

Preface

Before I thank anybody else, I have to thank **Mrs. Reeta Sahoo**, my computer teacher in Montfort School, who taught this language so well and with so much clarity, that I got the confidence to teach it to students myself. This compilation of notes is in fact her hard work more than mine. Other than the SQL chapters and questions which I have written myself, the rest of the material was prepared by her, and I have simply edited it and brought it together in a single platform. I will always be thankful to her for enabling me to do this.

I also have my family to thank, specially my mother who is my single biggest inspiration in life. The most recent addition to my family, my neice Inara who I always long to meet. My little sister, *Chutki*, who has been filling me with life ever since we met. And the rest of my family with whose support I get the courage to do something in life.



HOW TO USE THIS BOOK

The definitions and terms provided in the NETWORKING chapter are sufficient and may be prepared from here only, as other books have a very elaborate meaning and explanation, which is not needed in boards as such. Other parts of this book may be used as a primary source, or supplementary to the class notes that your teacher gives you. The previous year solved board paper may be looked at once thoroughly so that you can get the idea of the format of questions, and expected answers.

You are the best judge on how to utilize this book. Use it in the way you feel it suits your style of study best.

SYLLABUS PLANNER

S.No.	Class No.	No. of hours	TOPICS TO BE COVERED
1.	1	1	Introduction to Object Oriented Programming (OOPS)/ Basic terms
2.	2-6	5	‘class’ concept (Intro./ Object/ Constructor (Types)/ Destructor/ Copy Constructor/ Finding match/)
3.	7	1	Types of ‘class’ functions/ Inline functions/ Parts of a function/ Static binding
4.	8	1	Calling a constructor (Implicit/Explicit)/ Temporary instances(objects)
5.	9-10	2	Inheritance (Concept/Types)
6.	11	1	RESERVE CLASS
7.	12-18	7	File Handling (Types of files/ Operations on data files/ operation on text files/ fstream.h)
8.	19	1	Random access files (tellg/ tellp/ seekg/ seekp)/ ifstream.h, ofstream.h, fstream.h
9.	20	1	Memory Implementation of Arrays (1D/2D)
10.	21	1	‘Stack’ concept (Static linking)
11.	22	1	‘Queue’ concept (Static linking)
12.	23	1	Application of Stack (Infix to Postfix conversion/ Evaluation of Postfix exp.)
13.	24	1	RESERVE CLASS
14.	25	1	Concept of Pointers/ Static and dynamic variables/ Linked list/ Self Referential Structures
15.	26-27	2	Link Stack (Dynamic linking)
16.	28-30	2	Link Queue (Dynamic linking)
17.	31	1	Sorting (Bubble/Selection/Insertion/Merge)
18.	32	1	Searching (Linear search/Binary search)
19.	33-38	6	Boolean Algebra
20.	39-40	2	Some important concepts
21.	40	1	DOUBT SESSION

NOTE: - 1. If there is any topic not mentioned in the planner above, but has been taught in your school, please bring it to my notice so that the same can be covered in time.

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CBSE BOARD MARKING SCHEME

S. No.	TOPIC	MARKS
1.	Review of C++ covered in Class XI	12
2.	Object Oriented Programming in C++ a) Introduction to OOP using C++ b) Constructor & Destructor c) Inheritance	12
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6.	Boolean Algebra a) Introduction to Boolean Algebra & Laws b) SOP & POS c) Karnaugh Map d) Basic Logic Gates	08
7.	Communication and Open Source Concepts a) Introduction to Networking b) Media, Devices, Topologies & Protocols c) Security d) Web servers e) Open Source Terminologies	10
	Total	70

NOTE: - There are total 7 questions in the paper, and occur in the same order.

CHAPTER 1

Review of C++

(Covered in Class 11th)

1. C++. C++ was written by Bjarne Stroustrup at Bell Labs during 1983-1985. C++ is an extension of C.

2. C++ character set. C++ uses the character set given below as the building block to form, the basic program elements such as identifier, variable, array, etc.

Letters : Uppercase letters A-Z

Lowercase letters a-z

Digits : 0 9

Special Characters: / * + \ “ <

(= | { >

%) ~ ; } /

^ - [: ‘ ?

& _] ‘ . (blank)

3. Token. The smallest individual unit in a program is known as token or lexical unit. For example, keyword, literal, operator etc.

4. Reserved words. The **reserved words**, must not be used for any other purposes. These reserved words are also called *Keywords*. For eg. ,

asm	auto	break	case	catch	char	class	const	
continue	defult	delete	do	double	else	enum	extern	float
friend	goto	if	inline	int	long	new		for
private	protected		public	register	return	short	signed	operator
struct	switch	template	this	throw		try	typedef	sizeof
virtual	void	volatile	while				union	static
							unsigned	

5. Variables. A variable is a way of referring to a memory location used in a computer program. This memory location holds values. A variable name, array , function names etc, are also called **identifiers**.

6.Data type. In programming, we store the variables in our computer's memory, but the computer has to know what kind of data we want to store in them, since it is not going to occupy the same amount of memory to store a simple number than to store a single letter or a large number. So, a data type is used to describe the type of data and its value.

The data type can be Primitive or fundamental or atomic - int, char, float, double, void

(I) Derived or structured - array, enum, typedef, reference

(II) User defined - class , structures

The data types can be modified using the **data type modifiers** – long, short, signed, unsigned

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(a) int and unsigned int. The **int** and **unsigned int** types have the size of the system word. This occupies two bytes (the same as short and unsigned short) storage space in memory. Integer variables are declared with the keywords **int**, **short**, **unsigned** or **long**.

(b). char. The character type (**char**) occupies one byte of storage and can express a whole number in the range of -128 to 127. Unsigned characters have a range of 0 to 255.

(c). float. The **float** type occupies four bytes of storage and can express a float-point value in the range of 3.4E-38 to 3.4E+38. This type has seven-digit precision.

(d). double. The **double** type occupies eight bytes of storage and can express a floating-point value in the range 1.7E-308 to 1.7E+308. This type has fifteen-digit precision.

7. Constants. Constants are data values that never change their values during program execution. These are also called **literals**. With the **const** prefix you can declare constants with a specific type in the same way as you would do with a variable:

For example,

```
const NUM=100;  
const CH='Y';
```

8. Escape sequences. Certain special characters are represented as escape sequences. An escape sequence begins with a \ (backslash) followed by an alphanumeric character.

Here's a complete list of the escape sequences in C++:

\a /*alert (bell)*/	\b /*backspace*/
\f /*formfeed*/	\n /*newline*/
\r /*carriage return*/	\t /*horizontal tab*/
\v /*vertical tab*/	\\\ /*backslash*/
\? /*question mark*/	\' /*single quote*/
\" /*double quote*/	\000 /*octal number*/ \xhh /*hexadecimal number*/

9. Comment. C++ has two ways to insert comments into program. Any line that starts with a // is a comment and called single line comment. The multiple lines comments are included in /* comments here */

10. Operator. An operator is one which works on data items and performs some mathematical calculation or changes the data. C++ provides six types of operators.

(a). Assignment operator. An assignment operator assigns the value of the right-hand operand to the storage location named by the left-hand operand. For example,

```
x+=1; i.e., x = x + 1  
x/=1; i.e., x = x / 1
```

(b). Arithmetic operator. These are general mathematical operators, which work more than one operand. For these operators always two or more than two operands are necessary that is why these operators are called binary operator.

(c). Relational operators. The operators which are used to do comparison between two or more operands are called *relational operators*. e.g., `<`, `>`, `==`, `!=` etc

(d). Logical operators. These operators are used to combine one or more than one relational expressions. e.g., `&&`, `||`, `!`

(e). Unary operator. C++ provides two unary operators for which only one variable is required. These are increment and decrement operators.

(f). Conditional operator. The conditional operator, `? :` is C++'s only ternary operator. A ternary operator requires three operands (instead of the single and double operands of unary and binary operators). The conditional operator is used to replace **if-else** logic situations. The syntax of the conditional operator is:

`conditional_expression ? expression1 : expression2;`

(g). sizeof operator. This operator accepts one parameter, which can be either a type or a variable itself and returns the size in bytes of that type or object:

`a = sizeof (char);`

(h). Comma operator. The comma operator `,` is used to separate two or more expressions that are included where only one expression is expected.

11. Precedence of Operators. There is an established order with the priority of each operator, and not only the arithmetic ones (those whose preference come from mathematics) but for all the operators which can appear in C++. From greatest to lowest priority, the priority order is as follows:

Operator Name	Associativity	Operators
Primary scope resolution	left to right	<code>::</code>
Primary	left to right	<code>()[].-> dynamic_cast typeid</code>
Unary	right to left	<code>++ -- + - !~ & *</code> <code>(type_name)</code> <code>sizeof new delete</code>
C++ Pointer to Member	left to right	<code>.*->*</code>
Multiplicative	left to right	<code>* / %</code>
Additive	left to right	<code>+ -</code>
Relational	left to right	<code>< > <= >=</code>
Equality	left to right	<code>== !=</code>
Logical AND	left to right	<code>&&</code>

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Logical OR	left to right	
Conditional	right to left	?:
Assignment	right to left	= += -= *= /= <<= >>= %= &= ^= =
Comma	left to right	,

12. setw() Manipulator. The `setw()` manipulator is an operator that can be inserted directly into input output statements to give the space. Header file is `iomanip.h`

13. endl Manipulator. The `endl` manipulator can be inserted into the `cout` statement at a place where it is desired to take rest of the display on the next line.

14. main(). The `main` function is the entry point of any C++ program. A C++ program begins execution at the function `main`. When a C++ program is compiled and run, the code first executed is the code within the function titled `main`.

15. Control Structure. Control structures in C++ fall into two categories: selection/conditional/decision and repetition.

(a). Selection statement. The C++ selection statements, if and switch, provide a means to conditionally execute sections of code.

(i) if statement. The `if` statement allows branching (decision making) depending upon the result of logical expression. In C++ the `if` statement is used with relational operators. This statement is called decision statement because it tests a relationship, using the relational operator. The `if` statement has the following

format :

```
if (condition)
{
    Program statements;
}
```

(ii). switch statement. The `switch` statement handles a series of decisions by checking a particular variable or expression for different values it may assume and based on which different actions are taken. In most programs, it is necessary to include a `break` statement at the end of each `case` section. Several `cases` can execute the same statements by listing the `case` labels together before the statements. The `switch` structure can only test constant integral expressions.

(b). Loop. A loop is a group of instructions the computer executes repeatedly until some terminating condition is satisfied.

(i). for statement. This is probably the most useful and the most used loop in C/C++. The statements in the loop repeat continuously a certain number of times. The format of the `for` loop is:

```
for (start condition; continue condition; re-evaluation)
```

(ii). while statement. The **while** loop allows programs to repeat a statement or series of statements, over and over, as long as a certain test condition is true. The **while** loop is an entry-condition loop. If the **test condition** is **false** to begin with, the program never executes the body of the loop.

The format of the **while** statement is:

```
while (test expression)
{
    program statements;
}
```

(iii). do-while statement. It is very similar to the ‘while’ loop shown above. The only difference being, in a ‘while’ loop, the condition is checked beforehand, but in a ‘do while’ loop, the condition is checked after one execution of the loop. This ensures that the body of the loop executes at least once. The **do-while** loop is an **exit-condition loop**. This means that the body of the loop is always executed first. Then, the **test condition** is evaluated.

The syntax of the **do-while** loop is:

```
do
{
    program statements;
}
while (test expression);
```

16. exit() function. The **exit()** function ends a program before its normal termination. It requires the Standard Library header file, stdlib.h. The format is **exit(value);** where value is an integer variable or value.

17. break. The **break** statement gets you out of a loop. No matter what the loop’s ending condition. The program continues with the next statement immediately following the loop. **break** stops only the loop in which it resides. It does not break out of a “nested loop” (a loop within a loop).

18. continue. The **continue** statement, when executed in one of the repetition structures (**for**, **while** and **do/while**), skips any remaining statements in the body of the structure and proceeds with the next iteration of the loop.

19. goto statement. The **goto** statement causes the control to be shifted to a different location unconditionally, instead of executing the next statement in the sequence. The format of the **goto** statement is :

```
goto statement label;
```

20. stdin. C++ always assumes that input will come from **stdin**, means standard input device. It is usually the keyboard, although you can re-route this default. The reason why **cin** gets input from the keyboard is that most computers consider the keyboard to be the standard input device, **stdin**.

21. `stdout`. C++ assumes that all output would go to **`stdout`**, or the standard output device. The reason that **`cout`** goes to the screen is simply that **`stdout`** is routed to the screen, by default, on most computers.

22. Unformatted stream I/O functions.

(a) **`get()` function.** The `get()` function inputs a single character from the standard input device (the keyboard, if you do not redirect it). The format of `get()` is :

```
device.get(char_var);
```

For example,

```
char char_val;  
cout << "Enter your first name initials : ";  
cin.get(char_val);
```

(b) **`put()` function.** The `put()` function outputs a single character to the standard output device (the screen, if you do not redirect it from the operating system). The format of `put()` is :

```
device.put(char_val);
```

For example,

```
fname = char_val;  
cin.get(char_val);// Ignore new line  
cout.put(fname);
```

(c) **`getline()` function.** The `getline()` function is used with input streams, and reads characters into *buffer* until either:

- num* – 1 characters have been read,
- a newline is encountered,
- or, optionally, until the character *delim* is read. The *delim* character is not put into buffer.

The format of `getline()` function is :

```
device.getline(char_var, integer, "terminating_char");
```

For example,

```
char line[20];  
cout << "Enter a line terminated by . (dot) ";  
cin.getline(line, 20, '.');  
cout << line;
```

Header file is iostream.h

23. Console I/O functions. They perform input from the standard input device output to standard output device of a system. Header file is stdio.h

(a) **`getchar()` function.** The C++ library uses `getchar()` function to return a single character from a standard input device (typically a keyboard). The general form of the `getchar()` function is :

```
char_val = getchar();
```

where *char_val* refers to some previously declared character variable.

(b) **`putchar()` function.** When the standard C++ function that prints or displays a single character (by sending it to standard output) is called `putchar()`. The general form of the `putchar()` function is :

```
putchar(char_val);
```

24. getch() function. This function reads a character from keyboard but does not show it on the screen. Header file conio.h

The format of **getch()** is :

```
char char_var;  
char_var = getch();
```

25. getche() function. This function reads a character from keyboard and show it on the screen. Header file conio.h

The format of **getche()** is :

```
char char_var;  
char_var = getche();
```

26. putch() function. This function directly writes a character on the console. The format of **putch()** is : **putch(char_var);**

27. gets() function. The **gets()** function gets a string from **stdin** and puts output a string to **stdout** (and appends a newline character). The format of the **gets()** is :

```
gets(line_char);
```

28. puts() function. The **puts()** function provides a string to **stdout** (and appends a newline character). The format of the **puts()** is :

```
puts(line_char);
```

For example,

```
char line_char[80];  
clrscr();  
cout << "Input a string: ";  
gets(line_char); // Inputs a character line through the standard input device  
puts(line_char); // Prints the above line into the standard output device
```

29. Array. Array is a data structure which holds multiple variables of the same data type. An array is a sequence of objects all of which have the same type. The objects are called *elements* of the array and are numbered consecutively 0, 1, 2, These numbers are called *index values* or *subscripts* of the array.

30. 1-D array. One-dimensional array is a list of variables that are all of the same type and are referenced through a common name. An individual variable in the array is called an array element. Arrays form a convenient way to handle groups of related data. For example,

```
int arr[10]; // arr is one-dimentional array
```

31. Initializing Array. When data values are stored into an array using assignment operator, we call it as initializing array, for example, `int num = 10, char name[] = "Computer".`

32. String array. In C++, a string is an array of characters with the following exceptional features: An extra component is appended to the end of the array, and its value is set to the NULL character [\0]. This means that the total number of characters in the array is always 1 more than the string length.

33. 2-D array. The most commonly used table is a two-dimensional table (an array with two subscripts). You can create arrays of two or more dimensions, for example, to create a 10 × 12 two-dimensional integer array called *table*, you would use this statement :

```
int table[10][12];
```

declare the integer array table with 10 rows and 12 columns.

34. Function. The best way to develop and maintain a large program is to divide it into several smaller program modules of which are more manageable than the original program. Modules are written in C++ as classes and functions. A function is invoked by a function call. The function call mentions the function by name and provides information (as arguments) that the called function needs to perform its task.

35. return. The C++ keyword **return** is one of several means we use to exit a function. When the **return 0** statement is used at the end of main() function, the value 0 indicates that the program has terminated successfully or returns **NULL** value to the operating system.

36. void. A function that does not have a value is declared with the keyword **void** return type.

37. Function Pass By Value. This means that when calling a function with parameters, what we have passed to the function were copies of their values but never the variables themselves. The “passing by value” is also known as “passing by copy”.

38. Function Pass By Address. When a variable is passed by reference, we are not passing a copy of its value, but we are somehow passing the variable itself to the function and any modification that we do to the local variables will have an effect in their counterpart variables passed as arguments in the call to the function. A *reference parameter* is indicated by following the formal parameter name in the function prototype/header by an ampersand (&). The compiler will then pass the *memory address* of the actual parameter, not the value. The phrases “passing by address” and “passing by reference” mean, the very same thing.

39. Function prototype. A function prototype declares the return-type of the function and declares the number, the types and order of the parameters, the function expects to receive. The function prototypes enable the compiler to verify that functions are called correctly.

40. Function Overloading. In C++, it is possible to define several functions with the same name, performing different actions. The functions must only differ in their argument lists. Otherwise, function overloading is the process of using the same name for two or more functions. Each redefinition of a function must use different type of parameters or different sequence of parameters or different number of parameters.

41. Scope of variable. The program part(s) in which a particular piece of code or data value can be accessed is known as variable scope.

42. Life time of a variable. The time interval for which a particular variable live in the memory is called lifetime of a variable.

43. Local variables. A local variable is defined inside a block and is only visible from within the block. When execution of the block starts, the variable is available, and when the block ends, the variable ‘dies’. A local variable is visible within nested blocks unless a variable with the same name is defined within the nested block

44. Global variables. A global variable is a variable that is accessible in every scope. As the variable was a global one, there was no need to pass it as a parameter to use it in a function besides main. The global variable belongs to every function in the program.

45. Actual variables. When a function is *called*, the values (expressions) that are passed in the call are called the *arguments* or *actual parameters* (both terms mean the same thing). At the time of the call each actual parameter is assigned to the corresponding formal parameter in the function definition.

46. Formal variables. Formal parameters are written in the function prototype and function header of the definition. Formal parameters are local variables which are assigned values from the arguments when the function is called.

47. Scope resolution operator (::). This operator enables a program to access a global variable when a local variable of the same name is in scope.

48. Storage class specifier. There are four storage class specifiers.

(a) **auto.** By default all the variables are **auto**. It uses to declare automatic variables. Automatic variables are simply local variables, which are **auto** default.

(b) **register.** When we want to access variable frequently, we declare that variable as **register** type. The register modifier tells the compiler to store a variable in such a way that access becomes as fast as possible. Typically, this means storing the variable in the CPU or cache memory.

(c) **static.** The **static** modifier can be used with global variable or with local variable. The **static** modifier causes a local variable to stay in existence throughout the life of a program. Thus, the contents of a **static** variables are preserved between function calls. Also, unlike normal local variable, which are initialized each time their block is entered, a **static** variable is initialized only once, when its block is first entered.

(d) **extern.** The specifier **extern** is useful in the situation when we break a long program into smaller tasks and store them into different files. Using **extern** we can do the linking between the global variable in two or more files.

49. Header files. Header files are also called include files which provide function prototype declarations for library functions. Data types and symbolic constants used with the library

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functions are also defined in them, along with global variables defined by C++ and by the library functions.

50. isalpha(c). Returns True (nonzero) if c is an uppercase or a lowercase alphabet. A False (0) value is returned if anything other than a alphabet is passed to this function. The syntax is as: isalpha(c);

For example,

```
char c;
cout << "Enter any character ";
cin >> c;
if (isalpha(c))
    cout << "Your entered character is an alphabet";
else
    cout << "Your entered character is not an alphabet";
```

51. islower(c). Returns True (nonzero) if c is a lowercase alphabet. A False (0) value is returned if anything other than an uppercase or lowercase alphabet is passed to this function. The syntax is as: islower(c);

For example,

```
char c;
cout << "Enter any character ";
c = getchar();
fflush(stdin);
if (islower(c))
    cout << "Your entered character is lowercase letter";
else
    cout << "Your entered character is not lowercase letter";
```

52. isupper(c). Returns True (nonzero) if c is an uppercase alpahbet. A False (0) value is returned if anything other than an uppercase alphabet is passed to this function. The syntax is as: isupper(c);

For example,

```
char c;
cout << "Enter any character ";
c = getchar();
fflush(stdin);
if (isupper(c))
    cout << "Your entered character is uppercase letter";
else
    cout << "Your entered character is not uppercase letter";
```

53. isdigit(n). Returns True (nonzero) if n is a digit from 0 through 9. A False (0) value is returned if anything other than a digit is passed to this function. The syntax is as: isdigit(n);

For example,

```
int n;
cout << "Enter any number ";
```

```
n = getchar();
fflush(stdin);
if (isdigit(n))
    cout << "Your entered number is a digit";
else
    cout << "Your entered number is not a digit";
```

54. isalnum(c). Returns True (nonzero) if c is a digit from 0 through 9 or an alphabetic character (either uppercase or lowercase). A False (0) value is returned if anything other than a digit or letter is passed to this function. The syntax is as: isalnum(c);

For example,

```
int c;
cout << "Enter any number or character ";
c = getchar();
fflush(stdin);
if (isalnum(c))
    cout << "Your entered number is an alphanumeric character";
else
    cout << "Your entered number is not an alphanumeric character";
```

55. tolower(c). Converts the character c to lowercase. Nothing is changed if you pass a lowercase letter or a non-alphabetic character to the function. The syntax is as: tolower(c);

For example,

```
int c;
cout << "Please enter any character ";
c = getchar();
fflush(stdin);
if isalpha(c)
    if (isupper(c))
    {
        cout << "The converted letter is ... ";
        putchar(tolower(c));
    }
    else
        cout << "This is not an uppercase letter ";
else
    cout << "The character is not an alphabet";
```

56. toupper(c). Converts c to uppercase. Nothing is changed if you pass an uppercase letter or a non-alphabetic character to the function. The syntax is as: toupper(c);

For example,

```
int c;
cout << "Please enter any character ";
c = getchar();
fflush(stdin);
if isalpha(c)
```

```
if (islower(c))
{
    cout << "The converted letter is ... ";
    putchar(toupper(c));
}
else
    cout << "This is not an lowercase letter ";
else
    cout << "The character is not an alphabet";
```

57. strcpy(s1, s2). The function copies character string s2 to string s1. The s1 must have enough reserved elements to hold the string s2. The syntax is as :

For example,

```
char name[10],new_name[10];
cout << "Enter the name of state";
gets(name);
strcpy(new_name, name);
cout << "\nCopied name is " << new_name;
```

58. strcat(s1, s2). Concatenates (merges) the string s2 onto the end of the characters array s1. The array s1 must have enough reserved elements to hold both strings. The syntax is as :

For example,

```
char sname[10], Nclass[10];
char detail[30] = " ";
cout << "Enter your name ";
gets(sname);
cout << "Enter your class ";
gets(Nclass);
strcat(detail, sname); // Concatenates first name onto name
strcat(detail, " "); // Concatenates one blank space onto name
strcat(detail, Nclass); // Concatenates last name into name
cout << "\nCopied name is ";
puts(detail);
```

59. strcmp(s1, s2). Compares the string s1 with s2 on an alphabetic, element-by-element basis. If s1 alphabetizes before s2, strcmp() returns a negative value. If s1 and s2 are exactly the same, strcmp() returns a 0. If s1 alphabetizes after s2, strcmp() returns a positive value.

For example,

```
char pass[12] = "Welcome2007", newpass[12];
int ctr=0;
cout << "Enter your password name ";
cin >> newpass;
ctr = strcmp(pass, newpass);
if (ctr == 0)
    cout << "Correct password ";
else
```

```
cout << "Wrong password ";
```

60. `strlen(s1)`. Function `strlen()` takes a string as an argument and returns the number of characters in the string—the terminating null character is not included in the length of the string.

For example,

```
char name[20];
int len;
cout << "Enter your name";
gets(name);
len = strlen(name);
cout << "Your name length is " << len << " digit";
```

61. `ceil(x)`. Rounds upto the nearest integer. This function is sometimes called the ceiling function.

62. `floor(x)`. Rounds down to the nearest integer.

63. `fabs(x)`. Returns the absolute value of x. The absolute value of a number is its positive equivalent.

64. `fmod(x, y)`. Returns the remainder of x / y.

65. `pow(x, y)`. Returns x raised to the power y or x^y . If x is less than or equal to zero, y must be integer. If x equals zero, y cannot be negative.

66. `sqrt(x)`. Returns the square root of x. x must be greater or equal to zero.

67. `cos(x)`. Returns the cosine of the angle x. x is expressed in radians.

68. `sin(x)`. Returns the sine of the angle x. x is expressed in radians.

69. `tan(x)`. Returns the tangent of the angle x. x is expressed in radians.

70. `exp(x)`. Returns the base of the natural logarithm (e) raised to a power specified by x (e^x). e is approximately 2.718282.

71. `log(x)`. Returns the natural logarithm of the argument x, mathematically written as $\ln(x)$, x must be positive.

72. `log10(x)`. Returns the base-10 logarithm of the argument x, mathematically written as $\log_{10}(x)$. x must be positive.

73. UDT. User defined data types are created with the help of **struct** or **class** keywords.

74. Structure. A structure type is a user-defined composite type. It is composed of fields or members that

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can have different types. In C++, a structure is the same as a class except that its members are **public** by default.

75. Defining a structure. Structures are declared with the struct keywords. Definitions of members are placed within the declaration.

The format of the structure statement is :

```
struct <struct tag>
{
    member definition;
    member definition;
    :
    :
    member definition;
} [ one or more structure variables];
```

76. Structure tag. A structure tag name can be used to declare variable of a structure type.

77. Structure elements. The members of a structure are called structure elements. Structure elements are referenced through the dot ‘.’ or arrow ‘->’ operators.

78. The dot operator. Dot operator ‘.’ is used to access the structure variables . For example,

79. Copy structure. A structure can also be assigned to another structure only if both the structures are of same type.

80. Nested structure. C++ enables you to nest one structure definition within another. This technique saves time when you are writing programs that use similar structures.

81. typedef. Every variable has a data type. **typedef** is used to define new data type names to make a program more readable to the programmer.

For example:

```
main()
{
    typedef int Pounds;
    Pounds money = 2
}
```

82. Enumerated data type. In C and C++, enum types can be used to set up collections of named integer constants. (The keyword enum is short for “enumerated”.)

```
enum { SPRING, SUMMER, FALL, WINTER };
```

An enumerated data type can be defined for a finite list of values. By default an enumerated data type is assigned the value 0, second as 1, third as 2, and so on.

83. #define Directives. When you compile a program the compiler first uses a preprocessor to analyze the code. The #define directive can be used to either define a constant number or function or to replace an instruction in your code.

For example:

```
#define sqr(x) (x*x)
```

When you call `sqr(6)`, the preprocessor will first replace `sqr(6)` with `(6*6)` and then compile the program.

84. Automatic Type conversion happens whenever the compiler expects data of a particular type, but the data is given as a different type, leading to an automatic conversion by the compiler, if the conversion is impossible it will result in an error at compile time or a warning in case of undefined behavior (ie: converting an int to a char). Warnings may vary depending on the compiler used or compiler options.

```
int a = 5.6;  
float b = 7;
```

In the example above, in the first case an expression of type float is given and automatically interpreted as an integer. In the second case (more subtle), an integer is given and automatically interpreted as a float.

85. Type Casting or explicit conversion. It means you change the representation of a variable by changing its type to a different one. In order to type-cast a simple object to another you use the traditional type casting operator. For example, to cast a floating point number of type 'double' to an integer of type 'int'.

Format: Type name (Expression);

Let us see the concept of type casting in C++ with a small example:

```
#include <iostream.h>  
void main()  
{  
int a;  
float b,c;  
cout<< "Enter the value of a:";  
cin>>a;  
cout<< "n Enter the value of b:";  
cin>>b;  
c = float(a)+b;  
cout<<"n The value of c is:"<<c;
```

}

The output of the above program is

```
Enter the value of a: 10
Enter the value of b: 12.5
The value of c is: 22.5
```

In the above program a is declared as integer and b and c are declared as float. In the type conversion statement namely

```
c = float(a)+b;
```

The variable a of type integer is converted into float type and so the value 10 is converted as 10.0 and then is added with the float variable b with value 12.5 giving a resultant float variable c with value as 22.5

86. Header files. C++ is a huge language so much that it uses various sets of instructions from different parts to do its work. Some of these instructions come in computer files that you simply "put" in your program. These instructions or files are also called libraries. To make your job easier, some of these libraries have already been written for you so that as you include them in your program, you already have a good foundation to continue your construction. Yet, some of these libraries have their limitations, which mean you will expand them by writing or including your own libraries. The first library we will be interested in is called **iostream**. It asks the computer to display stuff on the monitor's screen.

87. cout. To display stuff on the monitor, C++ uses operators. The operator used to display something on the screen is called cout (pronounce see - out) (actually, cout is a class and not an operator, but we haven't learned what a class is). The cout word is followed by the extraction operator <<, then some simple rules to display anything. For example, to display a word or sentence, you include it in double quotes " and ".

88. cin. Besides the cout extractor, C++ is equipped with another operator used to request values from the user. The user usually provides such a value by typing it using the keyboard. The cin (pronounce "see in") operator is used for that purpose; it displays a blinking cursor on the monitor to let the user know that a value is expected. Unlike the cout operator, the cin uses two greater than signs ">>" followed by the name of the expected value. The syntax of the cin operator is:

```
cin >> valueName;
```

89. The address operator (&). When declaring a variable, the compiler reserves an amount of space in memory for that variable. C++ provides an operator that can tell you where (the space for) a variable is located. This is done using the "address of" operator represented by the ampersand &.

To get the address of a variable, use the ampersand operator on its left. The address is a hexadecimal number. Here is an example:

90. Function with constant parameters. When a function receives an argument, it performs one of two actions with regards to the value of the argument; it might modify the value itself or only use the argument to modify another argument or another of its own variables. If you know that the function is not supposed to alter the value of an argument, you should let the compiler know. This is a safeguard that serves at least two purposes. First, the [compiler](#) will make sure that the argument supplied stays intact; if the function tries to modify the argument, the compiler would throw an error, letting you know that an undesired operation took place. Second, this speeds up execution.

To let the compiler know that the value of an argument must stay constant, use the `const` keyword before the data type of the argument. For example, if you declare a function like `void Area(const string Side)`, the `Area()` function cannot modify the value of the `Side` argument. Consider a function that is supposed to calculate and return the perimeter of a rectangle if it receives the length and the width from another function, namely `main()`. Here is a program that would satisfy the operation (notice the `Perimeter()` function that takes two arguments):

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

```
float Perimeter(const float l=7, const float w=5)
{
    double p;

    p = 2 * (l + w);
    return p;
}

int main()
{
    float length, width;

    cout << "Rectangle dimensions.\n";
    cout << "Enter the length: ";
    cin >> length;
    cout << "Enter the width: ";
    cin >> width;
    cout << "\nThe perimeter of the rectangle is: "
        << Perimeter(length, width) << "\n\n";

    return 0;
}
```

In the above example you will get the syntax error as you are passing the values of `l` and `w` and they are defined as `const` parameter which user cannot modify.

91. Functions with default parameters. In computer programming, a **default argument** is an argument to a function that a programmer is not required to specify. In most programming

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languages, functions may take one or more arguments. Usually, each argument must be specified in full (this is the case in the C programming language).

Later languages (for example, in C++) allow the programmer to specify default arguments that always have a value, even if one is not specified when calling the function. For example, in the following function declaration:

```
int MyFunc(int a, int b, int c=12);
```

This function takes three arguments, of which the last one has a default of twelve. The programmer may call this function in two ways:

```
result = MyFunc(1, 2, 3);  
result = MyFunc(1, 2);
```

In the first case the value for the argument called *c* is specified as normal. In the second one, the argument is omitted, and the default value of 12 will be used instead.

92. Functions with array. At some moment we may need to pass an array to a function as a parameter. In C++ it is not possible to pass a complete block of memory by value as a parameter to a function, but we are allowed to pass its address. In practice this has almost the same effect and it is a much faster and more efficient operation.

In order to accept arrays as parameters the only thing that we have to do when declaring the function is to specify in its parameters the element type of the array, an identifier and a pair of void brackets []. For example, the following function:

```
void procedure (int arg[])
```

accepts a parameter of type "array of int" called *arg*. In order to pass to this function an array declared as:

```
int myarray [40];
```

it would be enough to write a call like this:

```
procedure (myarray);
```

Here you have a complete example:

```
1 // arrays as parameters  
2 #include <iostream.h>  
3  
4 void printarray (int arg[], int length) {  
5   for (int n=0; n<length; n++)      Output  
6     cout << arg[n] << " ";  
7   cout << "\n";                  5 10 15  
8 }                                2 4 6 8 10  
9  
10 int main ()  
11 {  
12   int firstarray[] = {5, 10, 15};
```

```
13 int secondarray[] = {2, 4, 6, 8, 10};  
14 printarray(firstarray,3);  
15 printarray(secondarray,5);  
16 return 0;  
17 }  
18
```

As you can see, the first parameter (int arg[]) accepts any array whose elements are of type int, whatever its length. For that reason we have included a second parameter that tells the function the length of each array that we pass to it as its first parameter. This allows the for loop that prints out the array to know the range to iterate in the passed array without going out of range.

93. Reference. A reference is an alternative name of a variable

```
int t;  
int &s = t;  
t = 100;  
cout<<t<<s;
```

Both will give the output 100.

94. Cascading of I/O . The multiple use of input or output operators (>> or <<) in one statement is called cascading of I/O.e.g., cout<<a<<b<<c;

95. Statement terminator. In C++ semicolon is known as statement terminator.

96. Compound block. A compound statement in C++ is a sequence of statements enclosed by a pair of braces. e.g.,

```
{  
statement1;  
statement2;  
}
```

97. Static local variable. A static local variable has the scope of local variable but the lifetime of a global variable.

98. Static global variable. A static global variable has a file scope but its lifetime is the entire program run.

CHAPTER 2

Communication and Network Concepts

1. **Network.** When several computers are connected together by lines or cables, this makes a network. When you come to the Greenwich Library and use our computer catalog to find a book, you are using our network. All of our computers are linked together so that they can share the same information.
2. **Network File System (NFS).** A Network File System is any software and network protocols that support the sharing of files by multiple users over a network. On Unix systems, this is usually implemented using the NFS protocol, which relies on UDP/IP. On Windows NT systems, this is usually implemented with the SMB protocol, which in turn can be implemented over IPX, NetBEUI or TCP/IP. On NetWare systems, this is usually implemented with the NCPFS protocol, which in turn relies on IPX.
3. **Node.** Any system or device connected to a network is also called a node. For example, if a network connects a file server, five computers, and two printers, there are eight nodes on the network.
4. **Server.** The node, which provides service to the network at a fixed address is called server. Server is a computer software application that carries out some task on behalf of users. This is usually divided into file serving, allowing users to store and access files on a common computer; and application serving, where the software runs a computer program to carry out some task for the users.
5. **ARPANET.** (Advanced Research Projects Agency Network)ARPANET is a research network sponsored by the DoD (U.S. Department of Defense).It is the first network.
6. **Local Area Network (LAN).** These networks connect computer equipment and other terminals distributed in a localized area, e.g., a university campus, factory, office. The connection is usually a cable or fibre and the extent of the cable defines the LAN. A LAN's wiring is usually owned and maintained by the company or organization that uses the LAN. The connection is usually through a cable or fibre, and the extent of the cable defines the LAN.
A computer is attached to a LAN using a Network Interface Card (NIC), a communications device inside each computer, printer or other machine attached to the network. A NIC translates the computer's binary information into electronic signals transferable over the LAN.
7. **Wide Area Network (WAN).** Wide area network spans a large area - possibly several continents. That is, the interconnect communication facilities in different parts of a country or are used as

public utility. A WAN transmits data at speeds generally lower than a LAN, and WAN wiring is often owned by local or long distance telephone companies or cable television operators. Users may connect their home PCs to a WAN with the help of modems and telephone lines.

They often require multiple communication connections, including microwave radio links and satellite.

8. **Metropolitan Area Network (MAN).** The scope of metropolitan area network lies between LANs and WANs, i.e., spanning a small city or a town. That is, a MAN is optimized for a larger geographical area than a LAN, ranging from several blocks of buildings to entire cities. As with local networks, MANs can also depend on communication channels of moderate to high data rates. MAN might also be owned and operated as public utilities. This kind of network is a high speed network using optical fibre connections.
9. **Communication channels.** The connecting cables are the communication channels between the different channel workstations. The three main types of cables are twisted pair cable, coaxial cable and optical fiber cable.
10. **Communication Network.** A collection of interconnected functional units that provides a data communications service among stations attached to the network.
11. **Twisted Pair Cable.** Twisted pair cable consists of two wires sheathed in an insulator and twisted together. It consists of two identical wires in the pair which have the same impedance to ground, making it a balanced medium. This characteristic helps to lower the cable's susceptibility to noise from neighboring cables or external sources. The most common form of wiring in data communication applications is the twisted pair cable. As a voice grade medium (VGM), it is the basis for most internal offices telephone wiring.
12. **Coaxial Cable.** The cable is finally surrounded in a water-proof, flexible sheath. Coaxial cable is familiar to you — it is the cable used to connect your television aerial. The supreme advantage of this method of construction is its resistance to radiation losses. The outer conductor acts to shield out any external fields, which preventing any internal fields escaping.
13. **Optical Fibre Cable.** A technology that uses glass (or plastic) threads (fibers) to transmit data. A fiber optic cable consists of a bundle of glass threads, each of which is capable of transmitting messages modulated onto light waves. Fiber optics has several advantages over traditional metal communications lines:
 - Fiber optic cables have a much greater bandwidth than metal cables. This means that they can carry more data.
 - Fiber optic cables are less susceptible than metal cables to interference.
 - Fiber optic cables are much thinner and lighter than metal wires.

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- Data can be transmitted digitally (the natural form for computer data) rather than analogically.

The main disadvantage of fiber optics is that the cables are expensive to install. In addition, they are more fragile than wire and are difficult to splice.

14. **Microwave.** Microwave is a direct line-of-sight radio transmission. For long distance communication microwave radio transmission is widely used as an alternative to coaxial cable. It is used to wideband communications systems and is quite common in the telephone system. Television transmission also utilized microwave transmission, because microwave transmission is above the 1 gigahertz (GHz) frequency band and provides the capacity for video transmission.
15. **Radiowave.** A radio wave acts as a carrier of information-bearing signals; the information may be encoded directly on the wave by periodically interrupting its transmission (as in dot-and-dash telegraphy) or impressed on it by a process called modulation. The two most common types of modulation used in radio are amplitude modulation (AM) and frequency modulation (FM). Radio waves are used for wireless transmission of sound messages, or information, for communication, as well as for maritime and aircraft navigation.
16. **Satellite.** The use of satellites in communications system is very much a fact of everyday life, as it evidenced by the many homes or cable TV operators who are equipped with antennas or “dishes” used for reception of satellite television.
17. **Baud.** This term describes the rate of change of the signal on the line, i.e., how many times (per second) the signal changes its pattern.
18. **Baud Rate.** The baud rate is a measure of the modulation rate, the number of discrete signaling events per second - not of the data transfer rate.
19. **Bit Rate.** The bit rate is related to the speed of a device, for example, the speed which binary digits can be transferred over a communication channel. A data rate expressed in bits per second. This is a similar to baud but the latter is more applicable to channels with more than two states.
20. **Bandwidth.** In electronic communication, bandwidth is the width of the range (or band) of frequencies that an electronic signal uses on a given transmission medium.
21. **Baseband.** Transmission of signals without modulation is called baseband. In a baseband local network, digital signal (1s and 0s) are inserted directly onto the cable as voltage pulses. The entire spectrum of the cable is consumed by the signal. This scheme does not allow frequency division multiplexing.

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22. **Broadband.** The use of coaxial cable for providing data transfer by means of analog (radio-frequency) signals. Digital signals are passed through a modem and transmitted over one of the frequency bands of the cable.
23. **Bus.** One or more conductors that serve as a common connection for a related group of devices.
24. **Data Transfer Rate.** Data transfer rate (DTR), is the speed at which data can be transmitted between devices. It might also be expressed in kilobytes or megabytes, or KB/sec and MB/sec. (Units are bps, kbps, Mbps, Gbps, Tbps)
25. **Kilobits.** A unit of data rate where $1 \text{ kb/s} = 1000 \text{ bits per second}$. This contrasts with units of storage where $1 \text{ Kb} = 1024 \text{ bits}$ (note upper case K).
26. **Megabits.** Millions of bits per second. A unit of data rate. $1 \text{ Mb/s} = 1,000,000 \text{ bits per second}$ (not 1,048,576). That is, Ethernet can carry 10 Mbps. In computers, data transfer is often measured in bytes per second.
27. **Protocol.** Protocols are the rules that computers have to follow when you ask them to do a certain job.
28. **Packet.** A packet is a group of bits that include data plus control information. Generally refers to a network layer protocol data unit.29. Circuit Switch Network. Circuit-switched networks are based on the direct connection of two computers, with the connected computers making exclusive use of a single connecting link. The telephone system is a common example of a circuit switched network: one party dials another to form a connection, and that connection becomes exclusively theirs for the duration of the call.
29. **Message Switching.** If two processes want to communicate, a temporary link is established for the duration of one message transfer. Physical links are allocated dynamically among correspondents as needed, and are allocated for only short periods. Each message is a block of data, with system information (such as the source, the destination, and error correction nodes) that allows the communication network to deliver the message to the destination correctly. This scheme is similar to the post-office mailing system.
30. **Baseband.** Packet-switched networks permit many different computers to “share” the same connecting link simultaneously. Each computer on a packet-switched network sends out its binary information in discrete packets of data of a limited size. Each packet travels independently and contains complete identification of its origin and destination. Because the information sent across the network is enclosed in these tight digital bundles, data from a variety of sources can share the network wires without becoming scrambled or lost. A packet-switched network permits efficient use of the network’s capacity and allows multiple simultaneous connections using the same links.

31. **Datagram.** In packet switching, a packet, independent of other packets, that carries information sufficient for routing from the originating data terminal equipment (DTE) to the destination DTE without the necessity of establishing a connection between DTEs and the network.
32. **Digital Data.** The data consists of a sequence of discrete elements called digital data.
33. **Analog Data.** When the digital data are to be sent over an analog facility, the digital signals must be converted to analog signals. These converted data called analog data. That is, data represented by a physical quantity that is considered to be continuously variable and whose magnitude is made directly proportional to the data or to a suitable function of the data.
34. **Modulation.** The technique, which converts digital signal to analog form, is known as modulation.
35. **Demodulation.** The process to convert analog signal into digital form is called demodulation.
36. **Transmission Medium.** The physical path between transmitters and receivers in a communications system.
37. **Serial Transmission.** In serial transmission, each unit of data being transferred travels in sequence. When data to be transmitted is at large distance, serial transmission option is chosen. Also, transfer of data in which elements are transferred in succession are over a single line.
38. **Parallel Transmission.** In parallel data transmission the transmission of character of a word is transmitted over different lines and usually simultaneously. This is done using many wires, with one wire carrying each bit.
39. **Synchronous Transmission.** In synchronous communication, data bytes are sent one after the other at regular intervals. The data form a continuous stream of bits spaced at equal intervals, with no space between consecutive bytes. The data transmission in which the time of occurrence of each signal representing a bit is related to a fixed time frame.
40. **Asynchronous Transmission.** In asynchronous transmission each character is transmitted separately, that is, one character at a time. The character is preceded by a start bit, which tells the receiving device where the character coding begins and is followed by a stop bit, which tells the receiving where the character coding ends.
41. **Ethernet Card.** A type of LAN which uses a simple twisted pair cable to connect the computers in the network. That is, the name Ethernet refers to the cable.

42. **Hub.** A hub is a physical layer device that connects multiple user stations, each via a dedicated cable. Electrical interconnections are established inside the hub. Hubs are used to create a physical star network while maintaining the logical bus or ring configuration of the LAN. In some respects, a hub functions as a multiport repeater. There are two types of hubs : active hub and passive hub.
43. **Active Hub.** The active hubs can be cascaded to connect 8 connection to which passive hubs, file servers or another active hub can be connected. The maximum distance covered by an active hub is about 2000 ft.
44. **Passive Hub.** In the passive hub, it is a passive distribution point which does not use power or active devices in a network to connect up to 4 nodes within a very short distance. The maximum distance covered by a passive hub is about 300 ft.
45. **RJ-45 Connector.** Short for Registered Jack-45, an eight-wire connector used commonly to connect computers onto a local-area networks (LAN), especially Ethernets. The RJ-45 connector is commonly used for network cabling and for telephony applications. It's also used for serial connections in special cases.
46. **Repeater.** A repeater is a physical layer device used to interconnect the media segments of an extended network. A repeater essentially enables a series of cable segments to be treated as a single cable. Repeaters receive signals from one network segment and amplify, retime, and retransmit those signals to another network segment.
47. **Bridge.** A bridge is used to interconnect two LANs which are physically separate but logically same. It uses the same logical link control protocol but may be used with different medium access control protocols.
48. **Router.** Router is used to load balance between various paths that exist on networks. It is an internetworking device that connects to computer networks. It makes use of an internet protocol and assumes that the entire attached device on the networks uses the same communications architecture and protocols. Routers can attach physically different networks.
49. **Gateway.** The special machine, which allows different electronic networks to talk to Internet that uses TCP/IP, is called gateway.
50. **File Servers.** Computers that act as shared repositories for files are called file servers. File servers provide controlled access to files and usually have some method of determining which users have access to which files and other system resources.

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51. **Print Servers.** Print Servers provide shared access to printers. Most LAN operating systems provide print service. Print service can run on a file server or on one or more separate print server machines. Non-file server print servers can be dedicated to the task of print service or they can be non-dedicated workstations.
52. **Database Servers.** A database server is a computer program that provides database services to other computer programs or computers, as defined by the client-server model. The term may also refer to a computer dedicated to running such a program. Database management systems frequently provide database server functionality, and some DBMS's (e.g., MySQL) rely exclusively on the client-server model for database access.
53. **Internet.** The Internet is a global network of computers that are linked together by cables and telephone lines making communication possible among them.
54. **Internet Protocol.** The Internet Protocol is the protocol responsible for addressing the data transmitted over the Internet. It acts much like an envelope; just as the address on the outside of a postal envelope indicates the destination of that information to the postmaster, the address on the IP packet indicates the destination of the data contained within it.
55. **E-Mail.** E-mail is a popular way of communication on the Internet by which you can send mail to any part of the world within few seconds and without spending huge amount of money. This is a basic Internet service for sending or receiving messages electronically over a computer network.
56. **ISP.** Any organization that provides access to the Internet is called ISP (Internet Service Provider).
57. **ISDN.** A new generation of digital telecommunication lines. ISDN (Integrated Services Digital Network) lines include two bearer channels which can handle up to 64 kbps each, for combined capacity of 128 kbps.
58. **Domain.** The highest sub-division of the Net, usually referring to a country or the type of organization, such as .edu for education, or .com for commercial.
59. **DNS.** A Domain Name System (DNS) translates between the numeric IP address that identify each host computer on the Internet and the corresponding domain names. The Internet addressing system that connects a domain name to a specified numeric IP address. For example, if your browser requests a Web page from the Yahoo! Web site, which has the host name www.yahoo.com, a DSN server translates that name to 204.71.200.67, one of the Yahoo!'s Web servers and then sends the request to that IP address. A domain name is portable. In other words, it can stay the same even if a system's IP address changes.

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60. **IP Address.** Each host computer on the Internet has a unique number, called its IP address, IP addresses are of the format xxx.xxx.xxx.xxx, where each xxx is a number from 0 to 255. IP addresses identify the host computers, so that packets of information reach the correct computer.
61. **Search Engines.** Search engines are a bottom-up approach for finding your way around the Web. You give a list of keywords or phrases to search a search engine (called a query) and it returns to you a list of Web pages that contains those words or phrases.
62. **HTTP.** HTTP is short for Hypertext Transfer Protocol. It is the set of rules, or protocol, that governs the transfer of hypertext between two or more computers. Hypertext is text that is specially coded using a standard system called Hypertext Markup Language (HTML). The HTML codes are used to create links.
HTTP also canned the language of Web communication.
63. **FTP.** It stands for File Transfer Protocol. FTP is part of the TCP/IP protocol suite. It is the protocol or set of rules, which enables files to be transferred between computers. FTP is a powerful tool which allows files to be transferred from “computer A” to “computer B”, or vice versa.
64. **TCP/IP.** The language that computers on the Internet use to talk to each other. TCP/IP stands for Transmission Control Protocol/Internet Protocol, which is just a long way to say “the language of the Internet.”
65. **IP.** The protocol that provides a basis for the Net. The Internet Protocol allows data to travel in packets that can be routed across different networks before being reassembled at their final destination.
66. **SLIP.** It stands for Serial Line Internet Protocol. SLIP is a protocol that allows a computer to use the Internet Protocol with a standard voice-grade telephone line and a high-speed modem. SLIP is an older protocol that is being superseded by PPP.
67. . **PPP.** PPP stands for the point-to-point protocol. It is used by users connected to a network with a serial connection or modem to establish a (usually) temporary network connection. It is usually used to route IP, and sometimes IPX network traffic between the fixed network and the remote user.
68. **SMTP.** SMTP is the Simple Mail Transfer Protocol. It is the most popular protocol for transferring electronic mail on the Internet.

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69. **POP3.** POP3 (Post Office Protocol 3) is the most recent version of a standard protocol for receiving e-mail. POP3 is a client/server protocol in which e-mail is received and held for you by your Internet server.
70. **.IMAP.** IMAP (Internet Message Access Protocol) is a standard protocol for accessing e-mail from your local server. IMAP (the latest version is IMAP Version 4) is a client/server protocol in which e-mail is received and held for you by your Internet server.
71. **Telnet.** Telnet is a network application that is used to login to one computer on the Internet from another. It is similar to establishing a conventional dial-up connection between two computers using modems and dial-up telephone lines. However, telnet connections use the Internet and not the telephone network.
72. **Remote Login.** Remote login means to connect the network at a remote station without any network. This remote login takes place through Telnet.
73. **GSM.** Global system for mobile communication (GSM) is a globally accepted standard for digital cellular communication. GSM is the name of a standardization group established in 1982 to create a common European mobile telephone standard that would formulate specifications for a pan-European mobile cellular radio system operating at 900 MHz.
74. **Multiplexing.** In data transmission, a function that permits two or more data sources to share a common transmission medium such that each data source has its own channel called multiplexing.
75. **FDM.** It stands for Frequency Division Multiplexing. FDM is a scheme in which numerous signals are combined for transmission on a single communications line or channel. Each signal is assigned a different frequency (sub channel) within the main channel.
76. **TDM.** It stands for Time Division Multiplexing. TDM is a method of putting multiple data streams in a single signal by separating the signal into many segments, each having a very short duration. Each individual data stream is reassembled at the receiving end based on the timing.
77. **WDM.** It stands for Wavelength Division Multiplexing. WDM is a method of combining multiple signals on laser beams at various infrared (IR) wavelengths for transmission along fiber optic media. Each laser is modulated by an independent set of signals. Wavelength-sensitive filters, the IR analog of visible-light color filters, are used at the receiving end.
78. **CDMA.** It stands for Code Division Multiple Access. This is another wireless channel. CDMA is

completely different from all the other allocation techniques. CDMA divides the channel into frequency bands and assigning those statically (FDM) or on demand (wave division multiplexing), with the owner using the band indefinitely.

79. **WLL.** It stands for Wireless Local Loop. Wireless Local Loop is an ideal application to provide telephone service to a remote rural area. The system is based on a full-duplex radio network that provides local telephone-like service among a group of users in remote areas. These areas could be connected via radio links to the national telephone network, though allowing the WLL subscriber to call or be reached by any telephone in the world.
80. **3G Technology.** In 3rd generation, wireless is a term used to describe telecommunications in which electromagnetic waves (rather than some form of wire) carry the signal over part or all of the communication path. Some monitoring devices, such as intrusion alarms, employ acoustic waves at frequencies above the range of human hearing; these are also sometimes classified as wireless. Common examples of wireless equipment in use today include :
 - Cellular phones and pagers • Global Positioning System
 - Cordless computer peripherals • Cordless telephone sets
 - Home-entertainment-system control boxes • Remote garage-door openers
 - Two-way radios. • Baby monitors
 - Satellite television • Wireless LANs or local area networks.
81. **SMS.** The Short Message Service (SMS) is the ability to send and receive text messages to and from mobile telephones. The text can comprise of words or numbers or an alphanumeric combination. SMS was created when it was incorporated into the Global System for Mobiles (GSM) digital mobile phone standard.
82. **Host.** Host System is a computer on a network, which provides services to users or other computers on that network. Host System's usually run a multi-user operating system such as Unix, MVS or VMS, or at least an operating system with network services such as Windows NT, NetWare NDS or NetWare Bindery.
83. **Encryption.** Encryption is a process of translating a message, called the Plaintext, into an encoded message, called the Ciphertext. This is usually accomplished using a secret Encryption Key and a cryptographic Cipher.
84. **Decryption.** Decryption is the reverse process to Encryption. Frequently, the same Cipher is used for both Encryption and Decryption. While Encryption creates a Ciphertext from a Plaintext, Decryption creates a Plaintext from a Ciphertext.
85. **Backbone Network.** As we know that LAN covers limited area and has a proper connection with

cable. But sometimes it is required to connect numbers of LANs to share data. When these LANs are connected it becomes a WAN. This type of connection behind the LAN is called backbone network.

86. **Network Security.** Network security measures are needed to protect data during their transmission and to guarantee that data transmissions are authentic. Two fundamental approaches are in use : conventional encryption, and public-key encryption.
87. **Cyber Law.** In Internet, the communication technology uses the means of transferring textual messages, pictures and many more. Each time there may be number of threats on either from the senders or receivers side which creates a bridge between networking communication. To short out these problems, the Internet security council made number of precautions, i.e., rules. These predefined rules called cyber law or law of Internet.
88. **Cyber Crime.** Crimes committed primarily through Internet contact include: credit card fraud, identity theft, child pornography, indecent chat-room behavior, software and media piracy, website vandalism, release of viruses and worms, spam marketing, invasion of privacy, cyber-spying and most forms of hacking.
89. **Computer Virus.** A Virus is a small program that embeds itself into other programs. When those other programs are executed, the virus is also executed, and attempts to copy itself into more programs. In this way, it spreads in a manner similar to a biological virus.
Viruses, by definition, can ‘infect’ any executable code. Accordingly, they are found on floppy and hard disk boot sectors, executable programs, macro languages and executable electronic mail attachments. Some viruses are self-modifying, in order to make detection more difficult. Such viruses are called polymorphic (many shapes).
90. **Virus Wall.** A Virus Wall is a program used to block the transmission of files ‘infected’ by a Virus. It is usually implemented as a WWW Proxy or Mail Relay. A Virus Wall may be considered to be a part of a Firewall.
91. **Firewall.** A Firewall is a system which limits network access between two or more networks. Normally, a Firewall is deployed between a trusted, protected private network and an untrusted public network. For example, the trusted network might be a corporate network, and the public network might be the Internet. A Firewall might grant or revoke access based on user Authentication, source and destination network addresses, network protocol, time of day, network service or any combination of these.
92. **India IT Act.** An Indian IT Act to provide legal recognition for transactions carried out by means of electronic data interchange and other means of electronic communication, commonly referred to as "electronic commerce". The Indian IT Act covers digital signature, electronic

governance, attribution, acknowledgment and dispatch of electronic records, secure electronic records and secure digital signature, regulation of certifying authorities, Digital Signature Certificates, etc.

93. **IPR Issues.** IPR means Intellectual Property Rights. Consists of Copyright, Patent, Trademark, Geographical Indications, Designs, company secrets collectively called as intellectual property rights. Intellectual properties are intangible assets.
94. **Cookie.** Cookies are files stored temporarily on a World-Wide Web browser's computer, which allow the World-Wide Web server to store persistent information associated with the browsing user. A World Wide Web server is able to store any information in a cookie, but generally can only retrieve information that it stored in the first place.
95. **Hacker.** A hacker was originally an expert or enthusiast of any kind (e.g., horse riding, astronomy). It was first used in conjunction with computer programming in the 1960s, when certain computer programmers used the term to describe themselves. Hackers are people who enjoy exploring the details of programmable systems. The word hacker is now widely used and recognized over the world as a computer user breaching a system's security and stealing valuable information.
96. **Cracker.** These individuals are generally responsible for breaking into networks, cracking passwords in websites and programs, and generally causing havoc throughout the Internet. They are mostly malicious teens who get a kick from destroying or altering data on a system. Crackers will look for a weakness in a computer system and then exploit that weakness. Some of them are advanced computer users, but often they have no idea of what they are doing and have very little, or no programming skills.
97. **Usenet.** Usenet News is a global electronic bulletin board system in which millions of computer users exchange information on a vast range of topics. The major difference between Usenet News and e-mail discussion groups is the fact that Usenet messages are stored on central computers, and users must connect to these computers to read or download the messages posted to these groups. This is distinct from e-mail distribution, in which messages arrive in the electronic mailboxes of each list member.
98. **Gopher.** From about 1992 through 1996, Gopher was an Internet application in which hierarchically-organized text files could be brought from servers all over the world to a viewer on your computer. Especially in universities, Gopher was a step toward the World Wide Web's Hypertext Transfer Protocol (HTTP), which effectively replaced it within a short time.
99. **WWW.** The World Wide Web (abbreviated as the Web or WWW) is a system of Internet servers that supports hypertext to access several Internet protocols on a single interface. Almost every protocol type available on the Internet is accessible on the Web. This includes e-mail, FTP,

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Telnet, and Usenet News. In addition to these, the World Wide Web has its own protocol: HyperText Transfer Protocol, or HTTP.

100. **Archie.** Archie is a program that allows you to search the files of all the Internet FTP servers that offer anonymous FTP. Archie is actually an indexing spider that visits each anonymous FTP site, reads all the directory and file names, and then indexes them in one large index. A user can then query Archie, which checks the query against its index. To use Archie, you can Telnet to a server that you know has Archie on it and then enter Archie search commands. However, it's easier to use a forms interface on the Web called ArchiePlex.
101. **Veronica.** Veronica is a program that allowed you to search the files of the Internet's Gopher servers for a particular search string. Like Archie, Veronica's equivalent program for FTP servers, Veronica is an indexing spider that visits the Gopher sites, reads the entire directory and files names, and then indexes them in one large index. However, with the almost complete demise of Gopher servers (most content has probably been put on the Web), Veronica has become a relic of the early 1990s.
102. **WAIS.** Wide Area Information System.
103. **Web Page.** A Web Page is an HTML document that is stored on a Web server and that has a URL, so that it can be accessed via the Web. A Web page is each separate text file you format for viewing on the Web.
104. **Web Site.** A Web Site is a collection of Web pages belonging to a particular person or organization. That is, a Web site refers to all the pages you are making available.
105. **Home Page.** A home page is the front door or first page of a Web site. That is, a home page is the first page visitors see when they visit your site.
106. **Personal Home Page.** A personal home page is the front door of a Web site that an individual puts on the Web to introduce him or herself, to share interests with others and to keep distant friends and acquaintances up-to-date in the course of life.
107. **Business Home Page.** A business home page is the front door to a business in Web site.
108. **Web Server.** A Web Server is simply a computer with an Internet connection that runs software designed to send out HTML, DHTML, XML or Java based pages and other file formats (such as multimedia files).
109. **Web Hosting.** Web hosting is the process of storing a website on a web server to it accessible on the Internet.

110. **Client Side Scripting.** Client-side scripting generally refers to the class of computer programs on the web that are executed client-side, by the user's web browser, instead of server-side (on the web server). This type of computer programming is an important part of the Dynamic HTML (DHTML) concept, enabling web pages to be scripted; that is, to have different and changing content depending on user input, environmental conditions (such as the time of day), or other variables. Web authors write client-side scripts in languages such as JavaScript (Client-side JavaScript) and VBScript.
111. **Server Side Scripting.** Server-side scripting is a web server technology in which a user's request is fulfilled by running a script directly on the web server to generate dynamic web pages. It is usually used to provide interactive web sites that interface to databases or other data stores. This is different from client-side scripting where scripts are run by the viewing web browser, usually in JavaScript. The primary advantage to server-side scripting is the ability to highly customize the response based on the user's requirements, access rights, or queries into data stores. (e.g. ASP, JSP, PHP)
112. **Browser.** A browser is a computer program that resides on your computer enabling you to use the computer to view WWW documents and access the Internet taking advantage of text formatting, hypertext links, images, sounds, motion, and other features. Netscape, Internet Explorer and Mozilla Firefox are currently the leading "graphical browsers" in the world (meaning they facilitate the viewing of graphics such as images and video and more).
113. **URL.** Each file on the Internet has an address, called a Uniform Resource Locator (URL). That is, Uniform Resource Locator, an address on the World Wide Web. A URL looks like this :
<http://www.vsnl.net.in/index.html>.
114. **Absolute URL.** An absolute URL designated the protocol, host, path and name of a resource. When a Web browser references an absolute URL, it stores the protocol, host and path information in order to support another type of URL. For example;
<http://www.sourcestream.com/test/>.
115. **Relative URL.** A relative URL is not fully qualified, but rather it inherits the protocol, host and path information from its parent document (the document that links to it).
116. **http://.** It is the beginning of a Web pages' URL.
117. **XML.** XML (eXtensible Markup Language) is a Web page creation language that enables designers to create their own customized tags to provide functionality not available with HTML. XML is a language of data structure and exchange, and allows developers to separate form from content. As XML is a text-based markup language that is fast becoming the standard for data

interchange on the Web. XML is a markup language for documents containing structured information.

118. **HTML.** Hyper Text Markup Language (HTML) documents are ASCII (American Standard Code for Information Interchange) or plain text documents that drive the World Wide Web (WWW). Within the document there are embedded commands (called tags) that are interpreted by the WEB browser. These embedded commands do all the fancy stuff of HTML like; (display pictures, make links to other sites, bold face, etc.). HTML is the universal language of the Web.
119. **E-Mail Address.** It is a network address. To send e-mail to someone, we must know his or her Internet e-mail address. Internet e-mail addresses look like this: hisriz@yahoo.co.in
The e-mail address has two main parts, joined by @ (the at sign): username and host or domain name.
120. **Username.** Same as Log in name. A unique name which is assigned to each user on a given host computer. For example, hisriz. However, usernames can also contain characters other than letters - they can contain numbers, underscores, periods and some other special characters. They cannot contain commas, spaces or parentheses.
121. **Host or Domain Name.** A computer on the Internet containing and providing access to various resources and services. The host name provides the complete address, including domain, Internet location of the mailbox, usually the name of a computer owned by a company, unique name organization or Internet service. A complete address, including domain and the unique name of the organization – for example, rediff.com, yahoo.com, etc.
122. **Cc.** This is a list of e-mail or ‘Carbon copy’ addresses to whom a copy of the message is to be delivered. Multiple e-mail address in ‘Cc’ fields are separated by a comma.
123. **Bcc.** This is same as ‘Cc’ except that this is a ‘Blind Carbon copy’. This list of recipients is not visible to the person who receives this message.
124. **Newsgroup.** A discussion forum in the network news system.
125. **Video Conferencing.** Video conferencing means two or more people hear and see each other, share whiteboard and share other applications.
126. **Voice Mail.** Voice mail is a centralized system of managing telephone messages for a large group of people.

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127. **Chat.** Online conversations in which you are immediately able to send messages back and forth to one another is called chat.
128. **Download.** Copying a file from a host system to your computer. In other words, transferring a file from a remote computer to your computer.
129. **Upload.** To transfer a file from your computer to your home directory on the host system.
130. **Password.** A code used to get access to a locked system. A good password must contain letters and numbers, which are not easy to guess.
131. **Intranet.** An intranet is a private computer network that uses Internet Protocol technologies to securely share any part of an organization's information or operational systems within that organization.
132. **Interspace.** Interspace is a proposal for a search and information retrieval protocol for social sites based on the rss standard. While social sites connect people, it seems a given, that they can only ever connect those people, which are members of their particular social site. so while one may find those people who joined the same social site, other friends may be using a totally different site. at the present time, members of different social site don't even have a way of knowing of each other's mutual presence on the internet.
133. **Infrared.** An invisible band of radiation at the lower end of the visible light spectrum. With wavelengths from 750 nm to 1 mm, infrared starts at the end of the microwave spectrum and ends at the beginning of visible light. Infrared transmission typically requires an unobstructed line of sight between transmitter and receiver.
Widely used in most audio and video remote controls, infrared transmission is also used for wireless connections between computer devices (see IrDA) and a variety of detectors (see IR detector). See IR remote control and IRED.
134. **PAN.** In all capitals, PAN is short for Personal Area Network. Based on the electric-field transmission medium, is an IBM technology that allows individuals to exchange data with a simple touch or grasp, such as a handshake. A PAN user is equipped with a receiver and a transmitter, which constantly sends infinitesimal data-carrying currents -- in the 0.1-1 MHz band -- through the body and picks up currents when in very close range with another device or individual carrying a transmitted.
135. **GPRS.** General Packet Radio Service is used mostly in Europe and Asia. GPRS is used most commonly for cell phones. In Canada, Rogers and Fido are using GPRS.
You can send and receive emails using GPRS and browse the Internet.

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General Packet Radio Service is a radio technology for GSM networks that adds packet-switching protocols, shorter set-up time for ISP connections, it also offers the possibility to charge by amount of data sent rather than connect time.

136. Difference between GSM and CDMA .

The GSM Association is an international organization founded in 1987, dedicated to providing, developing, and overseeing the worldwide wireless standard of GSM. CDMA, a proprietary standard designed by Qualcomm in the United States, has been the dominant network standard for North America and parts of Asia. However, GSM networks continue to make inroads in the United States, as CDMA networks make progress in other parts of the world. There are camps on both sides that firmly believe either GSM or CDMA architecture is superior to the other. That said, to the non-invested consumer who simply wants bottom line information to make a choice, the following considerations may be helpful.

137. **iMAP.** The Internet Message Access Protocol (IMAP) is one of the two most prevalent Internet standard protocols for e-mail retrieval, the other being the Post Office Protocol (POP).[1] Virtually all modern e-mail clients and mail servers support both protocols as a means of transferring e-mail messages from a server.

138. **VoIP Protocols.** **Voice-over-IP (VoIP)** implementations enables users to carry voice traffic (for example, telephone calls and faxes) over an IP network.

There are 3 main causes for the evolution of the Voice over IP market:

- Low cost phone calls
- Add-on services and unified messaging
- Merging of data/voice infrastructures

A VoIP system consists of a number of different components: Gateway/Media Gateway, Gatekeeper, Call agent, Media Gateway Controller, Signaling Gateway and a Call manager

(I) **Wi-Fi.** Wi-Fi is a trademark of the Wi-Fi Alliance that manufacturers may use to brand certified products that belong to a class of wireless local area network (WLAN) devices based on the IEEE 802.11 standards, which is by far the most widespread WLAN class today.

(II)**Wi-Max.** WiMAX (Worldwide Interoperability for Microwave Access) is a telecommunications protocol that provides fixed and fully mobile internet access. The current WiMAX revision provides up to 40 Mbit/s[1] [2] with the IEEE 802.16m update expected offer up to 1 Gbit/s fixed speeds. The name "WiMAX" was created by the WiMAX Forum, which was formed in June 2001 to promote conformity and interoperability of the standard. The forum describes WiMAX[3] as "a standards-based technology enabling the delivery of last mile wireless broadband access as an alternative to cable and DSL".

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139. **Spams.** Spam is flooding the Internet with many copies of the same message, in an attempt to force the message on people who would not otherwise choose to receive it. Most spam is commercial advertising, often for dubious products, get-rich-quick schemes, or quasi-legal services. Spam costs the sender very little to send -- most of the costs are paid for by the recipient or the carriers rather than by the sender. Important

Questions

Q.1 Difference between Virus, worms and Trojan Horse.

Ans **Virus.** A computer virus is a small program written to alter the way a computer operates, without the permission or knowledge of the user. A virus must meet two criteria:

- It must execute itself. It often places its own code in the path of execution of another program.
- It must replicate itself. For example, it may replace other executable files with a copy of the virus infected file. Viruses can infect desktop computers and network servers alike.

Trojan horses are impostors—files that claim to be something desirable but, in fact, are malicious. A very important distinction between Trojan horse programs and true viruses is that they do not replicate themselves. Trojan horses contain malicious code that when triggered cause loss, or even theft, of data. For a Trojan horse to spread, you must invite these programs onto your computers; for example, by opening an email attachment or downloading and running a file from the Internet. Trojan. Vundo is a Trojan horse.

Worms are programs that replicate themselves from system to system without the use of a host file. This is in contrast to viruses, which requires the spreading of an infected host file. Although worms generally exist inside of other files, often Word or Excel documents, there is a difference between how worms and viruses use the host file. Usually the worm will release a document that already has the "worm" macro inside the document. The entire document will travel from computer to computer, so the entire document should be considered the worm W32.Mydoom.AX@mm is an example of a worm

Important Questions of Networking

1. What are IP issues?

Ans. The term intellectual property refers broadly to the creations of the human mind. Intellectual property rights protect the interests of creators by giving them property rights over their creations.

2. How can the User Passwords help in data security ?

Ans. The user password is associated with each file. Just as a password is required to access a computer system, access to each file will be controlled by a password.

3. How can the access to a file be restricted ?

Ans. A file access can be restricted by providing password protection, authorization, authentication, etc.

4. Define authentication.

Ans. This process verifies that a person or object is who he, she or it claims to be. This could be achieved by asking some standard questions and getting answers to them; if the answers match with those on the system, the person or object is authenticated.

5. Differentiate between hackers and crackers.

Ans. HACKERS :

- Someone intensely interested the workings of any computer operating system and are often programmers.
- Hackers constantly seek further knowledge, freely share what they have discovered; therefore, they usually advanced knowledge of operating systems and programming languages.
- They probe the system, at both macro and microcosmic level, finding holes in software and snags in logic.
- They write programs to check the integrity of other programs. This comes down to creating and improving security measures through the process of analysis.
- For example, when a hacker creates a program that can automatically check the security structure of a remote machine, it is a representation of their desire to better what security risks and threats now exists.

CRACKERS :

- Someone who breaks into or otherwise violates the system integrity of remote machines, with malicious intent.
- Crackers can obtain unauthorized access, in which they: Destroy vital data; Deny legitimate users service; Or wreck overall havoc for their targets.
- Crackers are most easily identified by the fact that their actions are malicious.

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- In contrast to hackers, crackers rarely write their own programs. Instead, they beg, borrow, or steal tools from others.
- They use these tools NOT to improve Internet security, but to subvert it.
- They have technique, perhaps, but seldom possess programming skills or imagination.

6. Which of the following is not a Client Side script?

- (i) VB Script
- (ii) Java Script
- (iii) ASP
- (iv) PHP

Ans.(iii) ASP and (iv) PHP are not client side scripts.

7. If someone has hacked your Website, to whom you lodge the Complaint?

Ans. The complaint has to be lodged to the Police under IT Act.

8. What do you mean by IP Address? How is it useful in Computer Security?

Ans. An Internet Protocol (IP) address is a numerical identification and logical address that is assigned to devices connected in a computer network.

An IP Address is used to uniquely identify devices on the Internet and so one can quickly know the location of the system in the network.

9. What do you mean by Spam Mails? How can you protect your mailbox from Spams?

Ans. Spam mails, also known as junk e-mail, is a subset of spam that involves nearly identical messages sent to numerous recipients by e-mail. We can protect our mailbox from spams by creating appropriate filters.

10. What is the purpose of using a Web Browser ? Name any one commonly used Web Browser.

Ans. The Web Browser fetches the page requested, interprets the text and formatting commands that it contains and displays the page property formatted on the screen. Example of a Web Browser : Internet Explorer or Netscape Navigator or Mosaic.

11. When do you prefer XML over HTML and why?

Ans. The first benefit of XML is that because you are writing your own markup language, you are not restricted to a limited set of tags defined by proprietary vendors.

Rather than waiting for standards bodies to adopt tag set enhancements (a process which can take quite some time), or for browser companies to adopt each other's standards (yeah right!), with XML, you can create your own set of tags at your own pace.

12. How does firewall protect our Network?

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Ans. A firewall is a part of a computer system or network that is designed to block unauthorized access while permitting authorized communications. It is a device or set of devices configured to permit, deny, encrypt, decrypt, or proxy all (in and out) computer traffic between different security domains based upon a set of rules and other criteria.

13. How Trojan Horses are different from Worms? Mention any one difference.

Ans. A Trojan horse is a term used to describe malware that appears to the user, to perform a desirable function but, in fact, facilitates unauthorized access to the user's computer system.

A computer worm is a self-replicating computer program. It uses a network to send copies of itself to other nodes (computers on the network) and it may do so without any user intervention.

14. What is the importance of cyber law?

Ans. In Internet, the communication technology uses the means of transferring textual messages, pictures and many more. Each time there may be number of threats on either from the senders or receivers side which creates a bridge between networking communication. To short out these problems, the Internet security council made number of precautions, i.e., rules. These predefined rules called cyber law or law of Internet.

15. Differentiate between Internet and Intranet.

Ans. Internet is a network of computer networks which operates world-wide using a common set of communication protocols.

Intranet is an inter-connected network within one organization that uses Web technologies for the sharing of information internally.

16. Define a hub, switch, gateway, repeater and server.

CHAPTER 3

File Handling in C++

Important Terms

1. **Files.** Files in C++ are interpreted as a sequence or stream of bytes stored on some storage media.
2. **Text file.** A data of a file is stored in the form of readable and printable characters then the file is known as text file.
3. **Binary file.** A file contains non-readable characters in binary code then the file is called binary file.
4. **Streams.** The ifstream class for input, ofstream for output and fstream for both input and output. Streams provide communication channels between files and programs.
5. **fstream.h.** This header file includes the definitions for the stream classes ifstream, ofstream and fstream.
6. **ifstream.** This is used for input from a file.
7. **ofstream.** This is used for output to a file. For an ofstream object, the file open mode can be either ios ::out to output data to a file or ios::app to append data to the end of a file.
8. **fstream.** This is used for input to and output from a file.
9. A file can be opened in C++ by two methods :
 - (i)By using the constructor of the stream class to be used.
 - (ii) By using the open() function of the stream class to be used.
10. **open().** The ofstream member function open() opens a file and attaches it to an existing ofstream object.
11. The **close()** function closes the stream. Also, the close() function closes all the opened stream files.

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12. **eof()**. The ios member function eof() determines if the end of the file indicator has been set for the designated stream. End-of-file is set after an attempted read fails.
13. **write()**. The ostream member function write outputs a fixed number of bytes beginning with a specific location in memory to the specified stream. The write() function expects a first argument of type const char*. When the stream is associated with a file, the data is written at the location specified by the “put” file position pointer.
14. **read()**. The istream member function read inputs a fixed number of bytes from the specified stream to an area in memory beginning at a specified address. The bytes are input beginning at the location specified by the “get” file position pointer. read() requires a first argument of type char*.
15. **get pointer**. A get pointer indicates the position in the file from which the next input is to occur.
16. **put pointer**. It indicates the position in the file at which the next output is to be placed.
17. **seekg()**. The function seekg() set current get position in a stream.
18. **seekp()**. The function seekp() set current put position in a stream.
19. **tellg()**. The tellg() function returns the current ‘get’ position in a stream.
20. **tellp()**. The tellp() function returns the current ‘put’ position in a stream.

Important Questions

1. Write name of two member functions belonging to fstream class.
2. Name two member functions of ofstream class.
3. Name the stream classes supported by C++ for file input and output.
4. Name two member functions common to the class ifstream and ofstream.
5. Name the two streams generally used for file operations.

CHAPTER 4

Structured Query Language

There are 5 categories of languages,

- 1.Data Control Language (DCL). Eg. Grant, Revoke.
- 2.Transaction Control Language (TCL). Eg. Commit, Rollback
- 3.Data Definition Language (DDL). Eg. Create table, Alter table.
- 4.Data Manipulation Language (DML). Eg. Insert, Delete, Update.
- 5.Query. Eg. Structured Query Language (SQL)

In SQL, we have the following data types that are used in the creation of a table. There are various other data types that can be used by advanced programmers, but the ones mentioned below are sufficient for beginners.

- **integer and float** (for integers) [Eg. 10,9, 4, etc.]
- **char and varchar** (for characters) [have to be inserted in SINGLE QUOTES. Eg ‘Ram’, ‘Shyam’]
- **date** (for date format) [has to be inserted in SINGLE QUOTES. Eg. ‘12/10/2011’, ‘12-Sep-2011’, ‘12-10-2011’ etc.]

NOTE: - *SQL is not a case-sensitive language. But the components defined by the user are case sensitive. E.g. If the user initially defines the database as “Hisham” then he/she cannot refer to it as “hisham” or “HISHAM” later on.*

Creating a database

In SQL, all the tables have to be formed in a particular database defined by the user. Before defining tables, we have to make a database.

SYNTAX

Create database XYZ;
Use XYZ;

Create database Hisham;
Use Hisham;

Creating a table

SYNTAX

Create table ABC (columns in the table each separated by a comma);

Create table Student (Roll integer, Name char(30), Marks integer, Total float);

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Constraints on a table

Constraints are restrictions that can be put on various columns of the table during its creation. In SQL we have the following constraints.

- Primary key: - To set a column as the primary key of the table.
- Unique: - To restrict duplication of data in the column.
- Check: - to make sure the data added by the user agrees to a certain condition.
- Default: - To insert a value automatically into the table if the user does not provide any value for the column.
- NOT NULL: - To make the addition of data into the column compulsory for every record.

E.g. Create table Student (Roll integer **Primary Key**, Name char(20) **unique**, Marks float **check Marks>10**, Address char(30) **default='Rohini'**, Phone char(20) **NOT NULL**);

Inserting records into a table

SYNTAX

Insert into XYZ values (list of values to be inserted in the same order as present in the table)

Create database Hisham;

Use Hisham;

Create table Student (Roll integer, Name char(30), Marks integer, Total float);

Insert into Student values (1, 'Shyam', 90, 100);

Insert into Student values (2, 'Ram', 80,100);

'Select' statement

It is used to select columns from the table, records for which will be displayed.

SYNTAX

Select * from XYZ;

Select nameofcolumnstobeselected from XYZ;

Create database Hisham;

Use Hisham;

Create table Student (Roll integer, Name char(30), Marks integer, Total float);

Insert into Student values (1, 'Shyam', 90, 100);

Insert into Student values (2, 'Ram', 80,100);

Select * from Student; *(to see all the column fields)*

Select Roll, Name, Marks from Student; *(to see only selected column fields)*

Select Total from Students;

'where' clause

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It helps to put conditions on rows and can be used with ‘select’. It also uses relational ($=$, \neq , $>$, $<$, \geq , \leq) and logical (AND, OR, NOT) operators.

E.g. Select * from Student where Marks >40;

Select * from Student where Marks \neq 40 AND Roll=1; *(both statements must be satisfied)*

Select * from Student where Marks \geq 40 OR Roll=2; *(any statement can be satisfied)*

‘between’ clause

Helps to specify a range and can be used with ‘where’.

E.g. Select * from Student where Marks between 50 and 80; *(50 and 80 included)*

Select * from Student where Marks NOT between 50 and 80; *(50 and 80 excluded)*

‘In’ clause

E.g. Select * from Student where Roll IN(2,3,5); *(Records of only 2,3 and 5 displayed)*

Select * from Student where Roll NOT IN(2,3) *(All roll no. expect 2 and 3 displayed)*

‘Like’ clause

E.g. Select * from Student where Name like ‘a%’; *(All names beginning with ‘a’)*

Select * from Student where Name like ‘a___’; *(Names having maximum 3 letters after ‘a’)*

Select * from Student where Name like ‘a%a’; *(Beginning and ending with ‘a’)*

‘Update’ clause

Used to change values of the columns.

E.g. Update Student set Marks=Marks+20 where Roll=3;

Update Student set Marks=Marks+20, Address=’Rohini’ where Roll IN(2,3,4);

Update Student set Marks=20, Address=’Rohini’ where Name like ‘h%’;

‘Alter’ clause

To change the structure of columns.

E.g. Alter table Student ADD (Address char(30)); *(to add a column)*

Alter table Student MODIFY (Roll float); *(to change the data type of column ‘Roll’)*

Alter table Student DROP COLUMN Address; *(to delete the column)*

‘Delete’ clause

To delete a row, a set of rows or all the rows in a table.

E.g. Delete from Student; *(to delete all the rows)*

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Delete from Student where Roll=7;

(to delete some particular rows)

'Drop Table' clause

To delete the complete table.

E.g. Drop table Student;

'Desc' clause

Describes the complete structure of the table.

E.g. Desc Student;

'Order by' clause

Helps to arrange the database in either ascending or descending order.

E.g. Select * from Student order by Roll; *(by default ascending)*

Select Roll, Name, Marks from Student order by Roll;

Select * from Student order by Roll desc; *(descending order)*

Select Roll, Name, Marks from Student order by Roll desc;

Select * from Student order by Roll, Marks desc;

(orders by Roll in ascending order, but if Roll is same then orders the same records in descending order of Marks)

Handling NULL values

NULL values are those which are left blank while records are being added.

Select * from Student where Name IS NULL;

Select * from Student where Name IS NOT NULL;

Update Student set Name='Z' where Roll IS NULL;

|| Concatenation

Used to display two fields after removing the space between them.

Select Name||Roll from Student;

Select Name||Roll from Student as 'NR';

Column Alias

To change the heading of the columns for the purpose of displaying records.

Select Roll as 'Roll Number' from Student;

Select Roll as 'Roll Number', Name as 'Student' from Student where Marks>10;

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'Distinct' clause

Eliminates duplicate values from the table during display.

E.g. Select distinct Marks from Student;

Group/Aggregate Functions

They return one value per column.

- Sum() *(to calculate the sum of the mentioned columns)*
Select sum(Marks) from Student;
- Avg() *(to calculate average of the mentioned columns)*
Select avg(Marks) from Student;
- Max() *(to output the maximum value among the columns)*
Select max(Marks) from Student;
- Min() *(to output the minimum value among the columns)*
Select min(Marks) from Student;
- Count() *(to count the number of records for the given column)*
Select count(*) from Student;
Select count(Marks) from Student;

'Group by' clause

It groups the rows in the result table by columns that have the same value so that each group is reduced to a single row. The query should have at least one aggregate function when we use this clause.

We cannot use the 'where' clause with this clause, so we have to use 'having'.

E.g. Select DeptNo, sum(Salary) from Employee group by DeptNo;

Select DeptNo, sum(Salary) from Employee group by DeptNo having DeptNo=20;

(will display the total salary received by the employees of Department No.20)

Select DeptNo, sum(Salary) from Employee group by DeptNo having sum(Salary)>20000;

JOIN

To display the combination of two tables.

It can be used only when the two tables have at least one field that accepts the same type of values.

E.g. Select S.Name, T.Name from Student S, Teacher T where T.No=S.No;

(Teacher and Student are two tables both having a column for entering No.)

(Refer to the practice questions given ahead for better understanding)

SQL Practice Questions

PREVIOUS YEAR QUESTIONS
(with solution)

(QUESTION I)

Consider the following tables STORE and SUPPLIERS and answer the questions.

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 Stationary
23	Soft Plastics
22	Tetra Supply

(Q 1) Write SQL commands for the following statements:

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

(Answer) *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.

(Answer) *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.

(Answer) *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.

(Answer) *SELECT Scode, MIN(Rate) FROM STORE GROUP BY Scode;*

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(Q2) Give the output of the following SQL queries:

(i) SELECT COUNT(DISTINCT Scode) FROM Store;

(Answer) *COUNT(DISTINCT Scode)*

3

(ii) SELECT Rate*Qty FROM Store WHERE ItemNo=2004;

(Answer) *RATE*QTY*

880

(iii) SELECT Item, Sname FROM Store S, Suppliers P

WHERE S.Scode=P.Scode AND ItemNo=2006;

(Answer) *ITEM SNAME*
Gel Pen Classic Premium Stationary

(iv) SELECT MAX(LastBuy) FROM Store;

(Answer) *MAX(LASTBUY)*

24-Feb-10

(QUESTION II)

Consider the following tables Product and Client. Write the SQL commands for the statements (i) to (iv) and give the outputs for SQL queries (v) to (viii).

Table: - PRODUCT

P_ID	ProductName	Manufacturer	Price
TP01	Talcom Powder	LAK	40
FW05	Face Wash	ABC	45
BS01	Bath Soap	ABC	55
SH06	Shampoo	XYZ	120
FW12	Face Wash	XYZ	95

TABLE: - CLIENT

C_ID	ClientName	City	P_ID
01	Cosmetic Shop	Delhi	FW05
06	Total Health	Mumbai	BS01
12	Live Life	Delhi	SH06
15	Pretty Woman	Delhi	FW12
16	Dreams	Bangalore	TP01

(i) To display the details of those Clients whose City is Delhi.

(Answer) *SELECT * FROM CLIENT WHERE CITY = 'Delhi';*

(ii) To display the details of Products whose Price is in the range of 50 to 100 (Both values included).

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(Answer) *SELECT * FROM PRODUCT WHERE PRICE BETWEEN 50 AND 100;*

(iii) To display the ClientName, City from table Client and ProductName and Price from table Product with their corresponding matching P_ID.

(Answer) *SELECT A.CLIENTNAME, A.CITY, B.PRODUCTNAME, B.PRICE
FROM CLIENT A, PRODUCT B WHERE A.P_ID = B.P_ID;*

(iv) To increase the Price of all Products by 10.

(Answer) *UPDATE PRODUCT SET PRICE = PRICE + 10;*

(v) SELECT DISTINCT Address FROM Client;

(Answer) *CITY*

Bangalore

Delhi

Mumbai

(vi) SELECT Manufacturer, MAX(Price), Min(Price), Count(*)

FROM Product GROUP BY Manufacturer;

(Answer)

MAN	MAX(PRICE)	MIN(PRICE)	COUNT(*)
ABC	65	55	2
LAK	50	50	1
XYZ	130	105	2

(vii) SELECT ClientName, Manufacturer FROM Product, Client

WHERE Client.P_ID=Product.P_ID;

(Answer) *CLIENTNAME MAN*

Total Health

ABC

Cosmetic Shop

ABC

Pretty Woman

XYZ

Live Life

XYZ

Dreams

LAK

(viii) Select ProductName, Price*4 FROM Product;

(Answer) *PRODUCTNAME PRICE*4*

Talcom Powder

200

Face Wash

220

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Bath Soap	260
Shampoo	520
Face Wash	420

(QUESTION III)

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	SenderAddress	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	RecCity
K005	ND01	R Bajpayee	5, Central Avenue	Kolkata
ND08	MU02	S Mahajan	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 Tripathi	13, B1 D, Mayur Vihar	New Delhi

(QUESTIONS)

(i) To display the names of all Senders from Mumbai.

(Answer) `SELECT SENDERNAME FROM SENDER WHERE SENDER CITY = 'Mumbai';`

(ii) To display the RecID, SenderName, SenderAddress, RecName, RecAddress for every Recipient.

(Answer) `SELECT A.RECID, B.SENDERNAME, B.SENDERADDRESS,
A.RECNAME, A.RECADDRESS
FROM RECIPIENT A, SENDER B
WHERE A.SENDERID = B.SENDERID;`

(iii) To display Recipient details in ascending order of RecName.

(Answer) `SELECT * FROM RECIPIENT ORDER BY RECNAME;`

(iv) To display number of Recipients from each city.

(Answer) `SELECT RECCITY, COUNT(*) FROM RECIPIENT GROUP BY RECCITY;`

(v) `SELECT DISTINCT SenderCity FROM Sender;`

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(Answer) *SENDER CITY*

Mumbai
New Delhi

(vi) SELECT A.SenderName, B.RecName

```
FROM Sender A, Recipient B  
WHERE A.SenderID = B.SenderID and B.RecCity = 'Mumbai';
```

(Answer) *SENDERNAME* *RECNAME*

R Jain *H Singh*
S Jha *P K Swamy*

(vii) SELECT RecName, RecAddress

```
FROM Recipient  
WHERE RecCity NOT IN ('Mumbai', 'Kolkata');
```

(Answer) *RECNAME* *RECADDRESS*

S Mahajan *116, A Vihar*
S Tripathi *13, B1 D, Mayur Vihar*

(viii) SELECT RecID, RecName

```
FROM Recipient  
WHERE SenderID = 'MU02' OR SenderID = 'ND50';
```

(Answer) *RECI* *RECNAME*

ND08 *S Mahajan*
ND48 *S Tripathi*

(QUESTION IV)

Study the following tables DOCTOR and SALARY and write SQL commands for 6the 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

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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

(QUESTIONS)

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

(Answer) *SELECT NAME FROM DOCTOR
WHERE DEPT = 'MEDICINE' AND EXPERIENCE > 10;*

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

(Answer) *SELECT NAME FROM DOCTOR
WHERE DEPT = 'MEDICINE' AND EXPERIENCE > 10;*

(iii) Display the minimum ALLOWANCE of female doctors.

(Answer) *SELECT MIN(E.ALLOWANCE) FROM DOCTOR D, SALARY E
WHERE D.SEX = 'F' AND D.ID = E.ID;*

(iv) Display the highest consultation fee among all male doctors.

(Answer) *SELECT MAX(E.CONSULTATION) FROM DOCTOR D, SALARY E
WHERE D.SEX = 'M' AND D.ID = E.ID;*

(v) SELECT count(*) from DOCTOR where SEX = 'F';

(Answer) 4

(vi) SELECT NAME, DEPT, BASIC from DOCTOR, SALARY where DEPT = “ENT”

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and DOCTOR.ID = SALARY.ID;

(Answer)	NAME	DEPT	BASIC
	John	ENT	12000

(QUESTION V)

Consider the following tables EMPLOYEES and EMPSALARY. Write SQL commands for the statements (i) to (iv) and give outputs for SQL queries (v) to (viii).

TABLE: - EMPLOYEES

EMPID	FIRSTNAME	LASTNAME	ADDRESS	CITY
010	George	Smith	83 First Street	Howard
105	Mary	Jones	842 Vine Ave.	Losantiville
152	Sam	Tones	33 Elm St.	Paris
215	Sarah	Ackerman	440 U.S. 110	Upton
244	Manila	Sengupta	24 Friends Street	New Delhi
300	Rabert	Samuel	9 Fifth Cross	Washington
335	Henry	Williams	12 Moore Street	Boston
400	Rachel	Lee	12 Harrison St.	New York
441	Peter	Thompson	11 Red Road	Paris

TABLE: - EMPSALARY

EMPID	SALARY	BENEFITS	DESIGNATION
010	75000	15000	Manager
105	65000	15000	Manager
152	80000	25000	Director
215	75000	12500	Manager
244	50000	12000	Clerk
300	45000	10000	Clerk
335	40000	10000	Clerk
400	32000	7500	Salesman
441	28000	7500	Salesman

(QUESTIONS)

(i) To display Firstname, Lastname, Address and City of all employees living in Paris from the table EMPLOYEES.

(Answer) *SELECT FIRSTNAME, LASTNAME, ADDRESS, CITY FROM EMPLOYEES
WHERE CITY = 'Paris';*

(ii) To display the contents of EMPLOYEES table in descending order of FIRSTNAME.

(Answer) *SELECT * FROM EMPLOYEES*

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ORDER BY FIRSTNAME DESC;

(iii) To display the Firstname, Lastname, and Total Salary of all Managers from the tables EMPLOYEES and EMPSALARY, where Total Salary is calculated as Salary + Benefits.

(Answer) `SELECT FIRSTNAME, LASTNAME, SALARY+BENEFITS FROM EMPLOYEES,
EMPSALARY
WHERE DESIGNATION = 'Manager';`

(iv) To display the Maximum salary among Managers and Clerks from the table EMPSALARY.

(Answer) `SELECT MAX(SALARY) FROM EMPSALARY
WHERE DESIGNATION = 'Manager' OR DESIGNATION = 'Clerk';`

(v) `SELECT FIRSTNAME, SALARY FROM EMPLOYEES, EMPSALARY`

`WHERE DESIGNATION = 'Salesman' AND EMPLOYEES.EMPID=EMPSALARY.EMPID;`

(Answer)

FIRSTNAME	SALARY
Rachel	32000
Peter	28000

(vi) `SELECT COUNT(DISTINCT DESIGNATION) FROM EMPSALARY;`

(Answer) `COUNT(DISTINCT DESIGNATION)`

4

(vii) `SELECT DESIGNATION, SUM(SALARY) FROM EMPSALARY`

`GROUP BY DESIGNATION HAVING COUNT(*) > 2;`

(Answer)

DESIGNATION	SUM(SALARY)
Manager	215000
Clerk	135000

(viii) `SELECT SUM(BENEFITS) FROM EMPLOYEES WHERE DESIGNATION = 'Clerk';`

(Answer) *There is no output. There is an error, i.e. the BENEFITS column is not in EMPLOYEES table.*

CHAPTER 5

Database Concepts

IMPORTANT TERMS

1. **Database.** A database is a collection of logically related record, arranged in the form of rows and columns.
2. **DBMS (Database Management System).** A collection of programs that enables you to store, modify and extract information from the database.
3. **DBA.** Database Administrator is the one responsible for security and functioning of the database.
4. **Data Independence.** It means that data stored at different levels should affect each other when they get changed.
5. **Relation.** A relation is a two dimensional table.
6. **Attributes.** Columns of a table are called attributes.
7. **Degree.** The numbers of columns are called as the degree of the table.
8. **Tuple.** The rows of the table are called tuples.
9. **Cardinality.** The number of rows in a table is called the cardinality of the table.
10. **Primary Key.** The attribute or set of attributes that can uniquely identify each record of the table. A table can have only one primary key.
11. **Candidate Key.** There may be two or more than attributes or combination of attributes that uniquely identifies each record. They are called as candidate keys.
12. **Alternate Key.** The candidate keys other than the primary called are called as the alternate keys.
13. **Foreign Key.** A foreign key is a column in a table which is also the primary key of another table, such that corresponding values occur in the column of the two tables. In DBMS, this is also called as referential integrity.
14. **View.** A view is derived from another table, which is referred to as the basic table of the view.

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15. **Relational Algebra.** It is a procedural query language. It supports the following,

- **Six fundamental operations.**
 - Select(unary)
 - Project(unary)
 - Rename(unary)
 - Cartesian product(binary)
 - Union(binary)
 - Set difference(binary)
- **Several other operations defined in terms of fundamental operations**
 - Set-intersection
 - Natural join
 - Division

16. **Cartesian product.** Creates a new relation from all the concatenations of the two relations. It is a binary operation and is denoted by (x) . The degree of the new relation is equal to the sum of the degree of the original relations while the cardinality is the product of the tuples of the two relations on which the Cartesian product is formed.

17. **Join.** JOIN is used to combine related tuples from two relations.

- In the simplest form, JOIN is just the cross product of the two relations.
- As Join becomes more complex, tuples are removed within the cross product to make the result more meaningful.

18. **Normalization.** It is the process of data analysis used for grouping data elements in a record. While dealing with databases there may be unnecessary repetition of data which is called redundancy. It is the process used to reduce redundancy.

19. **1NF.** A table is said to be in 1NF if no two rows are table are identical and each table entry is single valued.

20. **2NF.** A table is said to be in 2NF if it is in 1NF and each non-key attribute is functionally dependent on the entire key.

21. **3NF.** A table is said to be in 3NF if it is in 2NF and all non-key attributes are non-transitively dependent on the primary key.

CHAPTER 6

Open Source Software

IMPORTANT TERMS

1. **OSS.** Open Source Software is the software which does not have much restrictions or conditions. That is, these softwares are freely available to the user, along with the source code. These softwares can be freely modified and used without any prior permission. Eg. OpenOffice, Linux.
2. **Freeware.** It is the kind of software available free of cost to the user, but the source code is not provided. Hence it cannot be freely modified, studied and redistributed without prior permissions. Eg. Internet Explorer, Google Chrome.
3. **Shareware.** It is the kind of software made available to the user only for a specific period of time after which the user has to pay the license fees. They cannot be modified and the source code is not provided. They are distributed in the binary form.
4. **Proprietary Software.** The source code of the proprietary software is not available freely. It is regulated and distributed through the special permission of the vendor or proprietor.
5. **FLOSS.** Free/Libre/Open Source Software which is both free software and open source software. The freedom is given to everybody to utilize this software. Often both free and open software can refer to the same program, but each term represents a different emphasis on importance of freedom (free software) and technical progress (open source software).
6. **GNU.** It is a free software operating system. Its name is a recursive acronym for “GNU’s Not Unix”, which was chosen because its design is UNIX-like but it contains no UNIX code.
7. **FSF.** Free Software Foundation is a non-profit organization created by Richard Stallman in 1985 to support GNU project and GNU licenses.
8. **OSI.** Open Source Initiative. This is an organization founded by Bruce Perens and Eric Raymond in 1998 to promote open source software’s.
9. **W3C.** World Wide Web Consortium was created in 1994. It is responsible for the software standard for the World Wide Web. It is responsible for developing protocols for WWW.
10. **Localization.** It is often abbreviated as l10n. Localization is the adaption of an object to a locality.

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11. **Linux.** It is a popular operating system and was originally used to refer to the kernel of the O/S. It is available with the source code and is an open source software.
12. **Mozilla.** The Mozilla Application Suite is a free, cross-platform internet suite, whose components include a web browser, an e-mail, a news client, and HTML editor and an IRS client.
13. **Apache Server.** It is a web server component of the popular web server application stack called LAMP (Linux, Apache, MySQL, and PHP/Perl/Python). It was designed by Rob McCool who was involved with the National Centre for Supercomputing Applications web server, simply called “NCSA httpd”.
14. **MySQL.** It is a multi user DBMS. MySQL databases are accessed in languages like C, C++ etc.
15. **PostgreSQL.** It is an object-relational database system (DBMS) released under a flexible BSD-style license.
16. **Pango.** It is an open source library for rendering internationalized texts integrated into GTK+ 2. It comes from the Greek “Pan” and Japanese “go”.
17. **Tomcat.** It is a web server that supports servlets and JSPs. Tomcat comes with a Jasper compiler that compiles JSPs into servlets.
18. **Apache Tomcat.** It is a web container developed by Apache Software Foundation.
19. **PHP.** “PHP: Hypertext Preprocessor” is an open source programming language which helps to develop server side application and dynamic web content.
20. **Python.** It is a programming language that uses fewer symbols than JAVA and C.
21. **OpenOffice. (OOo)** It is a free and open source office suite that includes word processor, presentations, spreadsheet, vector drawing and database components.