tr><td></td><td>✓ Difficult to repair.</td></tr></table>		<u>Advantages :</u>	<u>Disadvantages :</u>	✓ Secure transmission.	✓ Expensive.	✓ Low attenuation.	✓ Difficult to connect to fibers.	✓ No EMI interference.	✓ Hard to install.	✓ Very high transmission capacity.	✓ Noise exception.	✓ Used for broadband transmission and possible to mix data transmission channels with cannels for telescope, TV etc.	✓ Connection loss.		✓ Difficult to repair.
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(c) Ans.	Write one advantage and one disadvantage of following network topologies in network : (i)BUS Topology , (ii)STAR Topology <table><tr><td><u>BUS Topology</u></td><td><u>STAR Topology</u></td></tr><tr><td>Advantage :</td><td>Advantage :</td></tr><tr><td>✓ Simple architecture.</td><td>✓ Easy to detect faults and to remove parts.</td></tr><tr><td>Disadvantage :</td><td>Disadvantage :</td></tr><tr><td>✓ Breakage of wire at any point disturbs the entire network.</td><td>✓ Expensive as compared to Bus Topology</td></tr></table>		<u>BUS Topology</u>	<u>STAR Topology</u>	Advantage :	Advantage :	✓ Simple architecture.	✓ Easy to detect faults and to remove parts.	Disadvantage :	Disadvantage :	✓ Breakage of wire at any point disturbs the entire network.	✓ Expensive as compared to Bus Topology				
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(d) Ans.	What is the difference between LAN and MAN? <table><tr><th>LAN</th><th>MAN</th></tr><tr><td>LANs are computer networks confined to a localized area such as an office or a factory.</td><td>MANs are the networks that link computer facilities within a city.</td></tr></table>		LAN	MAN	LANs are computer networks confined to a localized area such as an office or a factory.	MANs are the networks that link computer facilities within a city.										
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42. Ans.	What is the purpose of using a repeater in context of networking? Purpose of using repeater in context of networking is to amplify transmission signals when these signal become weaker due to long distance transmission.															
43. Ans.	What are cookies? Cookies are messages that a Web server transmits to a web browser so that the Web server can keep track of the user's activity on a specific Web site. Cookies are saved in form of text file in client computer.															
44. Ans.	What is cracking? How is it different from hacking? Cracking is defined as the attempt to remove the copy protections inserted into software programs. A program successfully stripped of protections is then known as having been "Cracked".															

	Some of the removed protections include: Time limits, Registration Screen, Serial Number. Hacking can be ethical/legal but cracking is totally illegal method also called piracy.
45. Ans.	What is 80 – 20 rule of network design? In a properly designed small to medium-sized network, 80 percent of the traffic on a given segment should be local, and not more than 20 percent should need to move across a backbone link.
46. Ans.	Which of the following (i) is not a broadcast device (ii) offers a dedicated bandwidth? (a) Repeater (b) bridge (c) hub (d) switch (i) Bridge (ii) Switch
47. Ans.	What is web scripting? A script is a small bit of code that enables web browsers to do something rather than just displaying static results. Scripts are used in web design to create dynamic pages. There are 2 categories of Web script Client Side Script which can be written by using JavaScript, VB Script and Server Side Script which can be written in PHP, JSP
48. Ans.	Name some web scripting languages. There are many scripting languages available today. Most common once are VBScript, JavaScript, ASP, PHP, PERL, and JSP.
49. Ans.	What is Cyber Crime? As define in Cambridge dictionary defines Cyber Crimes as Crimes committed with the use of computers or relating to computers, especially through the Internet. Universally, Cyber Crime is understood as an unlawful act where in the computer is either a tool or a target or both.
50. Ans.	When was IT Act enforced in India? In India, IT Act was enforced on 17 October 2000.

TYPE B: SHORT ANSWER QUESTION

1. Ans.	What is network? What are its goals and applications? A network is an interconnected collection of autonomous computer that can share and exchange information. <u>Network Goals</u> Following are some of the network goals : ✓ Resource Sharing ✓ Reliability ✓ Reduced costs ✓ Communication Medium <u>Application of Networks</u> Following are the some of the important applications of network : ✓ Sharing ✓ Access to remote database ✓ Communication facilities
2. Ans.	Briefly explain how Internet evolved. ✓ Evolution of networking started way back in 1969 by the development of first network called ARPANET. The goal of this project was to connect computers at U. S. defense & different universities. ✓ In 1980's, the NSFnet was started to make high-capacity network strictly for academic and engineering research ✓ In 1990sthe internetworking of ARPANET, NSFnet and other private networks resulted into Internet.
3. Ans.	Write a short note on ARPAnet. ✓ Stands for Advanced Research Project Agency Network. ✓ It is a project sponsored by U. S. Department of Defense. ✓ Planted in 1969 to connect computers at U. S. defense & different universities. ✓ The users of this system were able to exchanging data and messages, play long distance games and socialize with people who share their interests. ✓ In 1980s, NSFnet was started to make high capacity network, which are more capable than ARPANET.

	✓ In 1990s the internetworking of ARPANET, NSFnet and other private networks resulted into internet.		
4. Ans.	<p>How does Internet work?</p> <p>In Internet, most computers are not connected directly to the Internet. Rather they are connected to smaller network, which in turn are connected through gateways to the Internet backbone.</p> <p>The reason that Internet works at all is that every computer connected to it uses the same set of rules for communication called protocol.</p> <p>How Internet functions :</p> <ul style="list-style-type: none"> ✓ Firstly the information or file to be sent to another computer is divided into small parts called Packets. ✓ Each packet is given a sequential number e.g. 1, 2, 3. ✓ Then packets are sent to the address of destination computer. ✓ The destination computer receives the packets randomly. If packet is lost it is demanded again. ✓ Then packets are rearranged in their correct order and get actual information/file. 		
5. Ans.	<p>Write a short note on InterSpace.</p> <ul style="list-style-type: none"> ✓ InterSpace is a client/server software program that allows multiple users to communicate online with real-time audio, video and text chat I dynamic 3D environments. ✓ Provide most advanced form of communication. ✓ It is an application environment for interconnecting spaces to manipulate information. ✓ Vision of what Internet become, where users cross-correlates information in multiple ways from multiple sources. 		
6. Ans.	<p>How is circuit switching different from message switching?</p> <p><u>Circuit switching</u> – when communication needs to take place, a dedicated path is opened end to end for the duration of the communication session. An example would be plain old telephone service.</p> <p><u>Packet switching</u> – is taking data and breaking it into little packages, or packets. Those packets are then sent across a network. The path that those packets take are not dedicated. So, individual packets may take separate paths on the network to get to the destination. This is how the internet works.</p>		
7. Ans.	<p>How does transmission take place across networks?</p> <p>Various switching techniques are used to transmit data across networks. These are as following:</p> <ul style="list-style-type: none"> ✓ Circuit Switching. ✓ Message Switching. ✓ Packet Switching. 		
8. Ans.	<p>What are communication channels? Discuss various communication channels available for networks.</p> <p>Communication channel mean the connecting medias that link various workstations.</p> <p>Following are three basic types of communication channels available:</p> <ol style="list-style-type: none"> a) <u>Twisted-Pair Cables</u>: This cable consists of two insulated copper wires twisted around each other. These are also used for short and medium range telephone communication. b) <u>Coaxial Cables</u>: A coaxial cable consists of one or more small cables in protective covering. These are more expensive than twisted pair cables but perform better. c) <u>Fiber-optic Cables</u>: These cables are made of plastic or glass and are about as thin as human hair. These cables are highly durable and offer excellent performance but are expensive. 		
9. Ans.	<p>Write some advantages and disadvantages of following :</p> <p>(i) Optical fibres (ii) coaxial cables (iii) twisted pair cables (iv) radio waves (v) micro waves (vi) satellites.</p> <p><u>Optical Fibres</u></p> <table border="0"> <tr> <td style="vertical-align: top;"> <p><u>Advantage</u></p> <ul style="list-style-type: none"> ✓ Secure transmission. ✓ Low attenuation. ✓ No EMI interference. ✓ Very high transmission capacity. ✓ Used for broadband transmission and possible to mix data transmission channels with cannels for telescope, TV etc. </td><td style="vertical-align: top;"> <p><u>Disadvantage</u></p> <ul style="list-style-type: none"> ✓ Expensive. ✓ Difficult to connect to fibers. ✓ Hard to install. ✓ Noise exception. ✓ Connection loss. ✓ Difficult to repair. </td></tr> </table> <p><u>Coaxial Cables</u></p>	<p><u>Advantage</u></p> <ul style="list-style-type: none"> ✓ Secure transmission. ✓ Low attenuation. ✓ No EMI interference. ✓ Very high transmission capacity. ✓ Used for broadband transmission and possible to mix data transmission channels with cannels for telescope, TV etc. 	<p><u>Disadvantage</u></p> <ul style="list-style-type: none"> ✓ Expensive. ✓ Difficult to connect to fibers. ✓ Hard to install. ✓ Noise exception. ✓ Connection loss. ✓ Difficult to repair.
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	<p><u>Advantage</u></p> <ul style="list-style-type: none"> ✓ Better data transmission than twisted-pair cables. ✓ Used as source for shared cable network. ✓ Used for broadband transmission. ✓ Higher bandwidths up to 400 mbps. <p><u>Disadvantage</u></p> <ul style="list-style-type: none"> ✓ Single cable failure can take down an entire network. ✓ Expensive ✓ Not compatible with twisted pair cables. <p><u>Twisted Pair Cables</u></p> <p><u>Advantage</u></p> <ul style="list-style-type: none"> ✓ Simple. ✓ Flexible. ✓ Low weight. ✓ Inexpensive. ✓ Connected easily. ✓ Easy to install and maintain. <p><u>Disadvantage</u></p> <ul style="list-style-type: none"> ✓ Incapable for long distance. ✓ Unsuitable for long distance. ✓ Supports maximum data rates 1 mbps without conditioning and 10 mbps with conditioning. <p><u>Radio Waves</u></p> <p><u>Advantage</u></p> <ul style="list-style-type: none"> ✓ Free from land acquisition rights. ✓ Provides ease of communication over difficult terrain. ✓ Provide mobility. ✓ Inexpensive <p><u>Disadvantage</u></p> <ul style="list-style-type: none"> ✓ Insecure communication. ✓ Susceptible to weather effects. <p><u>Micro Waves</u></p> <p><u>Advantage</u></p> <ul style="list-style-type: none"> ✓ Inexpensive. ✓ Free from land acquisition rights. ✓ Provides ease of communication over difficult terrain. ✓ Ability to communicate over oceans. <p><u>Disadvantage</u></p> <ul style="list-style-type: none"> ✓ Insecure Communication. ✓ Reduce signal strength. ✓ Susceptible to weather effects. ✓ Limited bandwidth. ✓ High cost for implementation and maintenance. <p><u>Satellites</u></p> <p><u>Advantage</u></p> <ul style="list-style-type: none"> ✓ Large area coverage of earth. ✓ Inexpensive compare to cable. ✓ Commercial attractive. ✓ Useful for sparsely populated areas. <p><u>Disadvantage</u></p> <ul style="list-style-type: none"> ✓ Cannot deploy large, High gain antennas. ✓ Overloading of available bandwidths. ✓ Require high investment in case off failure. ✓ High atmospheric losses above 30 GHz limit carrier frequencies. ✓ Requires legal permissions.
10.	<p>What is bandwidth? How is it measured?</p> <p>Ans. Bandwidth is the amount of data that can be transmitted via a given communications Channel in a given unit of time. It exactly shows that how much stuff that you can send through a connection. Bandwidth is measured in kilohertz (KHz), megahertz (MHz), gigahertz (GHz), terahertz (THz).</p>
11.	<p>What do you understand by data transfer rates?</p> <p>Ans. The speed with which data can be transmitted from one device to another. Data rates are often measured in megabits (million bits) or megabytes (million bytes) per second. These are usually abbreviated as Mbps and</p>

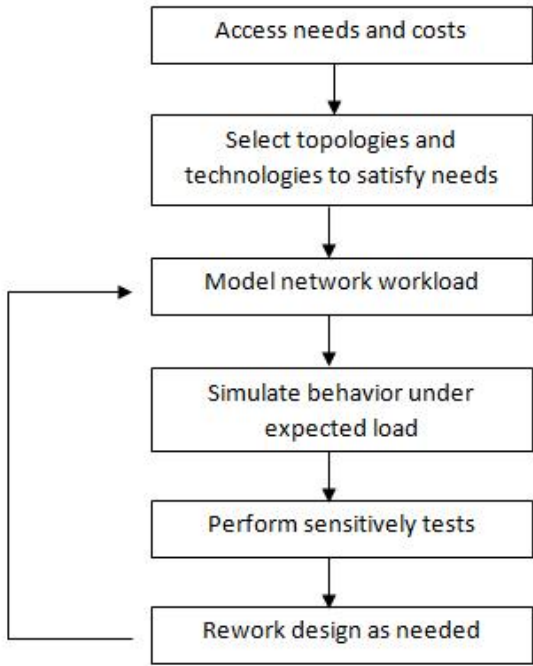
	MBps, respectively.									
12. Ans.	Discuss and compare various types of networks. There are three types of networks : a) LAN (Local Area Network) – A group of computers that shares a common connection and is usually in a small area or even in the same building. For example, it can be an office or a home network. It is usually connected by Ethernet cables and has high speed connections. If it was a wireless setup, it would be called a WLAN, which would have a lower connection speed. b) MAN (Metropolitan Area Network) –This is a larger network that connects computer users in a particular geographic area or region. For example, a large university may have a network so large that it may be classified as a MAN. The MAN network usually exists to provide connectivity to local ISPs, cable TV, or large corporations. It is far larger than a LAN and smaller than a WAN. Also, large cities like London and Sydney, Australia, have metropolitan area networks. c) WAN (Wide Area Network) – This is the largest network and can inter-connect networks throughout the world because it is not restricted to a geographical location. The Internet is an example of a worldwide public WAN. Most WANs exist to connect LANs that are not in the same geographical area. This technology is high speed and very expensive to setup.									
13. Ans.	Explain various mostly used topologies. 1. Bus or Linear Topology – It is characterized by common transmission medium shared by all the connected hosts, managed by dedicated nodes. It offers simultaneous flow of data and control. 2. Ring Topology – A ring topology connects one host to the next and the last host to the first. This creates a physical ring of cable. 3. Star Topology – It is characterized by central switching mode (communication controller) unique path (point-to-point link) for each host. It is easy to add and remove additional host by upgrading the centralized node. 4. Tree Topology – A tree topology may be defined as a group of bus topologies put together and controlled by one node.									
14. Ans.	Discuss the factors that govern the selection of topology for a network. There are number of factors that govern the selection of topology for a network, the most important of which are as following : a) Cost – For a network to be cost effective, one would try to minimize installation cost. This may be achieved by using well understood media and also, to a lesser extent, by minimizing the distances involved. b) Flexibility – Because the arrangement of furniture, internal walls etc. in offices are often subject to change, the topology should allow for easy reconfiguration of the network. This involves moving existing nodes and adding new ones. c) Reliability – Failure in a network can take two forms. Firstly, an individual node can malfunction. This is not nearly as serious as the second type of fault where the network itself fails to operate. The topology chosen for the network can help by allowing the location of the fault to be detected and to provide some means of isolating it.									
15. Ans.	Compare and contrast (i)Star and Bus topologies (ii)Star and Tree topologies (iii) Bus and Ring topologies (i)Star and Bus topologies <table><tr><td>Comparison :</td><td>Contrast :</td></tr><tr><td>✓ In both topologies all devices are connected to a central cable/hub.</td><td>✓ Bus topology is slower in contrast to star topologies of network ✓ Star topology is expensive in contrast to Bus Topology</td></tr></table> (ii)Star and Tree topologies <table><tr><td>Comparison :</td><td>Contrast :</td></tr><tr><td>✓ Both required more wiring.</td><td>✓ Tree topology is slower in contrast to star topologies of network.</td></tr></table>		Comparison :	Contrast :	✓ In both topologies all devices are connected to a central cable/hub.	✓ Bus topology is slower in contrast to star topologies of network ✓ Star topology is expensive in contrast to Bus Topology	Comparison :	Contrast :	✓ Both required more wiring.	✓ Tree topology is slower in contrast to star topologies of network.
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		✓ More difficult to configure in contrast to star topologies.	
	(iii) Bus and Ring topologies		
	Comparison :	Contrast :	
	<ul style="list-style-type: none"> ✓ Difficult to identify the problem if the entire network shuts down. ✓ If one node fails to pass the data, entire network has failed. 	<ul style="list-style-type: none"> ✓ Ring topology faster communication in contrast to Bus topology. ✓ In contrast to Bus topology Ring topology has independent line of connection which allows freedom of removing or adding nodes from the network. 	
16. Ans.	What is the role of modem in electronic communications? A modem (modulator-demodulator) is a device that modulates an analog carrier signal to encode digital information, and also demodulates such a carrier signal to decode the transmitted information. The goal is to produce a signal that can be transmitted easily and decoded to reproduce the original digital data. Modems can be used over any means of transmitting analog signals, from light emitting diodes to radio.		
17. Ans.	What are hubs? What are its types? A common connection point for devices in a network. Hubs are commonly used to connect segments of a LAN. A hub contains multiple ports. Hubs can be either passive or active Passive Hub – A passive hub serves simply as a conduit for the data, enabling it to go from one device (or segment) to another. Active Hub – In a situation of data received being weak but readable, the active hub restores the signal before rebroadcasting the same.		
18. Ans.	What is the role of switch in a network? A switch is a hardware device that joins multiple computers together within one local area network (LAN). Network switches appear nearly identical to network hubs, but a switch generally contains more intelligence than a hub. Unlike hubs, network switches are capable of inspecting data packets as they are received, determining the source and destination device of each packet, and forwarding them appropriately.		
19. Ans.	Briefly discuss the role of following devices in the context of networking. (i)repeater (ii)router (iii)bridge (iv)gateway <u>Repeater</u> – A repeater amplifies the input signal to an appropriate level and works at the physical level of the OSI model. Sometimes the signal on the Internet becomes weak before reaching the destination node. Thus, repeater is used to regenerate the incoming packet and amplify it and then transmit it to another segment of the network. <u>Router</u> – A router is a device or, in some cases, software in a computer which is connected to at least two networks and decides which way to send each information packet based on its current understanding of the state of the networks it is connected to. <u>Bridge</u> – A bridge device filters data traffic at a network boundary. Bridges reduce the amount of traffic on a LAN by dividing it into two segments. Bridges inspect incoming traffic and decide whether to forward or discard it. An Ethernet bridge, for example, inspects each incoming Ethernet frame - including the source and destination MAC addresses, and sometimes the frame size - in making individual forwarding decisions. <u>Gateway</u> – A network gateway is an internetworking system capable of joining together two networks that use different base protocols. A network gateway can be implemented completely in software, completely in hardware, or as a combination of both. Depending on the types of protocols they support.		
20. Ans.	What is a communication protocol? What is its role in a network? When computers communicate with each other, there needs to be a common set of rules and instructions that each computer follows. A specific set of communication rules is called a protocol. The basic role of a protocol is to define what is communicated, how it is communicated and when it is communicated.		
21. Ans.	Write short note on: (i) HTTP (ii) TCP/IP (iii) FTP. <ul style="list-style-type: none"> • Hypertext Transfer Protocol (HTTP) which uses a set of rules to allow communication between a browser 		

	<p>and server. Generally this protocol use port 80.</p> <ul style="list-style-type: none"> • Transmission Control Protocol (TCP), which uses a set of rules to send and receive information packets with other Internet points. • Internet Protocol (IP), which uses a set of rules to address each message so it reaches the correct destination. • File Transfer Protocol (FTP), which uses a set of rules to allow transfer of files (uploading and downloading) between the user's computer and server. Generally this protocol use port 110. 										
<p>22. Ans.</p>	<p>What is wireless computing? How is it different from mobile computing?</p> <p>Wireless refers to the method of transferring information between a computing device and a data source, without a physical connection.</p> <p style="text-align: center;"><u>Wireless Computing v/s Mobile Computing</u></p> <table border="1"> <thead> <tr> <th>Wireless computing</th><th>Mobile computing</th></tr> </thead> <tbody> <tr> <td>Wireless refers to the method of transferring information between a computing device and a data source, without a physical connection.</td><td>Mobile computing refers to computing devices that are not restricted to a desktop.</td></tr> <tr> <td>Wireless computing is simply data communication without the use of a landline.</td><td>Mobile computing essentially refers to a computing device that is not always connected to a central network.</td></tr> <tr> <td>Involve a cellular telephone, a two way radio, a fixed wireless connection, a laser, or satellite communications.</td><td>Include laptops, newly created smart phones and also PDA's.</td></tr> <tr> <td>Computing device is continuously connected to the base network.</td><td>Communicate with a base location, with or without, a wireless connection.</td></tr> </tbody> </table>	Wireless computing	Mobile computing	Wireless refers to the method of transferring information between a computing device and a data source, without a physical connection.	Mobile computing refers to computing devices that are not restricted to a desktop.	Wireless computing is simply data communication without the use of a landline.	Mobile computing essentially refers to a computing device that is not always connected to a central network.	Involve a cellular telephone, a two way radio, a fixed wireless connection, a laser, or satellite communications.	Include laptops, newly created smart phones and also PDA's.	Computing device is continuously connected to the base network.	Communicate with a base location, with or without, a wireless connection.
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Computing device is continuously connected to the base network.	Communicate with a base location, with or without, a wireless connection.										
<p>23. Ans.</p>	<p>Write short notes on the following : (i) GSM (ii) CDMA (iii) WLL (iv) 3G (v) SMS (vi) EDGE (vii) UMTS.</p> <p>(i) GSM (Global System for Mobile Communications): It is leading digital cellular system. In covered areas, cell phone users can buy one phone that will work anywhere the standard is supported. It uses narrowband TDMA, which allows eight simultaneous calls on the same radio frequency.</p> <p>(ii) CDMA (Code Division Multiple Access): It is a digital cellular technology that uses spread-spectrum techniques. CDMA does not assign a specific frequency to each user. Instead, every channel uses the full available spectrum.</p> <p>(iii) WLL (Wireless in Local Loop): WLL is a system that connects subscribers to the public switched telephone network using radio signals as a substitute for other connecting media.</p> <p>(iv) 3G: 3G is a specification for the third generation of mobile communication of mobile communication technology. 3G promises increased bandwidth, up to 384 kbps when a device is stationary.</p> <p>(v) SMS (Short Message Service): SMS is the transmission of short text messages to and from a mobile phone, fax machine and or IP address.</p> <p>(vi) EDGE (Enhanced Data rates for Global Evolution): EDGE is a radio based high speed mobile data standard.</p> <p>(viii) UMTS(Universal Mobile Telecommunications Service) : UMTS is a third-generation (3G) broadband, packet-based transmission of text, digitized voice, video, and multimedia at data rates up to 2 megabits per second (Mbps).</p>										
<p>24. Ans.</p>	<p>Discuss the advantage and disadvantage of E-mail.</p> <p>Following are the advantage and disadvantage of E-mail.</p> <p><u>Advantage :</u></p> <ul style="list-style-type: none"> ✓ Inexpensive way to move information. ✓ Delivered mail very fast. ✓ Reducing clutter of paper in office. ✓ Easy to send email. 										

	<ul style="list-style-type: none"> ✓ Maintain records of communication with someone else. ✓ Email waits until you read it. <p><u>Disadvantage :</u></p> <ul style="list-style-type: none"> ✓ Need computer to read or print email. ✓ Sent mail can be changed or deleted. ✓ Easy to sent a message that you latter regret. ✓ Hard to express emotions. 								
25. Ans.	<p>Compare and Contrast (i) e-mail and voice mail (ii) e-mail and chatting.</p> <p>(i) E-mail and voice mail</p> <p><u>Comparison :</u></p> <ul style="list-style-type: none"> ✓ Both e-mail and voice-mail are used for communication. <p><u>Contrast :</u></p> <table border="1"> <thead> <tr> <th>E-mail</th><th>Voice mail</th></tr> </thead> <tbody> <tr> <td>Written, may be read quickly or slowly, as the receiver desires</td><td>Oral, must be listened to at the speed it was delivered</td></tr> <tr> <td>May be stored on disk for future reference. Easy to access specific stored messages.</td><td>May be stored on tape for future reference. Hard to locate specific stored messages.</td></tr> <tr> <td>Preferred by visual learners</td><td>Preferred by auditory learners</td></tr> </tbody> </table> <p>(ii) E-mail and chatting.</p> <p><u>Comparison :</u></p> <ul style="list-style-type: none"> ✓ Both e-mail and chatting are used for communication. <p><u>Contrast :</u></p> <ul style="list-style-type: none"> ✓ Chat occurs in near real-time while Email doesn't ✓ Chat is a type of software while Email is a protocol ✓ Chat requires the permission of both parties while Email does not ✓ Chat is typically software dependent while Email is not ✓ Chat needs accounts on the same provider while Email does not 	E-mail	Voice mail	Written, may be read quickly or slowly, as the receiver desires	Oral, must be listened to at the speed it was delivered	May be stored on disk for future reference. Easy to access specific stored messages.	May be stored on tape for future reference. Hard to locate specific stored messages.	Preferred by visual learners	Preferred by auditory learners
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Preferred by visual learners	Preferred by auditory learners								
26. Ans.	<p>What is video conferencing? How is it related to networking?</p> <p>Video Conferencing is a two-way videophone conversation among multiple participants. To make use of video conferencing, you need to install a digital camera, video conferencing software and an internet connection. It is related to networking due to multiple users are connected with each other while conferencing.</p>								
27. Ans.	<p>What is web browser? What is a web server? How are these two related?</p> <p>A software application that enables to browse, search and collect information from the web known as web browser, web browsers are used at client side.</p> <p>The web pages on the Internet are stored on the computers that are connected to the Internet. These computers are known as web servers.</p> <p>Web browser and Web server are related in a way that web browser send request to the web server and web server responds to the requests made by web browsers and fulfill the request accordingly.</p>								
28. Ans.	<p>Write short notes on URLs and domain names.</p> <ul style="list-style-type: none"> ✓ URL Stand for Universal Resource Locator. ✓ URL specifies the distinct address for each resource on the Internet, such as ftp, http etc. ✓ URL looks like this: type://adress/path. ✓ Where, - type specifies the type of the server in which the file is located. ✓ - address is a address of the server. ✓ - path is a location of the file on the server. ✓ An Internet address which is character based is called a Domain Name, such as com, org etc. Here com indicates Commercial and org indicates non-profit Organization. ✓ Two letter short form indicating the country name may be used with URL e.g., http://www.microsoft.co.in here the last in suggest that it is based in India. 								
29. Ans.	<p>What is web hosting? What are its various categories?</p> <ul style="list-style-type: none"> ✓ Web Hosting is a means of hosting web-server application on a computer system. 								

	<ul style="list-style-type: none"> ✓ By using web hosting electronic content on the Internet is readily available to any web browser client. ✓ The computer system providing the web-hosting is known as web-server or the web host. ✓ Web hosting can be classified into following four categories : <ol style="list-style-type: none"> 1. Free Hosting: available with many famous sites which offer to host some web pages for no cost. 2. Virtual or Shared Hosting: here one's web site domain is hosted on the web server of hosting company along with the other web sites. Use "shared" if you have a professional website. 3. Dedicated Hosting: here, the company wishing to go online rents an entire web server from hosting company. This is suitable for large, high traffic sites. 4. Co-location Hosting: here, the company owning the site instead of web hosting company. Suitable for those who need the ability to make change.
30. Ans.	<p>Explain briefly the following : (i) HTML (ii) XML (iii) DHTML</p> <p><u>HTML :</u></p> <ul style="list-style-type: none"> ✓ Stands for Hyper Text Markup Language. ✓ Used to design the layout of a document and to specify the hyperlinks. ✓ Tells the browser how to display text, pictures and other support media. ✓ Support multimedia and new page layout features. ✓ Provides many tags for control the presentation of information on the web pages, such as <body>, , <hr> etc. <p><u>XML:</u></p> <ul style="list-style-type: none"> ✓ Stands for eXtensible Markup Language. ✓ A markup language is a mechanism to identify structure in a document. ✓ XML defines a standard way to add markup to documents. ✓ Provides an ability to define tags and the structural relationship between them. ✓ All of the semantics of an XML document will either be defined by the application that process them or by style sheets. <p><u>DHTML :</u></p> <ul style="list-style-type: none"> ✓ Stands for Dynamic HTML. ✓ DHTML refers to web content that changes each time it is viewed. For example, graphic can move from one location to another, in response to user action, such as mouse click. ✓ Enable a web page to react to user input without sending request to web server. ✓ Used to describe the combination of HTML, style sheets and scripts that allow document to be animate
31. Ans.	<p>What do you understand by network security? Why is it considered very important?</p> <p>Network security can be used to define the mechanism of providing security over network to the clients. Network security is considered very important because it is needed to protect data during their transmission and to guarantee that data transmissions are authentic.</p> <p>Two fundamental approaches are in use: conventional encryption and public-key encryption.</p>
32. Ans.	<p>What is a firewall? Briefly explain different firewall techniques.</p> <p>The system designed to prevent unauthorized access to or from a private network is called Firewall. There are several types of firewall techniques :</p> <ul style="list-style-type: none"> ✓ Packet filter: Looks as each packet entering or leaving the network and accepts or rejects it based on user-defined rules. Packet filtering is fairly effective and transparent to users, but it is difficult to configure. ✓ Application gateway: Applies security mechanisms to specific application, such as FTP and Telnet servers. This is very effective, but can impose performance degradation. ✓ Circuit-level gateway: Applies security mechanisms when a connection is established. Once the connection has been made, packets can flow between the hosts without further checking. ✓ Proxy server: Intercepts all messages entering and leaving the network. The proxy server effectively hides the true network addresses.
33. Ans.	<p>What is hacking? What is cracking? How are these two terms inter-related?</p> <ul style="list-style-type: none"> ✓ Hacking is an unauthorized/authorized access to computer/network in order to gather information of the actual user. ✓ Cracking is defined as the attempt to remove the copy protections inserted into software programs by the owner of software.

	✓ Hacking and Cracking both are related in a way that both unauthentically cause damage to the system.
34. Ans.	<p>Define the following :</p> <p>(a) Viruses (b) Worms (c) Trojan Horse (d) Spam (e) Cyber Crime (f) India IT Act 2000 (g) IPR</p> <p>(a) Viruses: Computer virus is a malicious program that requires a host and is designed to make a system sick, just like a real virus.</p> <p>(b) Worms: Worms are self-replicating programs that do not create multiple copies of itself on one computer but propagate through the computer network. Worms log on to computer system using the username and password and exploit the system.</p> <p>(c) Trojan Horse: A Trojan horse is a code hidden in program such as game or spreadsheet that looks safe to run but has hidden side effects.</p> <p>(d) Spam: Spam refers to an unwanted generally commercial email sent to a large number of addresses.</p> <p>(e) Cyber Crime: Cyber crime involves the usage of computer system and the computer network for criminal activity.</p> <p>(f) India IT Act 2000 : In India the cyber laws are contained in the Information Technology Act,2000 which was notified on 17 October 2000 which was based on the United Nation's Commission for International Trade related laws(UNCITRAL) model law.</p> <p>(g) IPR: The Intellectual Property may be defined as a product of intelligence that has commercial value, including copyrighted property such as literacy or artistic works, and ideational property.</p>
35. Ans.	<p>What is the general process of designing networks?</p> <p>The general process of designing networks requires you to follow the steps as shown in following Fig :</p>  <pre> graph TD A[Access needs and costs] --> B[Select topologies and technologies to satisfy needs] B --> C[Model network workload] C --> D[Simulate behavior under expected load] D --> E[Perform sensitively tests] E --> F[Rework design as needed] F --> C </pre> <p style="text-align: center;">General Network Design Process</p>
36. Ans.	<p>While designing networks, what factors related to network environment would you consider?</p> <p>While designing networks we would consider location of hosts, servers, terminals and other end nodes; the projected traffic for the environment; and the projected costs for delivering different service levels etc. factors related to network environment.</p>
37. Ans.	<p>While designing networks, what factor related to performance, would you consider?</p> <p>While designing networks we would consider network reliability, traffic throughput and host/client computer speeds etc. factors related to performance.</p>
38. Ans.	<p>When would you prefer (i) hubs over repeaters (ii) bridges over hubs (iii) switch over others network devices ?</p> <p>(i) We would prefer hubs over repeaters when the distance is less.</p>

	<p>(ii) We would prefer bridges over hubs when we need to connect multiple networks.</p> <p>(iii) We would prefer switch over others network devices when want to segment networks into different subnetworks to prevent traffic overloading.</p>														
39. Ans.	<p>When would you opt for a router in a network?</p> <p>We would opt for a router in a network in when we want to connect different network of different protocol for example, a router can link Ethernet to a mainframe.</p>														
40. Ans.	<p>What is the difference between client-side scripting and server-side scripting?</p> <table border="1"> <thead> <tr> <th><u>Client Side Scripting</u></th><th><u>Server-Side Scripting</u></th></tr> </thead> <tbody> <tr> <td>Script code is downloaded and executed at client end.</td><td>The script is executed at the server-end and the result is sent to the client-end.</td></tr> <tr> <td>Response to the interactions is more immediate once the program code has been downloaded.</td><td>Complex processes are more efficient as the program and associated resources are not downloaded to the browser.</td></tr> <tr> <td>Services are secure as they do not have access to files and databases.</td><td>Have access to files and databases but have security considerations when sending sensitive information.</td></tr> <tr> <td>Browser dependent.</td><td>Does not depend on browser.</td></tr> <tr> <td>Affected by the processing speed of user's computer.</td><td>Affected by the processing speed of host server.</td></tr> <tr> <td>JavaScript, VBScript etc are Client Side Scripting languages.</td><td>PHP, Perl, CGI are Server Side Scripting languages.</td></tr> </tbody> </table>	<u>Client Side Scripting</u>	<u>Server-Side Scripting</u>	Script code is downloaded and executed at client end.	The script is executed at the server-end and the result is sent to the client-end.	Response to the interactions is more immediate once the program code has been downloaded.	Complex processes are more efficient as the program and associated resources are not downloaded to the browser.	Services are secure as they do not have access to files and databases.	Have access to files and databases but have security considerations when sending sensitive information.	Browser dependent.	Does not depend on browser.	Affected by the processing speed of user's computer.	Affected by the processing speed of host server.	JavaScript, VBScript etc are Client Side Scripting languages.	PHP, Perl, CGI are Server Side Scripting languages.
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JavaScript, VBScript etc are Client Side Scripting languages.	PHP, Perl, CGI are Server Side Scripting languages.														
41. Ans.	<p>How are viruses harmful? How can you prevent them?</p> <p>Viruses' main objective is to make your system unstable and cause harm to data. Mainly these cause damage in many ways :</p> <ul style="list-style-type: none"> ✓ Can corrupt entire file system? ✓ Create bad sector on a disk. ✓ Decrease the space on hard disk by duplicating files. ✓ Can format the entire disk. ✓ Alter data in data files. ✓ Cause the system to hang. <p>Following are guidelines for virus prevention :</p> <ul style="list-style-type: none"> ✓ Never use unknown disk or CD without scanning. ✓ Scan files downloaded from the internet. ✓ Use licensed software. ✓ Never boot your PC from floppy. ✓ Make regular backups. ✓ Install and use antivirus software and keep it up to date. ✓ Protect your PC with password. 														

TYPE C: LONG ANSWER QUESTIONS

1. Ans.	<p>Internet is network of networks. How did it come into existence? How does it function?</p> <p>In following way internet was come into existence :</p> <ul style="list-style-type: none"> ✓ Evolution of networking started way back in 1969 by the development of first network called ARPANET. The goal of this project was to connect computers at U. S. defense & different universities. ✓ In 1980's, the NSFnet was started to make high-capacity network strictly for academic and engineering research ✓ In 1990sthe internetworking of ARPANET, NSFnet and other private networks resulted into Internet.
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	<p>How Internet functions :</p> <ul style="list-style-type: none"> ✓ Firstly the information or file to be sent to another computer is divided into small parts called Packets. ✓ Each packet is given a sequential number e.g. 1, 2, 3. ✓ Then packets are send to the address of destination computer. ✓ The destination computer receives the packets in randomly. ✓ Then packets are rearranged in their correct order and get actual information/file.
<p>2.</p> <p>Ans.</p>	<p>Discuss various types of networks. Can you imagine the relationship of a LAN with a WAN? What is it? Discuss.</p> <p>There are three types of networks :</p> <p><u>1 Local Area Networks (LANs) :</u></p> <ul style="list-style-type: none"> ✓ Group of computers and network ✓ Communication devices interconnected within a geographically limited area, such as a building or a campus. ✓ transfer data at high speeds ✓ Key purpose is to serve its users in resource sharing. ✓ Hardware and software resources are shared. <p><u>2. Metropolitan Area Network (MAN) :</u></p> <ul style="list-style-type: none"> ✓ Spread over city, for example cable TV networks. ✓ Purpose is sharing hardware and software resource among its users. <p><u>3. Wide Area Networks (WAN) :</u></p> <ul style="list-style-type: none"> ✓ Spread across countries. ✓ Group of LANs that are spread across several locations and connected together to look like one big LAN. ✓ Facilitate fast and efficient exchange of information at lesser cost and higher speed. ✓ The largest WAN in existence is internet. <p>Yes, We can imagine the relationship of a LAN with a WAN. Actually, WAN can even be a group of LANS that are spread across several locations and connected together to look like one big LAN.</p>
<p>3.</p> <p>Ans.</p>	<p>Briefly discuss wireless and mobile computing and various techniques used for wireless and mobile computing.</p> <p>Wireless communication is simply data communication without the use of landlines. Mobile computing means that the computing device is not continuously connected to the base or central network.</p> <p>Following are the various techniques used for wireless and mobile computing :</p> <ol style="list-style-type: none"> 1. GSM (Global System for Mobile Communications): It is leading digital cellular system. In covered areas, cell phone users can buy one phone that will any where the standard is supported. It uses narrowband TDMA, which allows eight simultaneous calls on the same radio frequency. 2. CDMA (Code-Division Multiple Access): It is digital technology that uses spread-spectrum techniques. CDMA does not assign a specific frequency to each user. Instead, every channel uses the full available spectrum. 3. WLL (Wireless in Local Loop): WLL is a system that connects subscribers to the public switched telephone network using radio signals as a substitute for other connecting media. 4. Email (Electronic Mail): Email is sending and receiving messages by computer. 5. Chat: Online textual talk in real time is called chatting. 6. Video Conferencing: A two way videophone conversation among multiple participants is called video conferencing. 7. SMS (Short Message Service): SMS is the transmission of short text messages to and from a mobile phone, fax machine and or IP address. 8. 3G and EDGE: 3G is a specification for the third generation of mobile communication of mobile communication technology. 3G promises increased bandwidth, up to 384 kbps when a device is stationary. <p>EDGE (Enhanced Data rates for Global Evolution): EDGE is a radio based high speed mobile data standard.</p>
<p>4.</p> <p>Ans.</p>	<p>Define network security. What is its need? How can it be achieved?</p> <p>Network security can be used to define the mechanism of providing security over network to the clients.</p> <p>Needs of network security :</p> <ul style="list-style-type: none"> ✓ Prevent unauthorized access of different types of information.

- ✓ To clarify that the information is not unauthentic.
- ✓ Transferring of data in encrypted form.

Network security can be achieved by various types of protection methods like authorization, authentication, encrypted smart cards, biometric systems and firewall.

5.(a) What is Repeater?

Ans. A repeater is a device that amplifies a signal being transmitted on the network.

(b) Expand the following terms with respect to networking :

(i)FTP (ii)CDMA (iii) HTML (iv) SMS

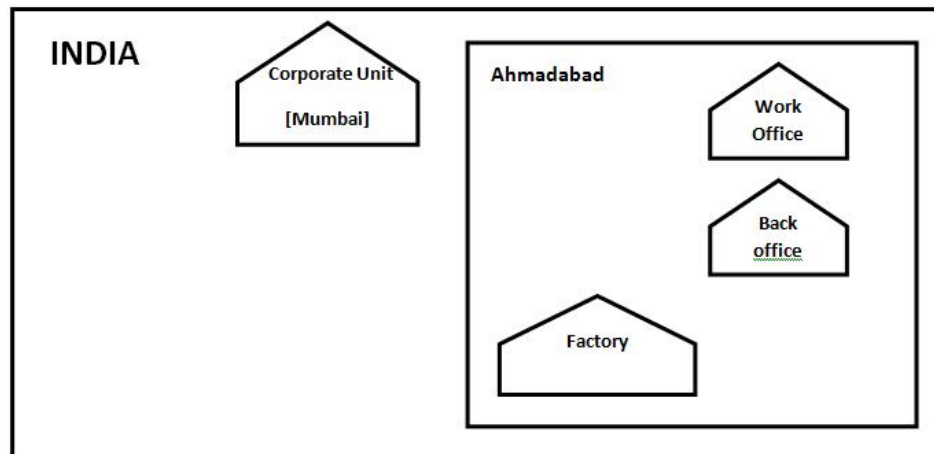
Ans. (i) FTP – File Transfer Protocol
(ii)CDMA – Code Division Multiple Access
(iii)HTML- Hypertext Markup Language
(iv)SMS – Short Message Service

(c) How is an Email different from chat?

Ans. Email is different from chat in following way :

- ✓ Chat occurs in near real-time while Email doesn't
- ✓ Chat is a type of software while Email is a protocol
- ✓ Chat requires the permission of both parties while Email does not
- ✓ Chat is typically software dependent while Email is not
- ✓ Chat needs accounts on the same provider while Email does not

(d) “New York Avenue” is planning to expand their network in India, starting with two cities in India to provide infrastructure for distribution of their canned products. The company has planned to setup their main office in Ahmadabad, at three different locations and have named their office as “Work Office”, “Factory” and “Back Office”. The company has its Corporate Office in Delhi. A rough layout of the same is as follows:



Approximate distance between these office is as follows:

From	To	Distance
Work Office	Back Office	110 Mtr
Work Office	Factory	14 KM
Work Office	Corporate Unit	1280 KM
Back Office	Factory	13 KM

In continuation of the above , the company experts have planned to install the following number computers in each of their offices:

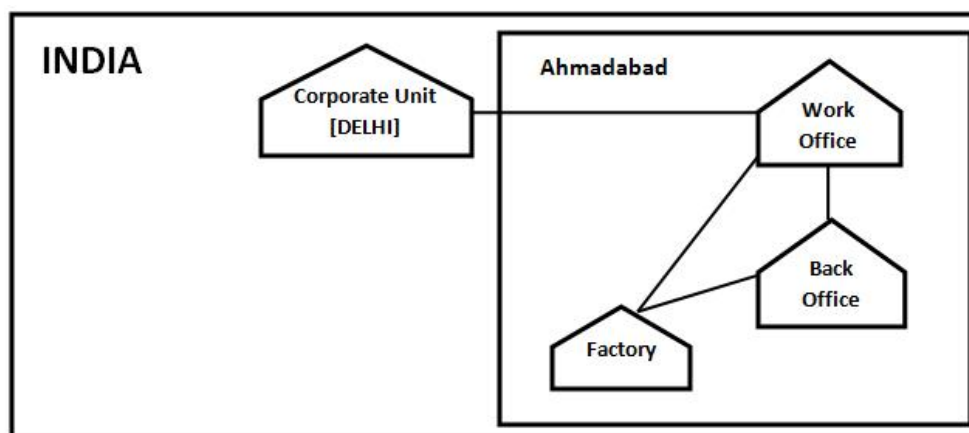
Work Office	200
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Back Office	115
Factory	67
Corporate	75

- (i) Suggest the kind of network required (out of LAN, MAN, WAN) for connecting each of the following office units:
- ☞ Work Office and Factory
 - ☞ Work Office and Back Office
- (ii) Which one of the following device will you suggest for connecting all the computers within each of their office units?
- ☞ Switch/Hub
 - ☞ Modem
 - ☞ Telephone
- (iii) Which of the following communication media, you will suggest to be procured by the company for connecting their local office units in Ahmadabad for very effective (High Speed) communication?
- ☞ Telephone Cable
 - ☞ Optical Fiber
 - ☞ Ethernet Cable
- (iv) Suggest a cable/wiring layout for connecting the company's local office units located in Ahmadabad. Also, suggest an effective method/technology for connecting the company's office unit located in Delhi.
- (v) Which one of the following devices will you suggest for connecting all the computers within each of their offices?
- ☞ Switch/Hub
 - ☞ Modem
 - ☞ Telephone

Ans.

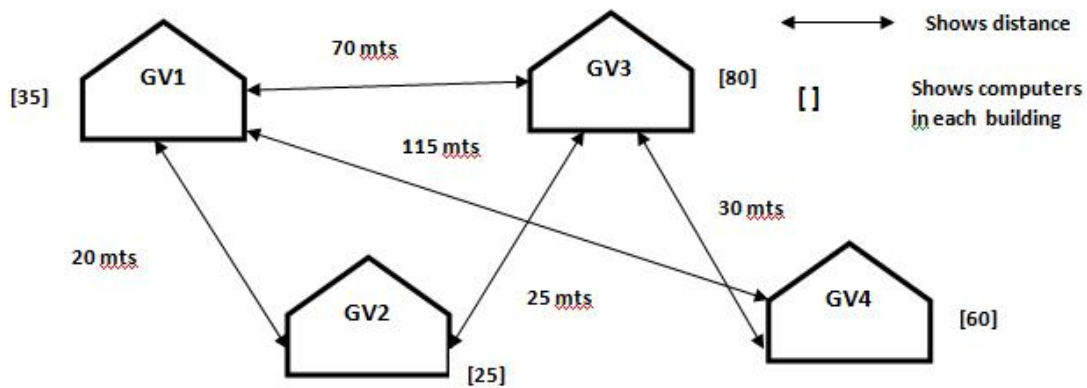
- (i) Work Office and Factory – MAN
Work Office and Back Office – LAN
- (ii) Switch/Hub
- (iii) Optical Fibre
- (iv) Suggested layout is shown in adjacent figure –



Technology for connecting to Delhi office – *Satellite*.

(v) Switch/Hub

6. Global Village enterprises has following four buildings in Hyderabad city :

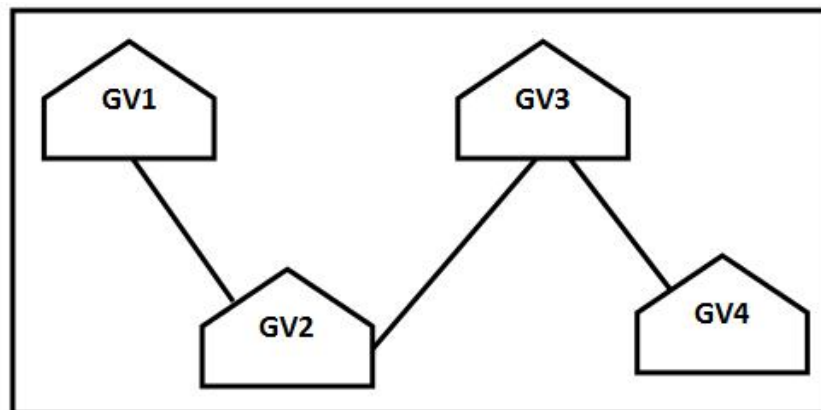


Computers in each building are networked but buildings are not networked so far. The company has now decided to connect buildings also.

- Suggest a cable layout for these buildings.
- In each of the buildings, the management wants that each LAN segment gets a dedicated bandwidth i.e., bandwidth must not be shared. How can this be achieved?
- The company also wants to make available shared Internet access for each of the buildings. How can this be achieved?
- The company wants to link its head office in GV1 building to its another office in Japan
 - Which type of transmission medium is appropriate for such a link?
 - What type of network would this connection result into?

Ans.

(a) Suggested layout is shown in adjacent figure –



- By placing Switch in each building.
- By using Switch internet can be shared.
- Satellite
 - WAN

7. (a) Write two advantages and two disadvantages for STAR topology.

Ans.

Advantage :

- ✓ Easy to install and wire.
- ✓ Easy to detect faults and to remove parts.

Disadvantage :

- ✓ Requires more cable length than a linear topology.
- ✓ More expensive than linear bus topologies because of the cost of the hubs, etc.

(b) Write one difference between Telnet and FTP.

Ans.

FTP is a File Transfer Protocol, and its only concern is to facilitate the transfer of files from one point to another whereas Telnet is simply a connection protocol that allows a user to connect to a remote server that is listening for Telnet commands

<p>(c)</p> <p>Ans.</p> <p>(d)</p> <p>Ans.</p>	<p>Explain the following terms in short : (i)DHTML (ii)ISP</p> <p>(i) DHTML – Dynamic Hyper Text Markup Language (ii) ISP – Internet Service Provider</p> <p>Define Packet switching.</p> <p>Packet switching is one of the switching techniques which refer to protocols in which messages are divided into packets before they are sent. Each packet is then transmitted individually and can even follow different routes to its destination. Once all the packets forming a message arrive at the destination, they are recompiled into the original message.</p>
<p>8. (a)</p> <p>Ans.</p> <p>(b)</p> <p>Ans.</p> <p>(c)</p> <p>Ans.</p> <p>(d)</p> <p>Ans.</p>	<p>Write two advantages and two disadvantages for STAR topology.</p> <p><u>Advantage :</u></p> <ul style="list-style-type: none"> ✓ Easy to install and wire. ✓ Easy to detect faults and to remove parts. <p><u>Disadvantage :</u></p> <ul style="list-style-type: none"> ✓ Requires more cable length than a linear topology. ✓ More expensive than linear bus topologies because of the cost of the hubs, etc. <p>Write one difference between coaxial and optical cable.</p> <ul style="list-style-type: none"> ✓ Coaxial cables have solid wire core surrounded by one or more foil or wire shields whereas optical fibres consists of thin strands of glass or glass like materials. ✓ Coaxial cables transmit electrical signals whereas Optical fibres transmit light signals or laser signals. <p>Explain the following terms in short : (i)FTP (ii)URL</p> <p>(i) FTP – File Transfer Protocol (ii)URL - Uniform Resource Locator</p> <p>Define Packet switching.</p> <p>Packet switching is one of the switching techniques which refer to protocols in which messages are divided into packets before they are sent. Each packet is then transmitted individually and can even follow different routes to its destination. Once all the packets forming a message arrive at the destination, they are recompiled into the original message.</p>
<p>9. (a)</p> <p>Ans.</p> <p>(b)</p> <p>Ans.</p> <p>(c)</p> <p>Ans.</p> <p>(d)</p>	<p>What was the role of ARPANET in Computer Network?</p> <p>ARPANET stands for Advanced Research Project Agency Network. It is a project sponsored by U. S. Department of Defense and planted in 1969 to connect computers at U. S. defense & different universities. In 1980s, NSFnet was started to make high capacity network, which are more capable than ARPANET. In 1990s the internetworking of ARPANET, NSFnet and other private networks resulted into internet.</p> <p>Which of the following is not a unit for data transfer rate? (i)bps (ii)abps (iii)gbps (iv)kbps</p> <p>abps is not a unit for data transfer rate.</p> <p>What is the difference between Trojan Horse and Virus in terms of computers?</p> <p>Computer virus is a malicious program that requires a host and is designed to make a system sick, just like a real virus whereas Trojan horse is a code hidden in program such as game or spreadsheet that looks safe to run but has hidden side effects.</p> <p>What term we use for a software/hardware device, which is used to block, unauthorized access while permitting authorized communications. This term is also used for a device or set of devices configured to permit, deny,</p>

	encrypt, or proxy all (in and out) computer traffic between different security domains based upon a set of rules and other criteria..			
Ans.	Firewall.			
(e)	Try it by yourself.			
(f)	Write the full forms of the following: (f1) GNU (f2) XML			
Ans.	(f1) GNU – GNU’s Not Unix. (f2) XML - eXtensible Markup Language			
(g)	Write one advantage of each for Open Source Software and Proprietary Software.			
Ans.	<u>Advantage of Open Source Software :</u> ✓ Low cost and no license fees; <u>Advantage of Proprietary Software :</u> ✓ Reliable, professional support and training available;			
10. (a)	What is Modem?			
Ans.	A modem is a computer peripheral that connects a workstation to other workstation via telephone line s and facilitates communications.			
(b)	Expand the following terms with respect to Networking :			
	(i) PPP (ii)GSM (iii)XML (iv)HTTP			
Ans.	(i) PPP - Point to Point Protocol (ii)GSM – Global System for Mobile communication (iii)XML - eXtensible Markup Language (iv)HTTP - Hypertext Transfer Protocol			
(c)	How is a Hacker different from a Cracker?			
Ans.	Programmers who gain knowledge about computer system for playful pranks are known as Hackers whereas Crackers are malicious programmers who break into secure systems.			
(d)	“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 office 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:			
	<div><div>INDIA</div><div><div>Corporate Unit [Delhi]</div><div><div>Chennai</div><div><div>Production Unit</div><div>Finance unit</div><div>Media unit</div></div></div></div></div>			
	Approximate distance between these Units is as follows:			
	<table><tr><th>From</th><th>To</th><th>Distance</th></tr></table>	From	To	Distance
From	To	Distance		

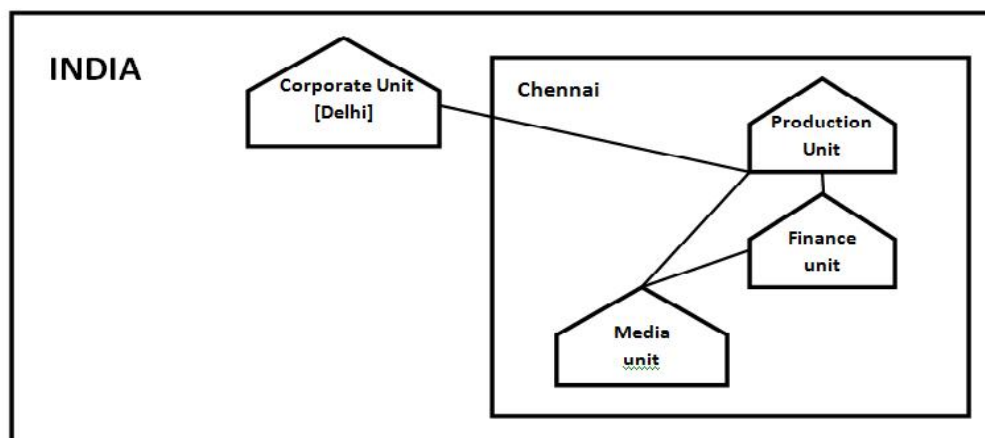
Production Unit	Finance Unit	70 Mtr
Production Unit	Media Unit	15 KM
Production Unit	Corporate Unit	2112 KM
Finance Unit	Media Unit	15 KM

In continuation of the above , the company experts have planned to install the following number computers in each of their offices:

Production Unit	150
Finance Unit	35
Media Unit	10
Corporate Unit	30

- (i) Suggest the kind of network required (out of LAN, MAN, WAN) for connecting each of the following office units:
- ☞ Production Unit and Media Unit
 - ☞ Production Unit and Finance Unit
- (ii) Which one of the following device will you suggest for connecting all the computers with in each of their units?
- ☞ Switch/Hub
 - ☞ Modem
 - ☞ Telephone
- (iii) 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?
- ☞ Telephone Cable
 - ☞ Optical Fiber
 - ☞ Ethernet Cable
- (iv) 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.

- Ans.
- (i) Production Unit and Media Unit- WAN
Production Unit and Finance Unit- LAN
- (ii) Switch/Hub
- (iii) Optical Fiber
- (iv) Cable/wiring Layout is:



Technology for connecting the company's office unit – *Satellite*.

11(a) What is the significance of Cyber law?

Ans. Cyberlaw is a generic term which refers to all the leagel and regulatory aspects of Internet and the World Wide Web. Anything concerned with or related to or emanating from any legal aspects or issues concerning any activity of

netizens and others, in Cyberspace comes within the ambit of Cyberlaw. The growth of Electronic commerce has propelled the need for vibrant and effective regulatory mechanisms which would further strengthen the legal infrastructure, so crucial to the success of electronic Commerce. All these regulatory mechanisms and legal infrastructures come within the domain of Cyberlaw.

(b) Expand the following terms with respect to Networking :

Ans. (i)CDMA (ii)FTP (iii)WLL (iv)HTML

(i)CDMA – Code Division Multiple Access

(ii) FTP – File Transfer Protocol

(iii)WLL – Wireless in Local Loop

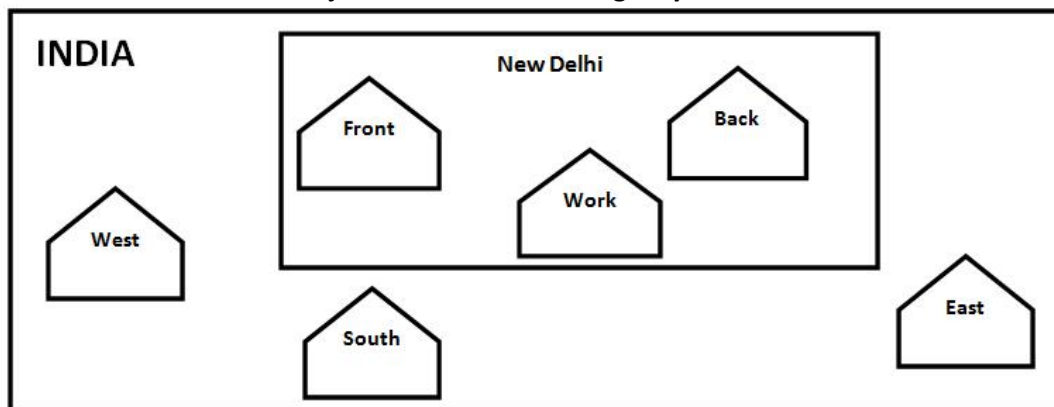
(iv) HTML – Hypertext Markup Language

(c) Which of the following unit measures the speed with which data can be transmitted from one node to another node of network? Also, give the expansion of the suggested unit

(i) Mbps (ii)KMph (iii) MGps

Ans. (i) Mbps. – Mega bytes per second.

(d) “Bhartiya Connectivity Association” is planning to spread their office 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 location and have named their New Delhi office has “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 major cities of India. A rough layout of the same is as follows:



Approximate distance between these office as per network survey team is as follows:

Place From	Place To	Distance
Back Office	Front Office	10 KM
Back Office	Work Office	70 Meter
Back Office	East Office	1291 KM
Back Office	West Office	790 KM
Back Office	South Office	1952 KM

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

(i) 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

(ii) 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

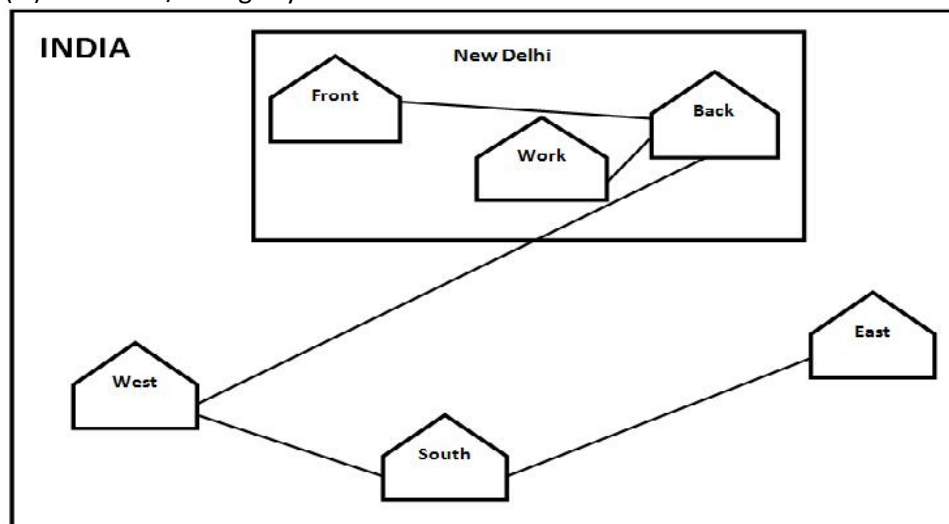
(iii) Which of the following communication medium, you will suggest to be procured by the company for connecting their local office units in New Delhi for very effective and fast communication?

- ☞ Telephone Cable
- ☞ Optical Fiber
- ☞ Ethernet Cable

Suggest a cable/wiring layout for connecting the company's local office located in New Delhi. Also, suggest an effective method/technology for connecting the company's regional office –“East Office”, “West Office” and “South Office” with offices located in New Delhi.

Ans.

- (i) Back Office and Work Office-MAN
Back Office and South Office-WAN
- (ii) Switch/Hub
- (iii) Optical Fiber
- (iv) Cable/wiring Layout is:



Technology for connecting the company's regional office – *Satellite*.

12(a) Differentiate between Internet and Intranet.

Ans. Internet is a network of computer network which operates world-wide using a common set of communication protocols. Internet is not owned by anybody.
Whereas Intranet is an inter-connected network within one organization that uses Web technologies for the sharing of information internally. Intranet is privately owned.

(b) Expand the following terms :

(i) CDMA (ii)URL (iii)HTTP (iv)WAN

Ans. (i)CDMA – Code Division Multiple Access
(ii)URL – Uniform Resource Locator
(iii)HTTP – Hyper Text Transfer Protocol
(iv)WAN – Wide Area Network

(c) Write one advantage of STAR topology as compared to BUS topology.

Ans. In STAR topology easy to detect faults whereas in BUS topology it is difficult to identify the problem if the entire

	network shuts down.																				
(d)	Try it by yourself.																				
13(a).	Name two transmission media for networking.																				
Ans.	Optical fibre and Coaxial cable.																				
(b)	Expand the following terms : (i) XML (ii) GSM (iii) SMS (iv) MAN																				
Ans.	(i) XML – eXtensible Markup Language (ii) GSM - Global System for Mobile communication (iii) SMS - Short Message Service (iv) MAN – Metropolitan Area Network																				
(c)	Differentiate between Hackers and crackers?																				
Ans.	Programmers who gain knowledge about computer system for playful pranks are known as Hackers whereas Crackers are malicious programmers who break into secure systems.																				
(d)	INDIAN PUBLIC SCHOOL in Darjeeling is setting up the network between its different wings. There are 4 wings named as SENIOR(S), JUNIOR (J), ADMIN (A) and HOSTEL (H).																				
	<div> Distance between various Wings <table border="1"> <tr><td>Wing A to Wing S</td><td>100 m</td></tr> <tr><td>Wing A to Wing J</td><td>200 m</td></tr> <tr><td>Wing A to Wing H</td><td>400 m</td></tr> <tr><td>Wing S to Wing J</td><td>300 m</td></tr> <tr><td>Wing S to Wing H</td><td>100 m</td></tr> <tr><td>Wing J to Wing H</td><td>450 m</td></tr> </table> </div> <div> Number of Computers <table border="1"> <tr><td>Wing A</td><td>10</td></tr> <tr><td>Wing S</td><td>200</td></tr> <tr><td>Wing J</td><td>100</td></tr> <tr><td>Wing H</td><td>50</td></tr> </table> </div>	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	Wing A	10	Wing S	200	Wing J	100	Wing H	50
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(i)	Suggest a suitable Topology for networking the computer of all wings.																				
(ii)	Name the wing where the server is to be installed. Justify your answer																				
(iii)	Suggest the placement of Hub/Switch in the network.																				
(iv)	Mention the economic technology to provide internet accessibility to all wings.																				
Ans.	(i) Star or Bus or any other valid topology or diagram. (ii) Wing S, because maximum number of computer are located at Wing S. (iii) Hub/Switch in all the wings. (iv) Coaxial cable/Modem/LAN/TCP-IP/Dialup/DSL/Leased Lines or any other valid technology.																				
14(a).	What is difference between Message Switching technique and Packet Switching technique?																				
Ans.	<u>Message Switching</u> – In this form of switching no physical copper path is established in advance between sender and receiver. Instead when the sender has a block of data to be sent, it is stored in first switching office, then forwarded later, one jump at a time. <u>Packet Switching</u> – With message switching there is no limit on block size, in contrast packet switching places a tight upper limit on block size.																				
(b)	Expand the following terminologies :																				
(i) TCP/IP (ii) XML (iii) CDMA (iv) WLL																					
Ans.	(i) TCP/IP – Transmission Control Protocol/ Internet Protocol (ii) XML - eXtensible Markup Language (iii) CDMA - Code Division Multiple Access (iv) WLL - Wireless in Local Loop																				
(c)	Write two applications of Cyber Law.																				

Ans.	Two applications of Cyber Law are: (i) Digital transactions (ii) Activities on Internet.
(d)	Try it by yourself.
15(a).	What is difference Star Topology and Bus Topology of network?
Ans.	In STAR topology easy to detect faults whereas in BUS topology it is difficult to identify the problem if the entire network shuts down.
(b)	Expand the following abbreviations :
	(i) GSM (ii) CDMA
Ans.	(i) GSM – Global System for Mobile communication (ii) CDMA - Code Division Multiple Access
(c)	What is protocol? Which protocol is used to search information from Internet using an internet browser?
Ans.	A protocol means the rules that are applicable for a network or we can say that the common set of rules used for communication in network. HTTP (Hyper Text Transfer Protocol) is used to search information from Internet using an internet browser.
(d)	Try it by yourself.
16(a).	What is difference between LAN and WAN?
Ans.	LANs are interconnected within a geographically limited area, such as a building or a campus whereas WANs are spread across countries.
(b)	Expand the following abbreviations :
	(i) HTTP (ii) ARPANET
Ans.	(i) HTTP - Hyper Text Transfer Protocol (ii) ARPANET - Advanced Research Project Agency Network
(c)	What is protocol? Which protocol is used to copy a file from/to a remotely located server?
Ans.	A protocol means the rules that are applicable for a network or we can say that the common set of rules used for communication in network. FTP (File Transfer Protocol) is used to copy a file from/to a remotely located server.
(d)	Name two switching techniques used to transfer data between two terminals (computers).
Ans.	Two switching techniques are : (i) Message Switching (ii) Packet Switching
(e)	Try it by yourself.