TEACHING / TRAINING MODULE

INFORMATION TECHNOLOGY

CLASS-XI & XII

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FOREWORD

The ST and SC Development Department, Government of Odisha, has initiated an innovative effort by setting up an ***Academic Performance Monitoring Cell*** (APMC) in Scheduled Castes and Scheduled Tribes Research and Training Institute (SCSTRTI) to monitor the Training and Capacity Building of teachers of SSD Higher Secondary Schools and Ekalabya Model Residential Schools (EMRS) under the administrative control of the ST & SC Development Departme. This innovative program is intended to ensure quality education in the Higher Secondary Level of the schools of the ST & SC Development Department.

The modules and lesson plans are prepared for the +2 Science and Commerce stream' in all the subjects such as Physics, Chemistry, Botany, Zoology, Mathematics, Information Technology, Odia, English and Commerce for both the years in line with the syllabus of Council of Higher Secondary Education (CHSE).

These modules/lesson plans are self contained. The subiect experts who are the best in their respective subjects in the State have been roped in for the exercise. They have given their precious time to make the module as activity based as possible.

I hope, this material will be extremely useful for the subject teachers in effective class room transactions and will be helpful in improving the quality education at the Higher Secondary Level. I also take this opportunity to thank all the subject experts of different subjects for rendering help and assistance to prepare the modules/lesson notes and lesson plans within a record time.

Prof. (Dr.) A.B.Ota
Director and Special Secretary,
SCSTRTI

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LESSON PLAN
INFORMATION TECHNOLOGY
+2 1ST YEAR SC/ARTS/COM

Session	Contents	No.of classes
	UNIT-1	
1	Components of a Computer System, Hardware components	1
2	Discussion about Computer bus and ports and their uses	1
3	Storage unit, Its characteristics and Primary Storage	1
4	Secondary storage units, Types of access, seek time, latency time	1
5	Discussion on Input Devices, device controller	1
6	Discussion on Output Devices	1
7	Explain about Software & its classifications	1
8	Operating System and its functions	1
9	Explain types of Operating System	1
10	Explain about Programming Languages	1
11	Language Processors.	1
12	File Compression Tools with examples	1
13	Explain disk defragmentation tools with examples	1
14	Discuss about Anti-Virus with its uses	1
15	Open Source Software(OSS) and its advantages	1
	UNIT-2	
16	Discussion about Programming Principles- 1 to 3	1
17	Discussion about Programming Principles- 4 to 6	1
18	Discussion about Programming Principles- 7 to 9	1
19	Discussion about Programming Principles- 10 to 12	1
20	Discussion about Programming Principles- 13 to 15	1
21	Terminology used in Java and data types.	1
22	Explain data types with examples	1
23	Type conversion with example	1
24	Control Structure-if statement with example	1
25	Control Structure-while statement with example	1
26	Control Structure-for statement with example	1
27	Nesting of structure with some examples	1
28	Introduction to java swings	1
29	Explain about IDE to compile and run java swings programs	1
30	Basic Interface components- label, text field, text area, button, checkbox, radio button	1
31	getting familiar with java swing user interface components	1

32	With example-frame, dialog, option pane	1
33	With example- scroll pane, label, text field, password filed	1
34	With example- text area, button, check box, radio button	1
35	With example- combo box, list	1
36	handling methods and properties setText (), getText (),	1
37	handling methods and properties isSelected (), setSelected ()	1
	UNIT-3	
38	Introduction to database concept	5
39	Relational database	3
40	Relation	1
41	Table, Attribute/Field, Tuple/Row	2
42	Keys	2
43	Introduction to MYSQL	1
44	Classifications of SQL	2
45	DDL commands	6
46	DML commands	7
	UNIT-4	
47	Introduction to E-Governance	1
48	Defination,Benefit to citizens	1
49	Its web sites	1
50	Its social impact	1
51	E-Governance challenges	1
52	E-learning: Introduction, Definition	1
53	Benefit to students	1
54	Benefit to teachers	1
55	E-Learning websites	1
56	Its social impact.	1

UNIT-1

INTRUDUCTION TO COMPUTER SYSTEM

Components of a Computer System

A computer system consists of both hardware and information stored on hardware. Information stored on computer hardware is often called software.

The hardware components of a computer system are the electronic and mechanical parts.

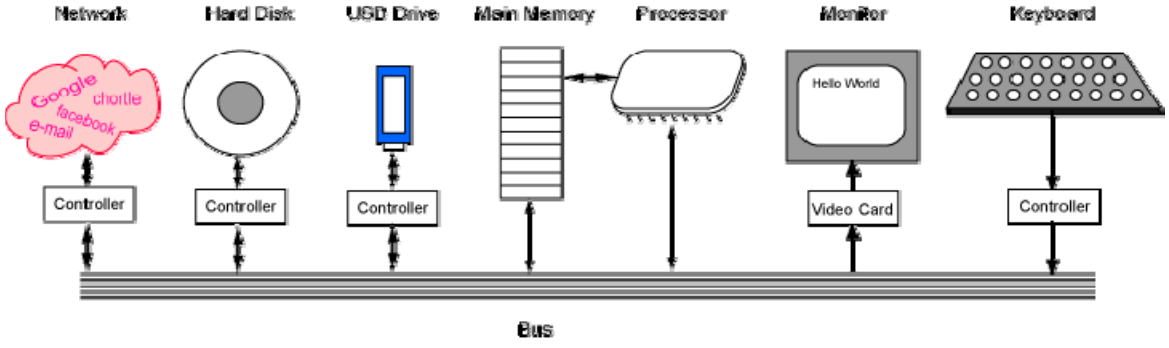
The software components of a computer system are the data and the computer programs.

The major hardware components of a computer system are:

- Processor
- Main memory
- Secondary memory
- Input devices
- Output devices

For typical desktop computers, the processor, main memory, secondary memory, power supply, and supporting hardware are housed in a metal case. Many of the components are connected to the main circuit board of the computer, called the motherboard. The power supply supplies power for most of the components. Various input devices (such as the keyboard) and output devices (such as the monitor) are attached through connectors at the rear of the case.

Hardware Components



Main Components of a Computer System

The terms *input* and *output* say if data flow into or out of the computer. The picture shows the major hardware components of a computer system. The arrows show the direction of data flow.

A **bus** is a group of wires on the main circuit board of the computer. It is a pathway for data flowing between components. Most devices are connected to the bus through a controller which coordinates the activities of the device with the bus.

The processor is an electronic device about a one-inch square, covered in plastic. Inside the square is an even smaller square of silicon containing millions of tiny electrical parts. A modern

processor may contain billions of transistors. It does the fundamental computing within the system, and directly or indirectly controls all the other components.
The processor is sometimes called the Central Processing Unit or CPU. A computer will have a processor, such as a Pentium processor or a SPARC processor.

Ports:

1) On computer and telecommunication devices, a port (noun) is generally a specific place for being physically connected to some other device, usually with a socket and plug of some kind. Typically, a personal computer is provided with one or more serial ports and usually one parallel port. The serial port supports sequential, one bit-at-a-time transmission to peripheral devices such as scanners and the parallel port supports multiple-bit-at-a-time transmission to devices such as printers.
2) In programming, a port (noun) is a "logical connection place" and specifically, using the Internet's protocol, TCP/IP, the way a client program specifies a particular server program on a computer in a network. Higher-level applications that use TCP/IP such as the Web protocol, Hypertext Transfer Protocol, have ports with preassigned numbers. These are known as "well-known ports" that have been assigned by the Internet Assigned Numbers Authority (IANA). Other application processes are given port numbers dynamically for each connection. When a service (server program) initially is started, it is said to bind to its designated port number. As any client program wants to use that server, it also must request to bind to the designated port number.

   Port numbers are from 0 to 65535. Ports 0 to 1024 are reserved for use by certain privileged services. For the HTTP service, port 80 is defined as a default and it does not have to be specified in the Uniform Resource Locator (URL).
3) In programming, to port (verb) is to move an application program from an operating system environment in which it was developed to another operating system environment, so it can be run there. Porting implies some work, but not nearly as much as redeveloping the program in the new environment. Open standard programming interface (such as those specified in X/Open's 1170 C language specification and Sun Microsystem's Java programming language) minimize or eliminate the work required to port a program.

Storage Unit:

A storage unit is that part of the computer system which is used to store the data and instructions to be processed. There are two types of storage:
1) Primary storage
2) Secondary storage.
Primary memory is also known as internal memory. This is a section of the CPU which holds program instructions, input data and intermediate results. Primary memory is also known as main memory.

Secondary storage is a memory that is stored external to the computer. It is used mainly for permanent and long-term storage of programs and data.

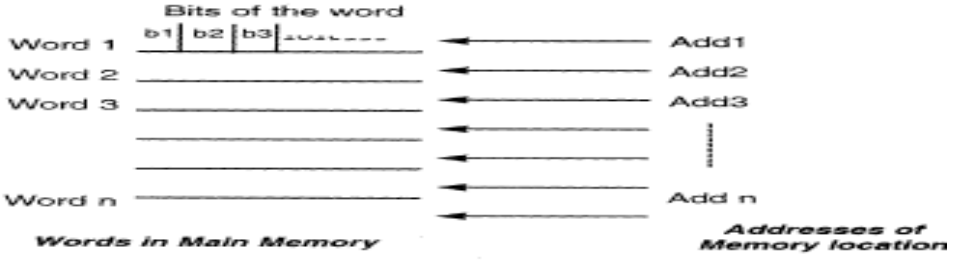
Characteristics of Storage units:

The storage units have special characteristics which decide the:

- Speed of operation of the computer,
- Its efficiency,
- Cost and
- The amount of data which the computer can store.

PRIMARY STORAGE

Primary storage is characterized by faster access time, less storage capacity and higher costs as compared to secondary storage units. Primary storage or main memory is that part of the computer system which stores the programs, data and intermediate results during the program execution. A primary storage comes as an integral part of all computer systems. It comprises of several small locations. Each location has a unique number assigned to it. This is called as the address of the location and it is used to identify the location. Each location has a capacity to store a fixed number of bits. The number of bits that a location can store is called as word length. Each location contains the same number of bits. Normally, primary memory size ranges from a few kilobytes on small computers to several thousand kilo bytes and megabytes on larger machines. The primary storage is volatile. Whenever the power is turned off the data is lost. Primary storage is also called Random Access Memory (**RAM**). RAM means it is possible to randomly select and use any storage location for storage and retrieval of data. RAM is also called a read/write memory because data can both be read from and written onto these units. When the power is switched off the data stored in the RAM is lost.



• **ROM**: ROM is Read Only Memory. In this type of memory, the data is permanently stored. The information can only be read, and new data cannot be written onto this memory. However, the contents of the ROM are not lost even when the power is turned off i.e. this memory is non-volatile. Such memories are also called as field stores, or permanent stores.

There are several high-level functions which are required to be performed by the computer system. Such functions are performed by writing special programs called micro programs. Micro

programs generally execute the low-level machine functions. These programs are mainly used as a substitute for hardware. Such programs can be stored on ROMs and be used again and again. This results in reducing the hardware of the system. ROM helps to increase the efficiency of the CPU as it can perform specialized tasks. ROM comes in the form of a chip. Once information is stored on a ROM chip it cannot be changed or altered.

- **PROM**: PROM is Programmable Read Only Memory. These are ROMs which can be programmed. A special PROM programmer is used to enter the program on the PROM. Once the chip has been programmed, information on the PROM cannot be altered. PROM is non-volatile ie. data is not lost when power is switched off.
- **EPROM**: Another type of memory is the Erasable Programmable Read Only Memory. It is possible to erase the data which has been previously stored on an EPROM and write new data onto the chip.
- **Cache Memory:**

This is a very special type of high speed memory. This memory cannot be accessed by the user. The main function of this cache memory is to make the programs and data available to the CPU very fast. Access time of memory is generally very high as compared to the execution time of the GPU. Therefore, a cache, which is a very small but fast memory, is used between the CPU and the main memory. This memory also called a high-speed buffer. A cache stores those segments of programs and data which are frequently needed. It makes available this data to the CPU at a very fast rate thus increasing the efficiency.

- **Registers:**

Registers are used to retain information temporarily. These are special memory units which are not actual parts of the main memory but allow efficient movement of information between the various units of the computer system. The registers receive information, hold it temporarily and make it available as and when required.

A computer uses several registers, where each register performs a specific function. Some of the common registers are:

1. **Memory Address Register** (MAR): The function of this register is to hold the address of the current or active memory location.
2. **Memory Buffer Register** (MBR): This register holds the contents of the address from which data is read or to which data has been written.
3. **Program Control Register**: It holds the address of the next instruction to be executed.
4. **Accumulator Register**: It holds the initial data, the intermediate results and the final data of the program under execution.
5. **Instruction Register**: This register holds the current instruction being executed.
6. **Input/output Register**: The function of this register is to communicate with the Input/output devices.

The storage capacity of primary storage is limited. It is normally not sufficient to accommodate all the data. Therefore, secondary storage medium is used to store large volumes of data. The

cost of secondary memory is much less as compared to primary memory; however, access time of primary memory is very fast. The data stored on secondary storage is transferred to the primary storage as and when required.

SECONDARY STORAGE:

Secondary storage is also called auxiliary memory. Secondary storage is used for storing copies of data and programs. This is a nonvolatile memory and is stored external to the computer. Information stored on secondary storage devices can be accessed in two ways:

- Sequential Access
- Direct Access:

Sequential Access Devices:

In sequential access data can be accessed only in the sequence in which it has been stored. Typical sequential access storage device is the magnetic tape. These types of devices are useful in applications like pay slip printing where the data is to be accessed one after the other.

Ex: Magnetic Tape

Direct Access Storage Devices

In random access the data at any location on the storage unit can be accessed directly without having to follow the sequence in which it has been stored. Typical dev ices that support direct access are the magnetic disk and magnetic drum.

Ex: Magnetic Disk

There are two types of disk systems:

1) Moving head System:

This consists of one read/write head for each disk surface. This head is mounted on an access arm which moves in and out. Thus, each head moves horizontally across the surface of the disk and can access each track individually.

2) Fixed head System:

In this system the access arm does not move. Many read/write heads one for each track are distributed over the surface of the disk. The time required to access the data stored on the disk depends upon the following factors:

•The **seek time** - the time required for positioning the read/write head over the appropriate track

•The **latency time** - the time required to spin the required data under the head. This time is also called the search time.

Input and Output Devices

Input and output devices allow the computer system to interact with the outside world by moving data *into* and *out of* the system. An *input device* is used to bring data into the system. Some input devices are:

1. Keyboard
2. Mouse
3. Microphone
4. Bar code reader
5. Graphics tablet

An *output device* is used to send data out of the system. Some output devices are:

- Monitor
- Printer
- Speaker

A network interface acts as both input and output. Data flows from the network into the computer, and out of the computer into the network.

Input/output devices are usually called **I/O** devices. They are directly connected to an electronic module attached to the motherboard called a **device controller**. For example, the speakers of a multimedia computer system are directly connected to a device controller called an audio card, which in turn is plugged into a bus on the motherboard.

With many recent computers, the functions of a device controller are integrated with the motherboard. Some motherboards have audio, graphics, and network controllers built in.

Sometimes secondary memory devices like the hard disk are called I/O devices (because they move data in and out of main memory). What counts as an I/O device depends on context. To a user, an I/O device is something outside of the computer case. To a programmer, anything outside of the processor and main memory is an I/O device. To an engineer working on the design of a processor everything outside of the processor is an I/O device.

SOFTWARE:

Software means a set of programs, procedures and other associated documentation which describes what the program does and how it is to be used. Hardware and software both must work together. Several software's can be run on the same hardware to perform different types of jobs. The software acts as an interface between the user and the computer.

Software is mainly classified into:

Application Software:

Application software is a program or a set of programs which are written to carryout a specific application.eg. Payroll, financial accounting etc. Nowadays special application software or packages for specialized areas like drawing, engineering, manufacturing, banking, and publishing are available. The set of programs which together make an application package are called application programs.

System Software:

The systems software controls the working of the computer system. It helps the user to use the computer by allowing him to communicate with the system. System software controls the working of other software's, hardware, hardware devices like printers, memory, CPU etc.

Thus, they make the operation of the computer more efficient. The programs included in system software are systems programs. Without the systems programs, it would not be possible for the application programs to work on the computer. The systems software is generally provided by the manufacturer of the computer hardware. Without the systems software the hardware would not work.

Utility Software:

These are a set of programs or tools which are used in program development or for performing limited tasks. Ex: Compression tools, Disk defragmenter, Antivirus.

Firmware:

With the advances in technology it is now possible to make the software available on ROM (Read Only Memory) chips. These chips, which form a part of the software, have the programs in them. Thus, programs available on hardware are called Firmware. Today not only systems software, but even some dedicated application programs are being made available on firmware.

Operating System:

The operating system acts as an interface between the humans and the computer. The operating system ensures smooth and efficient operation of a computer.

DEFINITION: An Operating system is defined as an integrated set of programs which manage the various resources and operations of a computer system. The operating system acts as an interface between the humans and the computer. The operating system ensures smooth and efficient operation of a computer.

Functions of OS: The operating systems are designed to perform the following functions:

- **Processor management:** A process is a program in execution. The processor is a hardware device which processes a sequence of instructions. Assigning of processors to the different tasks being executed by the computer is processor management.
- **Memory management:** Allocation of main memory and other storage to the system programs and the user data and programs.
- **Input/output management:** Management of the input/output devices and their assignment to the various programs that are being executed
- **File management:** The files must be stored in various storage devices. They must be transferred from one storage device to another. This is taken care of by the Operating System.
- **Data security and integrity:** The data and programs must be handled in such a way that they do not interfere with each other.
- **Assigning priority to jobs:** The operating system is the one which must decide and allot priority to the jobs which are to be executed.
- **Interpret commands and detect errors:** Each of these functions are performed by a program or a set of programs and all the programs together make the operating system. Normally, there is one control program of the operating system that resides in the main memory of the

computer. This program is known as the resident program. The other programs known as transient programs or service programs reside on the disk and are accessed as and when required. The total amount of work performed by the operating system over a period is known as **throughput**. The **response time** is the time interval between the time the user submits request and the -time he receives the response. Response time is also known as **turnaround time** the efficiency of a computer system depends upon the throughput and the response time.

Types of OS:

1. **Batch Processing:**
2. **Multiprogramming:**
3. **Multiprocessing:**
4. **Time Sharing:**
5. **On line Processing:**
6. **Real Time Processing:**
7. **Distributed Operating System:**
8. **Embedded System:**

Language Processors

A programming language is a means of communication for the user to communicate with the computer system. The programming language is a set of instructions which tells the computer what to do. This is a language which is understood by both man and machine. There are several programming languages. However, all these languages are designed to perform at least certain basic instructions and operations; These instructions and operations are:

- Input/output operations,
- Arithmetic operations - mathematical operations like addition, subtraction,
- Logical operations - Comparison for equality, inequality etc.
- Movement of instructions and data to and from the CPU.

To use the programming language, the programmer must strictly follow the rules of the language including all commas, punctuation marks etc. otherwise the program will not be understood by the computer. Thus, although the programming languages are much smaller and simpler than the natural languages, they must be used with the greatest accuracy.

Types of programming languages

a) Machine Language:

b) Assembly Language:

c) High Level Languages:

d)Fourth Generation Languages (4 GL)

The programs which are used to translate programs written in high level language into machine language are known as **translators.** These translators are also known as **language processors**.

The types of translators are:

I) Assembler

I) Compiler Interpreter

The compiler translates the entire source program into machine language program at once. The source code remains intact. Once a program is compiled it can be run as many times as required, without being required to be recompiled. A compiler can translate only those programs which have been written in the language for which it is designed. Also, each machine must have its own compiler. A compiler is a program which normally resides on the secondary storage device. It gets loaded into the CPU when the source program is to be translated. Acompiler checks for errors like illegal symbols, statements etc. during compilation and gives out a list of error messages at the end of execution. This is a very valuable aid to the programmer to correct the programs. However, the compiler is incapable of detecting any logical errors in the program.

The interpreter is the program which translates a high-level language program into machine language as follows:

- it takes one statement from the high-level language program
- translates it into a machine instruction and the instruction is immediately executed.

Thus assemblers, compilers and interpreters are systems software whichtranslate the source program into object program i.e. program which can be understood bythe computer.

Compression Tools:

A **compression program** or **compression utility** is a software program that can compress and decompress various file types.

Most operating systems include tools for compressing and uncompressing files. For example, latest versions of Microsoft Windows include a compression utility for creating and extracting .zip files and Linux has tools for both .tar.gz and .zip. Other compressed files, like .7z and .rar, require a third-party compression utility to be installed, such as the ones listed below.

Example of compression utilities

- 7-Zip
- PKZIP
- WinAce
- WinZip
- WinRAR

***Disk Defragmentation*:**

Defragmentation is the process of consolidating fragmented files on the user's hard drive. Files become fragmented when data is written to disk, and there is not enough contiguous space to hold the complete file. Storage algorithms break the data apart so that it will fit into the available space.

The process of defragmentation moves the data blocks on the hard drive around to bring all the parts of a file together. Defragmentation reduces file system fragmentation, increasing the efficiency of data retrieval and thereby improving the overall performance of the computer. At the same time, it cleans the storage and provides additional storage capacity.

Defragmentation is the opposite of fragmentation, which is an inefficient use of computer storage.

Fragmentation occurs gradually as users change, save, or delete files. The saved modifications for a file are usually stored at a hard drive location that is different from that of the original file. Supplementary modifications are stored to even more locations. Gradually, both the file and the hard drive become fragmented, and the computer becomes very slow as it needs to search in various places to open a file.

Defragmentation tools were introduced to eliminate this issue and are preinstalled in different versions of the Windows OS. These built-in defragmenters rearrange the hard drive data and reunite the fragmented files, which helps the computer to run more efficiently. A hard drive uses automatic schedulers for periodic defragmentation. In addition, users may use tools for storage media defragmentation, such as:

- Microsoft Windows 98: This OS contains a built-in defragmentation tool available via the system's Tools menu.
- Microsoft Windows NT: This OS was released without a defragmenter tool because its new technology file system (NTFS) was designed for automatic system defragmentation. However, third-party defragmentation tools are often used.
- Microsoft Windows 2000: This OS is equipped with defragmentation tools, which are more efficient than those found in earlier Windows operating systems.
- Microsoft Windows XP and Windows 7: These operating systems contain default disk defragmentation tools.

Anti-Virus:

Anti-virus software is a program or set of programs that are designed to prevent, search for, detect, and remove software viruses, and other malicious software like worms, trojans, adware, and more.

These tools are critical for users to have installed and up-to-date because a computer without anti-virus software installed will be infected within minutes of connecting to the internet. The bombardment is constant, with anti-virus companies update their detection tools constantly to deal with the more than 60,000 ***new*** pieces of malware created daily.

There are several different companies that build and offer anti-virus software and what each offer can vary but all perform some basic functions:

- Scan specific files or directories for any malware or known malicious patterns
- Allow you to schedule scans to automatically run for you
- Allow you to initiate a scan of a specific file or of your computer, or of a CD or flash drive at any time.
- Remove any malicious code detected –sometimes you will be notified of an infection and asked if you want to clean the file, other programs will automatically do this behind the scenes.
- Show you the 'health' of your computer

Always be sure you have the best, up-to-date security software installed to protect your computers, laptops, tablets and smart phones.

***Open-Source Software (OSS)*:**

Open-source software (OSS) is software that is distributed with source code that may be read or modified by users.

The OSS community generally agrees that open-source software should meet the following criteria:

- The program must be freely distributed
- Source code must be included with the program
- Anyone must be able to modify the source code
- Modified versions of the source code may be redistributed

As well, an open-source software license must not require the exclusion of, or interfere with, the operation of other software.

Unlike traditional software distributed in an unchangeable compiled format, open-source software is delivered with both compiled and non-compiled formats, allowing open code modification. In traditional software licenses, this privilege would be reserved for copyright holders.

Examples: Linux Operating System, Apache Web Server Application

Advantages:

People prefer open source software to proprietary software for several reasons, including:

Control. Many people prefer open source software because they have more controlover that kind of software. They can examine the code to make sure it's not doing anything they don't want it to do, and they can change parts of it they don't like. Users who aren't programmers also benefit from open source software because they can use this software for any purpose they wish—not merely the way someone else thinks they should.

Training. Other people like open source software because it helps them become better programmers. Because open source code is publicly accessible, students can easily study it as they learn to make better software. Students can also share their work with others, inviting comment and critique, as they develop their skills. When people discover mistakes in programs' source code, they can share those mistakes with others to help them avoid making those same mistakes themselves.

Security. Some people prefer open source software because they consider it more secure and stable than proprietary software. Because anyone can view and modify open source software, someone might spot and correct errors or omissions that a program's original authors might have missed. And because so many programmers can work on a piece of open source software without asking for permission from original authors, they can fix, update, and upgrade open source software more quickly than they can proprietary software.

Stability. Many users prefer open source software to proprietary software for important, long-term projects. Because programmers publicly distribute the source code for open source software, users relying on that software for critical tasks can be sure their tools won't disappear or fall into disrepair if their original creators stop working on them. Additionally, open source software tends to both incorporate and operate according to open standards.

UNIT-2
INTRODUCTION TO PROGRAMMING

I) PROGRAM & PROGRAMMING PRINCIPLES

Every programmer benefits from understanding programming principles and patterns. The list was inspired by The Principles of Good Programming.

1. Most systems work best if they are kept simple rather than made complex.

Why

- Less code takes less time to write, has less bugs, and is easier to modify.
- Simplicity is the ultimate sophistication.
- It seems that perfection is reached not when there is nothing left to add, but when there is nothing left to take away.

2. Don't implement something until it is necessary.

Why

- Any work that's only used for a feature that's needed tomorrow, means losing effort from features that need to be done for the current iteration.
- It leads to code bloat; the software becomes larger and more complicated.

How

- Always implement things when you need them, never when you just foresee that you need them.

3. Do the Simplest Thing That Could Possibly Work

Why

- Real progress against the real problem is maximized if we just work on what the problem really is.

How

- Ask yourself: "What is the simplest thing that could possibly work?"

4. Separation of Concerns

Separation of concerns is a design principle for separating a computer program into distinct sections, such that each section addresses a separate concern. For example, the business logic of the application is a concern and the user interface is another concern. Changing the user interface should not require changes to business logic and vice versa.

Why

- Simplify development and maintenance of software applications.
- When concerns are well-separated, individual sections can be reused, as well as developed and updated independently.

How

- Break program functionality into separate modules that overlap as little as possible.

5. Keep things DRY

Every piece of knowledge must have a single, unambiguous, authoritative representation within a system.

Why

- Duplication (inadvertent or purposeful duplication) can lead to maintenance nightmares, poor factoring, and logical contradictions.
- A modification of any single element of a system does not require a change in other logically unrelated elements.
- Additionally, elements that are logically related all change predictably and uniformly and are thus kept in sync.

How

- Put business rules, long expressions, if statements, math formulas, metadata, etc. in only one place.
- Identify the single, definitive source of every piece of knowledge used in your system, and then use that source to generate applicable instances of that knowledge (code, documentation, tests, etc.).
- Apply the Rule of three.

6. Code for The Maintainer

Why

- Maintenance is by far the most expensive phase of any project.

How

- *Be* the maintainer.
- Always code as if the person who ends up maintaining your code is a violent psychopath who knows where you live.
- Always code and comment in such a way that if someone a few notches junior picks up the code, they will take pleasure in reading and learning from it.
- Don't make me think.
- Use the Principle of Least Astonishment.

7. Avoid Premature Optimization

Programmers waste enormous amounts of time thinking about, or worrying about, the speed of noncritical parts of their programs, and these attempts at efficiency have a strong negative impact when debugging and maintenance are considered. We should forget about small efficiencies, say about 97% of the time: premature optimization is the root of all evil. Yet we should not pass up our opportunities in that critical 3%.

Understanding what is and isn't "premature" is critical of course.

Why

- It is unknown upfront where the bottlenecks will be.
- After optimization, it might be harder to read and thus maintain.

How

- Make It Work Make It Right Make It Fast

- Don’t optimize until you need to, and only after profiling you discover a bottleneck optimize that.

8. Minimize Coupling

Coupling between modules/components is their degree of mutual interdependence; lower coupling is better. In other words, coupling is the probability that code unit “B” will “break” after an unknown change to code unit “A”.

Why

- A change in one module usually forces a ripple effect of changes in other modules.
- Assembly of modules might require more effort and/or time due to the increased inter-module dependency.
- A module might be harder to reuse and/or test because dependent modules must be included.
- Developers might be afraid to change code because they aren’t sure what might be affected.

How

- Eliminate, minimize, and reduce complexity of necessary relationships.
- By hiding implementation details, coupling is reduced.
- Apply the Law of Demeter.

9. Composition Over Inheritance

Why

- Less coupling between classes.
- Using inheritance, subclasses easily make assumptions, and break LSP.

How

- Test for LSP (substitutability) to decide when to inherit.
- Compose when there is a “has a” (or “uses a”) relationship, inherit when “is a”.

10. Orthogonality

The basic idea of orthogonality is that things that are not related conceptually should not be related in the system.

Why

- To be able to evolve services you need to ensure that a provider can make changes to support new demands while causing minimal breakage to their existing clients.

How

- Code that sends commands or data to other machines (or to other programs on the same machine) should conform completely to the specifications, but code that receives input should accept non-conformant input if the meaning is clear.

11. Maximize Cohesion

Cohesion of a single module/component is the degree to which its responsibilities form a meaningful unit; higher cohesion is better.

Why

- Increased difficulty in understanding modules.
- Increased difficulty in maintaining a system, because logical changes in the domain affect multiple modules, and because changes in one module require changes in related modules.
- Increased difficulty in reusing a module because most applications won't need the random set of operations provided by a module.

How

- Group related functionalities sharing a single responsibility (e.g. in a class).

12. Open/Closed Principle

Software entities (e.g. classes) should be open for extension but closed for modification. I.e. such an entity can allow its behavior to be modified without altering its source code.

Why

- Improve maintainability and stability by minimizing changes to existing code.

How

- Write classes that can be extended (as opposed to classes that can be modified).
- Expose only the moving parts that need to change, hide everything else.

13. Single Responsibility Principle

A class should never have more than one reason to change.

Long version: Every class should have a single responsibility, and that responsibility should be entirely encapsulated by the class. Responsibility can be defined as a reason to change, so a class or module should have one, and only one, reason to change.

Why

- Maintainability: changes should be necessary only in one module or class.

14. Hide Implementation Details

A software module hides information (i.e. implementation details) by providing an interface, and not leak any unnecessary information.

Why

- When the implementation changes, the interface clients are using does not have to change.

How

- Minimize accessibility of classes and members.
- Don't expose member data in public.
- Avoid putting private implementation details into a class's interface.
- Decrease coupling to hide more implementation details.

15. Command Query Separation

The Command Query Separation principle states that each method should be either a command that performs an action or a query that returns data to the caller but not both. Asking a question should not modify the answer.

With this principle applied the programmer can code with much more confidence. The query methods can be used anywhere and, in any order since they do not mutate the state. With commands one must be more careful.

Why

- By clearly separating methods into queries and commands the programmer can code with additional confidence without knowing each method's implementation details.

How

- Implement each method as either a query or a command
- Apply naming convention to method names that implies whether the method is a query or a command

II) PROGRAMMING FUNDAMENTALS

A *data type* is a set of values and a set of operations defined on them. For example, we are familiar with numbers and with operations defined on them such as addition and multiplication. There are eight different built-in types of data in Java, mostly different kinds of numbers. We use the system type for strings of characters so frequently that we also consider it here.

type	*set of values*	*common operators*	*sample literal values*
`int`	integers	`+ - * / %`	`99 12 2147483647`
`double`	floating-point numbers	`+ - * /`	`3.14 2.5 6.022e23`
`boolean`	boolean values	`&& || !`	`true false`
`char`	characters		`'A' '1' '%' '\n'`
`String`	sequences of characters	`+`	`"AB" "Hello" "2.5"`

Terminology. We use the following code fragment to introduce some terminology:

```
int a, b, c;
a=1234;
b=99;
c=b + a;
```

The first line is a *declaration statement* that declares the names of three *variables* using the *identifiers* a, b, and c and their type to be int. The next three lines are *assignment statements* that change the values of the variables, using the *literals* 1234 and 99, and the *expression* a + b, with the result that has the value 1333.

Characters and strings. A char is an alphanumeric character or symbol, like the ones that you type. We usually do not perform any operations on characters other than assigning values to variables. A String is a sequence of characters. The most common operation that we perform on strings is known as *concatenation*: given two strings, chain them together to make a new string. For example, consider the following Java program fragment:

```
String a, b, c;
a = "Hello,";
b = " Bob";
c = a + b;
```

The first statement declares three variables to be of type String. The next three statements assign values to them, with the result that has the value "Hello, Bob". Using string concatenation, java prints the relative lengths of the subdivisions on a ruler.

Integers. An int is an integer (whole number) between -2^{31} and $2^{31} - 1$ (−2,147,483,648 to 2,147,483,647). We use 'int' frequently not just because they occur frequently in the real world, but also, they naturally arise when expressing algorithms. Standard arithmetic operators for addition, multiplication, and division, for integers are built into Java, as illustrated in the following table:

Floating-point numbers. The double type is for representing *floating-point* numbers, e.g., for use in scientific applications. The internal representation is like scientific notation, so that we can compute with real numbers in a huge range. We can specify a floating-point number using either a string of digits with a decimal point, e.g., 3.14159 for a six-digit approximation to the mathematical constant pi, or with a notation like scientific notation, e.g., 6.022E23 for Avogadro's constant 6.022×10^{23}. Standard arithmetic operators for addition, multiplication, and division, for doubles are built in to Java, as illustrated inthe following table:

Booleans. The boolean type has just two values: true or false. The apparent simplicity is deceiving—booleans lie at the foundation of computer science. The most important operators defined for the boolean are for *and*, *or*, and *not*.

- *and*: a && b is true if both a and b are true, and false otherwise.
- *or*: a || b is true if either a or b is true (or both are true), and false otherwise
- *not*: ! a is true if a is false, and false otherwise.

Although these definitions are intuitive and easy to understand, it is worthwhile to fully specify each possibility for each operation in a *truth table*.

Comparisons. The *comparison* operators are *mixed-type* operations that take operands of one type (e.g., int or double) and produce a result of typeboolean. These operations play a critical role in the process of developing more sophisticated programs.

We often find ourselves converting data from one type to another using one of the following approaches.

Type conversion.

We often find ourselves converting data from one type to another using one of the following approaches.

- *Explicit type conversion*. Call methods such as Math.round(), Integer.parseInt(), and Double.parseDouble().

- *Automatic type conversion.* For primitive numeric types, the system automatically performs type conversion when we use a value whose type has a larger range of values than expected.
- *Explicit casts.* Java also has some built-in type conversion methods for primitive types that you can use when you are aware that you might lose information, but you must make your intention using something called a *cast*.
- *Automatic conversions for strings.* The built-in type String obeys special rules. One of these special rules is that you can easily convert any type of data to a String by using the + operator.

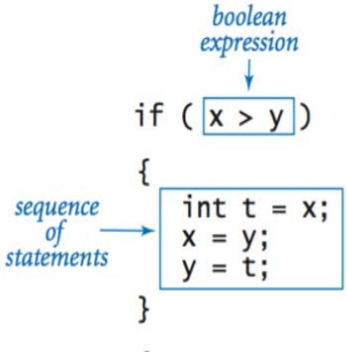
CONTROL STRUCTURE:

In the programs that we have examined to this point, each of the statements is executed once, in the order given. Most programs are more complicated because the sequence of statements and the number of times each is executed can vary. We use the term *control flow* to refer to statement sequencing in a program.

If Statements.

Most computations require different actions for different inputs.

- The following code fragment uses an if statement to put the smaller of two int values in x and the larger of the two values in y, by exchanging the values in the two variables if necessary.



- The table below summarizes some typical situations where you might need to use an if or if-else statement.

absolute value	`if (x < 0) x = -x;`

put the smaller value in x and the larger value in y	`if (x > y)`
	`{`
	`  int t = x;`
	`  x = y;`
	`  y = t;`
	`}`

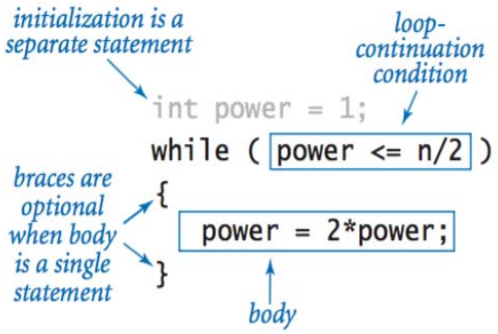
maximum of x and y	`if (x > y) max = x;` `else  max = y;`
error check for division operation	`if (den == 0) System.out.println("Division by zero");` `else  System.out.println("Quotient = " + num/den);`

error check for quadratic formula	`double discriminant = b*b - 4.0*c;`
	`if (discriminant < 0.0)`
	`{`
	`  System.out.println("No real roots");`
	`}`
	`else`
	`{`
	`  System.out.println((-b + Math.sqrt(discriminant))/2.0);`
	`  System.out.println((-b - Math.sqrt(discriminant))/2.0);`
	`}`

While loops.

Many computations are inherently repetitive. The while loop enables us to execute a group of statements many times. This enables us to express lengthy computations without writing lots of code.

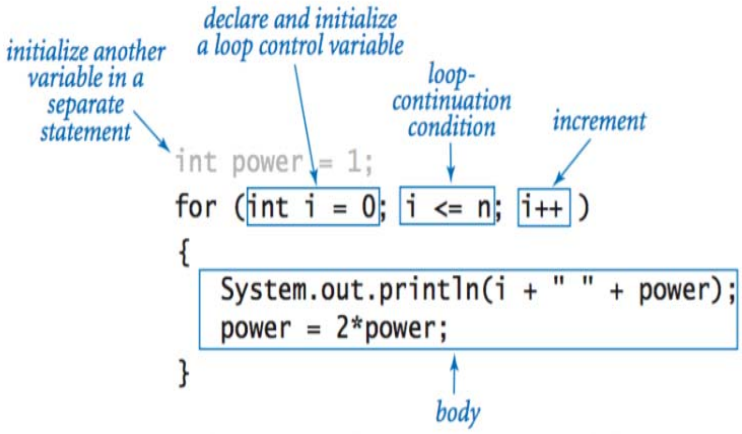
- The following code fragment computes the largest power of 2 that is less than or equal to a given positive integer *n*.



For loops.

The *for loop* is an alternate Java construct that allows us even more flexibility when writing loops.

- *For notation.* Many loops follow the same basic scheme: initialize an index variable to some value and then use a while loop to test an exit condition involving the index variable, using the last statement in the while loop to modify the index variable. Java's for loop is a direct way to express such loops.



- *Compound assignment idioms.* The idiom i++ is a shorthand notation for i = i + 1.
- *Scope.* The *scope* of a variable is the part of the program that can refer to that variable by name. Generally, the scope of a variable comprises the statements that follow the declaration in the same block as the declaration. For this purpose, the code in the for-loop header is considered to be in the same block as the for loop body.

Nesting.

The if, while, and for statements have the same status as assignment statements or any other statements in Java; that is, we can use them wherever a statement is called for. We can use one or more of them in the body of another statement to make *compound statements*. To emphasize the nesting, we use indentation in the program code.

Loop examples.

compute the largest power of 2 less than or equal to n	`int power = 1;`
	`while (power <= n/2)`
	`  power = 2*power;`
	`System.out.println(power);`

compute a finite sum $(1 + 2 + \ldots + n)$	`int sum = 0;`
	`for (int i = 1; i <= n; i++)`
	`  sum += i;`
	`System.out.println(sum);`

compute a finite product $(n! = 1 \times 2 \times \ldots \times n)$	`int product = 1;`
	`for (int i = 1; i <= n; i++)`
	`  product *= i;`
	`System.out.println(product);`

print a table of function values	`for (int i = 0; i <= n; i++)` `  System.out.println(i + " " + 2*Math.PI*i/n);`

compute the ruler function (see PROGRAM 1.2.1)	`String ruler = "1";`
	`for (int i = 2; i <= n; i++)`
	`  ruler = ruler + " " + i + " " + ruler;`
	`System.out.println(ruler);`

III) GETTING STARTED WITH PROGRAMMING

Introduction, rapid application development with IDE, basic interface components (label, text field, text area, button, checkbox, radio button), Basics of writing a program using IDE, getting familiar with **java swing** user interface components (frame, dialog, option pane, scroll pane, label, text field, password filed, text area, button, check box, radio button, combo box, list), handling methods and properties (setText (), getText (), isSelected (), setSelected ())

Java Swing is a part of Java Foundation Classes (JFC) that is *used to create window-based applications*. It is built on the top of AWT (Abstract Windowing Toolkit) API and entirely written in java.Unlike AWT, Java Swing provides platform-independent and lightweight components.
The javax.swing package provides classes for java swing API such as JButton, JTextField, JTextArea, JRadioButton, JCheckbox, JMenu, JColorChooser etc.
The setBounds(int xaxis, int yaxis, int width, int height)is used in the above example that sets the position of the button.

Popular Java Editors

To write your Java programs, you will need a text editor. There are even more sophisticated IDE available in the market. But for now, you can consider one of the following −

- **Notepad** − On Windows machine, you can use any simple text editor like Notepad (Recommended for this tutorial), TextPad.
- **Netbeans** − Netbeans is a Java IDE that is open source and free, which can be downloaded from https://www.netbeans.org/index.html.
- **Eclipse** − Eclipse is also a Java IDE developed by the Eclipse open source community and can be downloaded from https://www.eclipse.org/.

Every user interface considers the following three main aspects −
UI Elements − These are the core visual elements the user eventually sees and interacts with. GWT provides a huge list of widely used and common elements varying from basic to complex, which we will cover in this tutorial.
Layouts − They define how UI elements should be organized on the screen and provide a final look and feel to the GUI (Graphical User Interface). This part will be covered in the Layout chapter.
Behavior − These are the events which occur when the user interacts with UI elements. This part will be covered in the Event Handling chapter.

Every SWING controls inherits properties from the following Component class hierarchy.

S No	Class & Description
1	**Component** A Component is the abstract base class for the non-menu user-interface controls of SWING. Component represents an object with graphical representation
2	**Container** A Container is a component that can contain other SWING components

3	**JComponent** A JComponent is a base class for all SWING UI components. To use a SWING component that inherits from JComponent, the component must be in a containment hierarchy whose root is a top-level SWING container

SWING UI Elements

Following is the list of commonly used controls while designing GUI using SWING.

S No	Class & Description
1	**JLabel**- A JLabel object is a component for placing text in a container.
2	**JButton** -This class creates a labeled button.
3	**JColorChooser** A JColorChooser provides a pane of controls designed to allow a user to manipulate and select a color.
4	**JCheck Box** A JCheckBox is a graphical component that can be in either an **on** (true) or **off**(false) state.
5	**JRadioButton** The JRadioButton class is a graphical component that can be in either an **on**(true) or **off** (false) state. in a group.
6	**JList**- A JList component presents the user with a scrolling list of text items.
7	**JComboBox** A JComboBox component presents the user with a to show up menu of choices.
8	**JTextField** - A JTextField object is a text component that allows for the editing of a single line of text.
9	**JPasswordField** A JPasswordField object is a text component specialized for password entry.
10	**JTextArea** A JTextArea object is a text component that allows editing of a multiple lines of text.
11	**ImageIcon** A ImageIcon control is an implementation of the Icon interface that paints Icons from Images

UNIT-3
RELATIONAL DATABASE MANAGEMENT SYSTEM

I) DBMS

Structure

3.0 Introduction to database concept
3.1 Relational database
3.2 Relation
3.3 Table, Attribute/Field, Tuple/Row
3.4 Keys

3.0 Introduction to database concept

Data:

- Facts, figures, statistics etc. having some meaning (e.g. 1, ABC etc).
- Raw facts
- Data is a collection of facts and figures that can be processed to produce information.

Database

Database is a collection of related data.

Database Users

Administrators:

- Database administrator is a person.
- Who is the controlling authority of database?

Designers

- Designers are the group of people who actually work on the designing part of the database.
- They keep a close watch on what data should be kept and in what format.
- They identify and design the whole set of entities, relations, constraints, and views.

End Users

End users are those who actually get benefits of using DBMS.

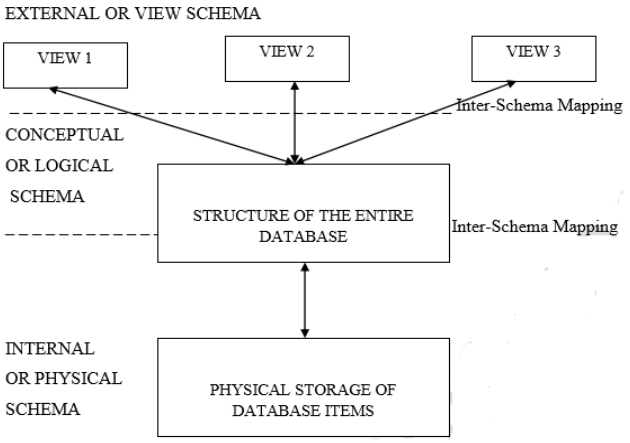
Advantages of database

- Reduced data redundancy
- Reduced updating errors and increased consistency
- Greater data integrity and independence from applications programs
- Improved data access to users through use of host and query languages
- Improved data security
- Reduced data entry, storage, and retrieval costs
- Facilitated development of new applications program
- Control concurrent data access
- Reliable & available

Disadvantages of database

- Database systems are complex, difficult, and time-consuming to design
- Substantial hardware and software start-up costs
- Damage to database affects virtually all applications programs
- Extensive conversion costs in moving form a file-based system to a database system
- Initial training required for all programmers and users

Three Views of Data



Internal or Physical schema

- The lowest level, called the **Internal or Physical schema**
- It deals with the description of how raw data items (like 1, ABC, KOL, H2 etc.) are stored in the physical storage (Hard Disc, CD, Tape Drive etc.).
- It also describes the data type of these data items, the size of the items in the storage media, the location (physical address) of the items in the storage device and so on.

Conceptual or Logical Schema

- The middle level is known as the Conceptual or Logical Schema.
- It deals with the structure of the entire database.
- Conceptual or Logical schema is very useful for database administrators whose responsibility is to maintain the entire database.

External or View Schema

- The highest level of abstraction is the External or View Schema.
- This is targeted for the end users.
- Now, an end user does not need to know everything about the structure of the entire database, rather than the amount of details he/she needs to work with.

Data Independence

It is the property of the database which tries to ensure that if we make any change in any level of schema of the database, the schema immediately above it no need of change.

Data independence can be classified into the following two types:

1. **Physical Data Independence**: This means that for any change made in the physical schema, the need to change the logical schema is minimal. This is practically easier to achieve.

2. Logical Data Independence: This means that for any change made in the logical schema, the need to change the external schema is minimal. As we shall see, this is a little difficult to achieve.

3.1 Relational database

A Relational Database Management System (RDBMS) is a software that −

- Enables you to implement a database with tables, columns and indexes.
- Guarantees the Referential Integrity between rows of various tables.
- Updates the indexes automatically.
- Interprets an SQL query and combines information from various tables.

RDBMS Terminology

Few definitions related to the database.

- **Database** − A database is a collection of tables, with related data.
- **Table** − A table is a matrix with data. A table in a database looks like a simple spreadsheet.
- **Column** − One column (data element) contains data of one and the same kind, for example the column postcode.
- **Row** − A row (= tuple, entry or record) is a group of related data, for example the data of one subscription.
- **Redundancy** − Storing data multiple times i.e. data duplication
- **Primary Key** − A primary key is unique. A key value cannot occur twice in one table. With a key, you can only find one row.
- **Foreign Key** − A foreign key is the linking pin between two tables.
- **Compound Key** − A compound key (composite key) is a key that consists of multiple columns, because one column is not sufficiently unique.

3.2 Relation

A Relation is a set of records/tuples, a tuple being a set of attribute values, each attribute identified by its name.

3.3 Table, Attribute/Field, Tuple/Row

Table

- A table is a collection of related data held in a structured format within a database.
- "Table" is another term for "relation"; although there is the difference in that a table is usually a multiset (bag) of rows where a relation is a set and does not allow duplicates.
- A Table one can have duplicates and other anomalies.

Employee:

E_No	E_Name	Address	Salary
01	N1	A1	20000
02	N2	A2	40000
03	N1	A2	20000

- **Table Name**: Employee
- **Attributes**: Column or field =E_No,E_Name,Address,Salary

- **Tuple**: Number of Records/Number of rows=03
- **Cardinality** : Number of rows =03
- **Degree**:Number of columns =04
- **Primary key** : Unique identifier =E_No

Cardinality of primary key

Cardinality of primary key column=Number of records in the table.

What does a Cardinality of Zero mean?

If a column has a cardinality of zero, it means that the column has no unique values.

3.4 Keys

Key

A ***key*** is an attribute or a combination of attributes that uniquely identifies each row within a table. A key implies uniqueness, so in other words, a key functionally determines the nonkeys. A database key is a attribute utilized to sort and/or identify data in some manner. Each table has a primary key which uniquely identifies records.

Primary Key

A ***primary key*** is a special relational database table column (or combination of columns) selected to uniquely identify all table records. A primary Key which uniquely identifies a row of table, primary key does not allow null values and also not allow duplicate values.

A primary key's main features are:

1. It must contain a unique value for each row of data.
2. It cannot contain null values.

Customer:

C#	First Name	Last Name
01	Amit	Nanda
02	Trupti	Nanda
03	Sai	Amrita
04	Alok	Mishra

In the table above, C# is the primary key.

The values placed in primary key columns must be unique for each row: no duplicates can be tolerated. In addition, nulls are not allowed in primary key columns.

Candidate Key

When one key attribute is not sufficient to determine all other non key values of a relation, at that times more than one key attributes or more than one combination of key attributes uniquely determines row of a relation is called candidate key.

Generally a candidate key becomes the primary key of the relation**.** If a relation has more than one candidate key, one of them will become the primary key and the rest are called ***alternate key.***

Alternate key

A candidate key that is not the primary key is called an alternate key

Foreign Key

A foreign key is a field in a relational table that matches the primary key column of another table. The foreign key can be used to cross-reference tables.

II) Introduction to MYSQL

Structure

3.5 Introduction to MYSQL
3.6 Data Types
3.7 Classification of SQL Statements

3.5 Introduction to MYSQL

- MySQL is the most popular Open Source Relational SQL Database Management System.
- MySQL is one of the best RDBMS being used for developing various web-based software applications.
- MySQL is developed, marketed and supported by MySQL AB, which is a Swedish company.

3.6 MYSQL Data Types

MySQL uses many different data types broken into three categories −

- Numeric
- Date and Time
- String Types.

NUMERIC Data Types

INT()	A normal-sized integer that can be signed or unsigned. If signed, the allowable range is from -2147483648 to 2147483647. If unsigned, the allowable range is from 0 to 4294967295. You can specify a width of up to 11 digits.
FLOAT(M,D)	A floating-point number that cannot be unsigned. You can define the display length (M) and the number of decimals (D). This is not required and will default to 10,2, where 2 is the number of decimals and 10 is the total number of digits (including decimals). Decimal precision can go to 24 places for a FLOAT.
DOUBLE(M,D)	A double precision floating-point number that cannot be unsigned. You can define the display length (M) and the number of decimals (D). This is not required and will default to 16,4, where 4 is the number of decimals. Decimal precision can go to 53 places for a DOUBLE. REAL is a synonym for DOUBLE.
DECIMAL(M,D)	An unpacked floating-point number that cannot be unsigned. In the unpacked decimals, each decimal corresponds to one byte. Defining the display length (M) and the number of decimals (D) is required. NUMERIC is a synonym for DECIMAL.

Date and Time Types

DATE	YYYY-MM-DD
DATETIME	YYYY-MM-DD HH:MM:SS
TIME	HH:MM:SS

String Types

- **CHAR(M)** − A fixed-length string between 1 and 255 characters in length. Example CHAR(5)

- **VARCHAR(M)** − A variable-length string between 1 and 255 characters in length. For example, VARCHAR(25). You must define a length when creating a VARCHAR field.

3.7 Classification of SQL Statements

SQL Commands are classified into four categories.

- DDL Commands
  - ✓ CREATE
  - ✓ ALTER
  - ✓ DROP
  - ✓ RENAME
- DML Commands

- ✓ SELECT
- ✓ INSERT
- ✓ DELETE

- DCL Commands
  - ✓ GRANT
  - ✓ REVOKE
- TCL Commands
  - ✓ COMMIT
  - ✓ ROLLBACK
  - ✓ SAVEPOINT

DDL Commands:

Database queries

1. **Create database**
   CREATE DATABASE <database name>;

2. **Select the current database**
   USE <database name>;

3. **Delete the database**
   DROP DATABASE <database name>;

4. **List all database**
   SHOW databases;

5. **Rename database**
   ALTER DATABASE <old database name> RENAME <new database name>;

Table queries

1. **Create table**
   CREATE TABLE <table name> (<fieldname><datatype>(<size>),…..);
2. **List all tables in current database**
   SHOW tables;
3. **Display the structure of table**
   DESC <table name>;
4. **Modify the structure of table**
   - **Delete column**

ALTER TABLE <table name> DROP COLUMN <column name>;

- **Add new column**

ALTER TABLE <table name> ADD COLUMN <column name><data type> (<size>);

- **Change Column Data type**

ALTER TABLE <table name> MODIFY <Column name> <New Data type>;

5. **Changing Name of table**
   ALTER TABLE <Old table name> RENAME<New table name>;
6. **Delete the table**
   DROP TABLE <table name>;

DML Commands:

1. **Insert new records in a table**
   INSERT INTO *table name* (*column1*, *column2*, *column3*, ...)
   VALUES (*value1*, *value2*, *value3*, ...);
2. **Delete existing records in a table**
   DELETE FROM *table_name* WHERE *condition*;
3. **Fetch data from table**
   - **Select all data**
     SELECT * FROM <Table Name>;
   - **Selecting selected columns from a Table**
     SELECT COLUMN_NAME FROM <Table Name>;
   - **Select Particular row**
     SELECT Column_name1,Column_name2….
     FROM <table name>
     WHERE condition]
   - **Eliminate Duplicate Values**
     SELECT DISTINCT <Column name>
     FROM table(s)
     [WHERE condition];
   - **Display record in Ascending/Descending order**
     SELECT * FROM <table name>
     ORDER BY Column_name1 ASC/DESC;
   - **Select values within a range**
     SELECT Column_Name(s)
     FROM table_name
     WHERE column_name BETWEEN value1 AND value2;

UNIT - 4
IT APPLICATIONS

I) E-GOVERNANCE

Structure

4.0 Introduction
4.1 Definition
4.2 Benefit to Citizen
4.3 Its Web Sites
4.4 Its Social impact
4.5 E-Governance challenges

4.0 Introduction

A worldwide revolution in information and communications technologies is occurring. The Internet, the personal computer, and the mobile phone are fundamentally changing our lives - affecting the way we work, learn and interact. Governments around the world are recognizing the value of e-Government. Properly designed and implemented, e-Government can improve efficiency in the delivery of government services, simplify compliance with government regulations, strengthen citizen participation and trust in government, and yield cost savings for citizens, businesses and the government itself. Not surprisingly, therefore, policymakers and managers are looking to adopt e-Government in countries around the world - ranging from the most developed to the least developed.

4.1 Definition

- **Electronic Governance** or **E-Governance** is the application of information and communication technology (ICT) for delivering government services, exchange of information, communication transactions.
- It has radically defined the way a government provides service to citizens, businesses and other arms of the government using the following delivery models:
    - Government to Citizen (G2C)
    - Government to Business (G2B)
    - Government to Government (G2G)
    - Government to Employees (G2E)

4.2 Benefit to Citizen

- E-Government helps build trust between the Government and Citizens.
- Building trust between governments and citizens is fundamental to good governance.

- E-Governance is to offer a variety of ICT services to citizens in an efficient and economical manner
- Strengthen the relationship between government and citizens using technology.
- ICT can help build trust by enabling citizen engagement in the policy process, promoting open and accountable government and helping to prevent corruption.

4.3 Its Web Sites

Top e-government sites that are great resource in-case you are searching for most popular government sites in India.

1. National Informatics Centre - **https://www.nic.in** is the premier web technology organization of India's Union Government. It has played a pivotal role in steering e-governance applications in the governmental departments at national, state and district levels.
2. Indian Railways – **https://www.indianrail.gov.in** - The official site with information on trains, fares and availability.
3. Staff Selection Commission - **https://www ssc.nic.in** - Makes recruitment to non-technical group 'C' and group 'B' non gazetted posts in Ministries/ Departments of the Government of India, the C.A.G, and the offices of the Accountant General.
4. Reserve Bank of India - **https://www rbi.org.in** - Monetary authority, regulator and supervisor of the financial system, manager of exchange control and issuer of the national currency.
5. Union Public Service Commission - **https://www upsc.gov.in** - Recruitment and examination schedules conducted by the organization.
6. Income Tax Department - **https://www incometaxindia.gov.in** - Tax law, rules, and notifications. Tax return and other forms available for download.
7. National Portal of India - **https://www.india.gov.in** - Official website with access to information and services being provided by the Indian Government.

4.4 Its Social impact

a) Increased Transparency

Although few Governments have explicitly stated transparency as a goal, some transparency gains have been achieved through e-applications

b) Increasing Efficiency and Effectiveness of Service Delivery

Some of the efficiency benefits reported by different applications are:

- ✓ Faster processing, shorter wait, and shorter queues
- ✓ Less number of trips to Government offices: saves transport cost and avoids wage loss.
- ✓ More accurate and legible documents, easy recovery from errors, better reception areas.
- ✓ Lesser corruption and more transparency
- ✓ Improved access to offices (delivery points are closer and sometimes available 24 X7).

Country	Types of Application	Number of days to process before application	Number of days to process after application
INDIA	Valuation of property	Few days	5 minute
	Land Registration	7-15 days	2-3 hours
	Obtaining land title certificate	3-30 days	5-30 minutes
	Filling taxes	2-3 days	2 hours

c) Reduce Corruption through E-governance

E-Government applications reduce corruption in the public sector:

- ✓ Introduce transparency in data, decisions/actions, rules, procedures and performance of Government agencies.
- ✓ Automates processes to take away discretion from civil servants to delay and deny a service.
- ✓ Provide a convenient entry point for simplification of rules and re- engineering processes. Almost all applications have done partial re-engineering.
- ✓ Make decisions traceable so that action can be taken in case of a complaint.
- ✓ Builds accountability by providing greater access to information through web publishing to civil society groups.
- ✓ Provides documentation to citizens for follow up action in case they wish to file a complaint.
- ✓ Modularizes tasks making outsourcing possible.
- ✓ Introduces competition amongst electronic delivery channels and departmental counters that provide a service.
- ✓ Standardization of comments/objections on petitions and applications of citizens leads to effective supervision.
- ✓ Centralizes data becomes available for better audit and analysis. This feature is being used effectively by e-tax applications. Integration of data across applications provides improved intelligence. Enables unbiased sampling for audit purposes.

4.5 E-Governance Challenges

- E-governance is facing numerous challenges world over.
- These challenges are arising from administrative, legal, institutional and technological factors.
- There are a large number of obstacles in implementation of e-Governance in India.
- These can be categorized under the following titles: Environmental and Social Challenges, Economical Challenges and Technical Challenges.

These challenges are explained below:

a) Environmental and Social challenge

i) **Different Language**: India is a country where people with different cultures and different religions live. People belonging to different states speak different languages. The diversity of people in context of language is a huge challenge for implementing e-Governance projects as e-Governance applications are written in English language. And also, English may not be understandable by most of the people. Therefore, it becomes a challenge for the government to write e-Governance applications which are to be implemented for the whole nation in more than one language so that these may be acceptable to the users of a particular language.

ii) **Low Literacy:** Literacy can be defined as the ability to read and write with understanding in any language. A person who can merely read but cannot write cannot be considered as literate. Any formal education or minimum educational standard is not necessary to be considered literate. Literacy level of India is very low which is a huge obstacle in implementation of e-Governance projects. Illiterate people are not able to access the e-Governance applications; hence the projects do not get much success.

iii) **Low IT Literacy:** Much of the Indian people are not literate and those who are literate, they do not have much knowledge about Information Technology (IT). Most of the people in India are not aware about the usage of Information Technology. So, in India, having such low level of IT literacy, how can e-Governance projects be implemented successfully? We can say that IT illiteracy is a major obstacle in implementation of e-Governance in India. So, first of all Indian people must be made aware about the usage of Information Technology.

iv) **Lack of awareness in people:** Most of the Indian people are not aware of the benefits of e-Governance services. Even the government do not pay much attention to make the people aware about e-Governance activities. Unawareness is a major challenge in the implementation of e-Governance projects.

b) Economical Challenges

i) **Cost**: In developing countries like India, cost is one of the most important obstacles in the path of implementation of e-Governance where major part of the population is living below poverty line. Even the politicians do not have interest in implementing e-Governance. A huge amount of money is involved in implementation, operational and evolutionary maintenance tasks. These costs must be low enough so that to guarantee a good cost/benefit ratio.

ii) **Applications must be transferrable from one platform to another**: e-governance applications must be independent from hardware or software platforms. Therefore, these

applications can be used at any platform irrespective of the hardware or software and from one platform to the other platform. These applications may also help on possible reuse by other administrators

iii) **Maintenance of electronic devices**: As the Information Technology changes very fast and it is very difficult for us to update our existing systems very fast. Regulations of different devices and their different characteristics may vary and the system in use must be capable to handle all the emerging needs. Maintenance is a key factor for long living systems in a rapidly changing technical environment.

c) Technical challenges

i) **Privacy and Security:** A critical obstacle in implementing e-Governance is the privacy and security of an individual's personal data that he/she provides to obtain government services. With the implementation of e-government projects, some effective measures must be taken to protect the sensitive personal information of the people. Lack of security standards can limit the development of e-Government projects that contain personal information such as income, medical history etc.

ii) **Geographical problems:** Corporate networks reside on reliable and controlled networks. Government networks have to go into all areas which are even unfriendly to live. It is, however, costly to wire up all the villages in the country. So, e-Governance systems must have to use the wireless networks like existing cellular networks to reach the applications into remote areas irrespective of the geographical issues.

iii) **Local language**: The acceptance of English language in India is very low. The e-governance applications are written in English. That is why e-Governance projects do not get success. Hence, the e-governance applications must be written in local language of the people so that they may be able to use and take advantage of these applications.

II) E-LEARNING

Structure

4.6 Definition
4.7 Benefit to students(learner)
4.8 Benefit to Teacher(Training Management)
4.9 E-Learning websites
4.10 E-learning social Impact

4.6 Definition

A learning system based on formalized teaching but with the help of electronic resources is known as **E**-learning. While teaching can be based in or out of the classrooms, the use of computers and the Internet forms the major component of **E**-learning.

4.7 Benefit to Students (learner)

- Online Learning:- The online method of learning is best suited for everyone
- Quick Delivery of Lessons**:-** eLearning is a way to provide quick delivery of lessons. As compared to traditional classroom teaching method, this mode has relatively quick delivery cycles
- Reduced Costs: - eLearning is cost effective as compared to traditional forms of learning. The reason for this price reduction is because learning through this mode happens quickly and easily. A lot of training time is reduced with respect to trainers, travel, course materials, and accommodation.
- Less Impact on Environment:-As eLearning is a paperless way of learning, it protects the environment to a lot of extent

4.8 Benefit to Teacher

- **Connecting:** By connecting to other educators, teacher's network, consider competing ideas, gather resources.
- **Passion-Based Learning:** Educating is a passion in its own right, but most teachers have a subject and/or talent that they love to talk about and share with their students.
- **Mastering Diverse Languages:** Teaching students whose first language is not English can be difficult if not already bilingual, and many educators aren't offered the tools to improve through their schools.
- **Save Time**: Time is one of the most precious commodities for educators. By eliminating the need to commute to a university during evenings and weekends, educators can spend more time on learning concepts than traveling to class.

4.9 E-Learning websites

E-Learning websites

Name	Website	Purpose
Khan Academy, Established-2006	https://www.khanacademy.org	Khan Academy is a non-profit educational organization created by educator Salman Khan with an aim of providing a free, world-class education for anyone, anywhere. It produces short lectures via YouTube videos. All resources are free of cost to anyone around the world and its videos are translated into 36 languages including English as their main language. As of 2015, it has more than 5,000 courses
Coursera,Established-2012	https://www.coursera.org	Coursera tie up with many universities and institutions provide students free online courses.
W3 School Established-1998	https://www.w3schools.com	Teaching students the various aspect of web design.
Codecademy Established-2011	https://www.codecademy.com	Allow student to select their goal/learning objective and recommending proper courses to that students.
Tata Interactive Systems, Established-1990	**www.tatainteractive.com**	It is one of the top E-learning companies in India to provide all kind of online education at one place. With a team of over 350 multi-disciplinary specialists, it has won 100 international awards and was featured as the top 20 training outsourcing companies globally for the last 7 years.
Ask IITians, Establishment: 2007	**http://www.askiitians.com**	Aditya Singhal and Nishant Sinha of IIT Delhi founded askIITians, to cater primarily to students of India and Middle East who are preparing for engineering entrance exams like IIT-JEE or AIEEE.

4.10 Social Impact of E-Learning

- Availability of same course to millions
- improved skills
- impacts of education are improved health and prosperity, specifically among girls and women
- A person or a student speaking a different language can all get access and use of e-learning application

MODULE QUESTIONS

UNIT-1

SET-I

Q.No.1 Explain the role of **Bus**as a vital component of a computer system.

Q.No.2 What are the categories of **ports** available as part of Information Technology.

Q.No.3 What is a **word?** What is the significance of **word length** in determining the efficiency of a Computer.

Q.No.4 How information stored in secondary storage are accessed?

Q.No.5 What is a **device controller** and what role it plays in Input / Output Operations?

SET-II

Q.No.1 What are the **functions of an Operating System**?

Q.No.2 What is **Throughput** and **Response time**?

Q.No.3 What is the role of **Language Processors**, explain with example.

Q.No.4 Why regular **Defragmentation** is necessary in a computer System?

Q.No.5 Why a **Compression Too**l is required in a Computer?

Q.No.6 What are the advantages of **Open Source Software(OSS)?**

UNIT-2

SET-I

Q.No.1 Why the Principle '**Keep Things DRY'** is important?

Q.No.2 Why the Principle '**Code for Maintainer'** is important?

Q.No.3 What is **Coupling**? Why it is needed to be Minimized?

Q.No.4 What is '**Open and Close'** principle is necessary?

Q.No.5 What is **Cohesion**? Why it is needed to be Maximized?

SET-II

Q.No.1 What is **boolean** type? Explain with example.

Q.No.2 What is **casting**? Why it is necessary? Explain with example.

Q.No.3 WAP to compute a finite product, (n!= 1X2X….Xn) using for loop.

Q.No.4 WAP to compute largest power of 2 less than n using while loop.

Q.No.5 WAP using the Java swing components.

UNIT-3

GROUP-A

1. (a) What is Database?

   (b) Define primary key.

   © What is cardinality of a relation?

   (d) What is physical data Independence?

   (e) What is DBA?

GROUP-B

2. Discuss the advantages and disadvantages of using database.
3. Discuss three views of database.
4. What is data Independence? Explain physical and logical data Independence.
5. Discuss classifications of SQL commands
6. Discuss DDL commands of SQL.
7. Write a SQL command
   - Create a table name as student (rollno integer (5), name varchar (10), address varchar (20)).
   - Insert five records into the student table.
   - Display all records.
   -

UNIT-4

GROUP-A

1.

a) What is E-Governance?

b) What is E-learning?

c) Write two benefits of E-Governance.

d) Write two benefits of using E-Learning.

e) Write two E-Learning web sites.

GROUP-B

2. Define E-Governance and its impact in society?

3. Discuss the benefits of E-Learning to teacher.

4. Explain few E-Governance web sites.

Information Technology
Test-I
UNIT-I

F.M:35 **TIME:1.5 HOURS**

GROUP-A

(Answer All Questions) **[11x1]**

8. (a) What is Bus?

   (b) Explain Word Length of memory.

   (c) What is throughput?

   (d) What is the use of Registers?

   (e) What is disk fragmentation?

   (f) What is an Anti-Virus?

   (g) Explain Open Source Software.

   (h) What is the use of Compression Tools.

   (i) What is a firmware?

   (j) What is a Device Controller?

   (k) Explain Latency time.

GROUP-B

(Answer Any Four)

[4x2]

9. (a) Name the types of Primary storage devices?

   (b) What are the characteristics of a Storage unit?

   (c) What are the types of Software, Give examples.

   (d) What are the translators used for High Level Language Processing?

   (e) Give the names of some compression tools.

GROUP-C

(Answer Any two)

[2x4]

10. (a) What are the advantages of Open Source Software?

    (b) What are the functions of an Operating System?

    (c) What are the types of Registers?

GROUP-D

(Answer Any one)

[1x6]

11. (a) Explain the types of Operating System.

    (b) Explain about 3 general purpose Application Software.

Class – XII
Information Technology

LESSON PLAN

INFORMATION TECHNOLOGY

+2 2nd YEAR SC/ARTS/COM

Session	Contents	No. of classes
	UNIT-1	
1	Networking - a brief overview	1
2	Network devices& their functions	2
3	Types of Network	2
4	Network Topologies	2
5	Communication Media	1
6	Wired Communication Technology	2
7	Wireless Technology	2
8	Internet Concepts & Backbone	1
9	Internet Access	1
10	Role of ISP, Internet Protocols	2
11	Internet Addressing	1
12	MAC	1
13	Internet Applications	2
14	Internet Threats & Virus	1
15	Prevention from Virus, Use of cookies	1
16	Firewall and Use of Digital Signature	1
17	Cyber Crime	1
18	Cyber Laws	1
	UNIT-2	
19	Basic concept of Access Specifiers for class members with examples	4
20	Concept of Inheritance with examples of each type	4
21	String class & Methods with code examples	4
22	Math Class & methods	3
23	Accessing Database using JDBC with Programming Example	3
24	Introduction to HTML and DHTML	1
25	HTML program structure	1
26	Different tags with properties, attributes and examples	3
27	HTML Forms	1
28	Introduction to HTML	1
	UNIT-3	
29	Transaction and states of transaction	2
30	ACID properties of transaction	2
31	Committing and revoking a transaction using COMMIT & ROLLBACK	1

32	Group By and Count(*) Statement	1
33	Displaying data from multiple tables	3
34	Introduction to MYSQL	4
35	MySQL String Functions	4
36	MySQL Mathematical Functions	4
	UNIT-4	
37	E-Business	1
38	E-Commerce	1
40	Types of E-Commerce	2
41	Features of E-Commerce	1
42	E-Commerce web sites	1
43	Social impacts of E-Commerce	1
44	Front End and Back End	1
45	Database Connectivity	1

UNIT-1

Networking & Open Standards

i) Computer Networking:

Introduction To Computer Networks

Modern world scenario is ever changing. Data Communication and network have changed the way business and other daily affair works. Now, they highly rely on computer networks and internetwork.

A set of devices often mentioned as nodes connected by media link is called a Network.

A node can be a device which can send or receiving data generated by other nodes on the network like a computer, printer etc. These links connecting the devices are called **Communication channels**.

Computer network is a telecommunication channel using which we can share data with other computers or devices, connected to the same network. It is also called Data Network. The best example of computer network is Internet.

A network must be able to meet certain criteria's, these are mentioned below:

1. Performance
2. Reliability
3. Scalability

Computer Networks: Performance

It can be measured in the following ways:

- **Transit time :** It is the time taken to travel a message from one device to another.
- **Response time :** It is defined as the time elapsed between enquiry and response.

Computer Networks: Reliability

It decides the frequency at which network failure take place. More the failures are, less is the network's reliability.

Computer Networks: Security

It refers to the protection of data from any unauthorized user or access. While travelling through network, data passes many layers of network, and data can be traced if attempted. Hence security is also a very important characteristic for Networks.

Basic Communication Model

A Communication model is used to exchange data between two parties. For example: communication between a computer, server and telephone (through modem).

Data Communication

The exchange of data between two devices through a transmission medium is called **Data Communication**. The data is exchanged in the form of **0's** and **1's**. The transmission medium used is wire cable. For data communication to occur, the communication device must be a part of a communication system. Data Communication has two types - **Local** and **Remote** which are discussed below:

1. **Delivery**: Delivery should be done to the correct destination.
2. **Timeliness**: Delivery should be on time.
3. **Accuracy**: Data delivered should be accurate.

Components of Data Communication

1. **Message:** It is the information to be delivered.
2. **Sender:** Sender is the person who is sending the message.
3. **Receiver:** Receiver is the person to whom the message is being sent to.
4. **Medium:** It is the medium through which the message is sent. For example: A Modem.
5. **Protocol:** These are some set of rules which govern data communication.

Uses of Computer Networks

Had it not been of high importance, nobody would have bothered connecting computers over a network. Let's start exploring the uses of Computer Networks with some traditional use cases at companies and for individuals and then move on to the recent developments in mobile users and home networking.

Computer Networks: Business Applications

Following are some business applications of computer networks:

1. Resource Sharing:

The goal is to make all programs, equipment's (like printers etc), and especially data, available to anyone on the network without regard to the physical location of the resource and the user.

2. Server-Client model:

One can imagine a company's information system as consisting of one or more databases and some employees who need to access it remotely. In this model, the data is stored on powerful computers called **Servers**. Often these are centrally housed and maintained by a system administrator. In contrast, the employees have simple machines, called **Clients**, on their desks, using which they access remote data.

3. Communication Medium:

A computer network can provide a powerful communication medium among employees. Virtually every company that has two or more computers now has e-mail (electronic mail), which employees generally use for a great deal of daily communication

4. E-Commerce:

A goal that is starting to become more important in businesses is doing business with consumers over the Internet. Airlines, bookstores and music vendors have discovered that many customers like the convenience of shopping from home. This sector is expected to grow quickly in the future.

The most popular forms are listed in the below figure:

Tag and Full Name	Example
B2C - Business-to-Consumer	Ordering books on-line
B2B - Business-to-Business	Car manufacturer ordering tires from supplier
C2C - Consumer-to-Consumer	Auctioning second-hand products on line
G2C - Government-to-Consumer	Government distributing tax forms electronically
P2P - Peer-to-Peer	File sharing

Computer Networks: Home Applications

Some of the most important uses of the Internet for home users are as follows:

- **Access to remote information**
- **Person-to-person communication**
- **Interactive entertainment**
- **Electronic commerce**

Computer Networks: Mobile Users

Mobile computers, such as notebook computers and Mobile phones, is one of the fastest-growing segment of the entire computer industry. Although wireless networking and mobile computing are often related, they are not identical, as the below figure shows.

Wireless	Mlobile	Applications
No	No	Desktop computers in offices
No	Yes	A notebook computer used in a hotel room
Yes	No	Networks in older, unwired buildings
Yes	Yes	Portable office; PDA for store inventory

Line Configuration in Computer Networks

A Network is nothing but a connection made through connection links between two or more devices. Devices can be a computer, printer or any other device that is capable to send and receive data. There are two ways to connect the devices :

1. Point-to-Point connection
2. Multipoint connection

Network Devices (Hub, Repeater, Bridge, Switch, Router, Gateways and Brouter)

1. Repeater – A repeater operates at the physical layer. Its job is to regenerate the signal over the same network before the signal becomes too weak or corrupted to extend the length to

which the signal can be transmitted over the same network. An important point to be noted about repeaters is that they do not amplify the signal. When the signal becomes weak, they copy the signal bit by bit and regenerate it at the original strength. It is a 2-port device.

2. Hub – A hub is basically a multiport repeater. A hub connects multiple wires coming from different branches, for example, the connector in star topology which connects different stations. Hubs cannot filter data, so data packets are sent to all connected devices. In other words, collision domain of all hosts connected through Hub remains one. Also, they do not have intelligence to find out best path for data packets which leads to inefficiencies and wastage.

Types of Hub

- **Active Hub :-** These are the hubs which have their own power supply and can clean , boost and relay the signal along the network. It serves both as a repeater as well as wiring center. These are used to extend maximum distance between nodes.
- **Passive Hub :-** These are the hubs which collect wiring from nodes and power supply from active hub. These hubs relay signals onto the network without cleaning and boosting them and can't be used to extend distance between nodes.

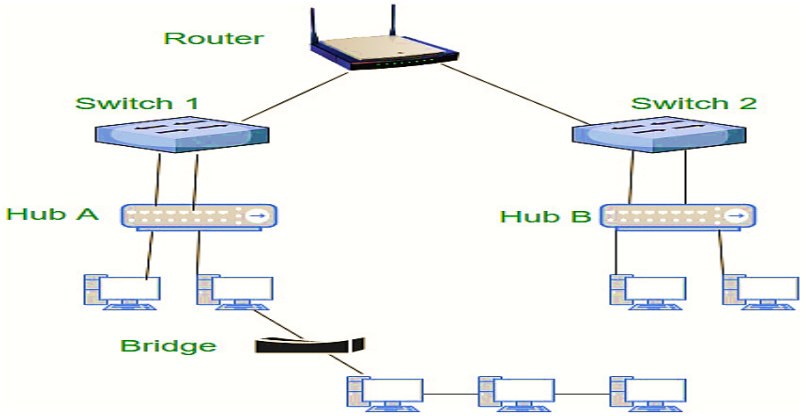
3. Bridge – A bridge operates at data link layer. A bridge is a repeater, with add on functionality of filtering content by reading the MAC addresses of source and destination. It is also used for interconnecting two LANs working on the same protocol. It has a single input and single output port, thus making it a 2 port device.

Types of Bridges

- **Transparent Bridges :-** These are the bridge in which the stations are completely unawareof thebridge's existence i.e. whether or not a bridge is added or deleted from the network , reconfiguration ofthe stations is unnecessary. These bridges make use of two processes i.e. bridge forwarding and bridge learning.
- **Source Routing Bridges:-** In these bridges, routing operation is performed by source station and the frame specifies which route to follow. The hot can discover frame by sending a special frame called discovery frame, which spreads through the entire network using all possible paths to destination.

4. Switch – A switch is a multi-port bridge with a buffer and a design that can boost its efficiency (large number of ports imply less traffic) and performance. Switch is data link layer device. Switch can perform error checking before forwarding data, that makes it very efficient as it does not forward packets that have errors and forward good packets selectively to correct port only. In other words, switch divides collision domain of hosts, but broadcast domain remains same.

5. Routers – A router is a device like a switch that routes data packets based on their IP addresses. Router is mainly a Network Layer device. Routers normally connect LANs and WANs together and have a dynamically updating routing table based on which they make decisions on routing the data packets. Router divide broadcast domains of hosts connected through it.



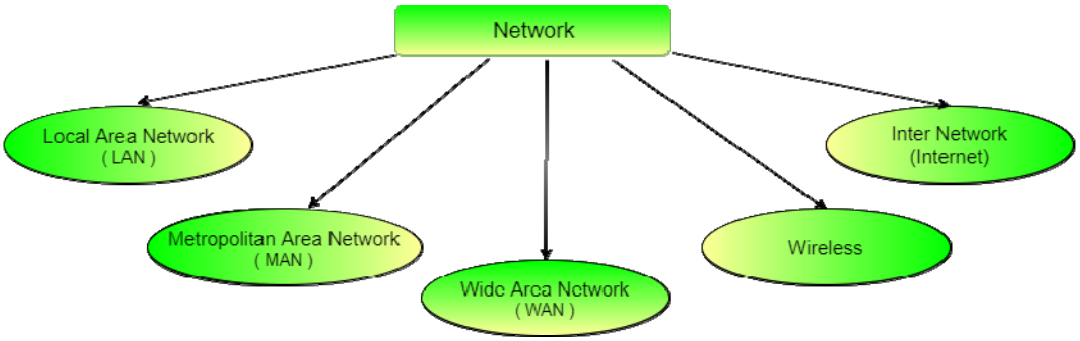
6. Gateway – A gateway, as the name suggests, is a passage to connect two networks together that may work upon different networking models. They basically work as the messenger agents that take data from one system, interpret it, and transfer it to another system. Gateways are also called protocol converters and can operate at any network layer. Gateways are generally more complex than switch or router.

7. Brouter – It is also known as bridging router is a device which combines features of both bridge and router. It can work either at data link layer or at network layer. Working as router, it is capable of routing packets across networks and working as bridge, it is capable of filtering local area network traffic.

Types of Communication Networks

Communication Networks can be of following 5 types:

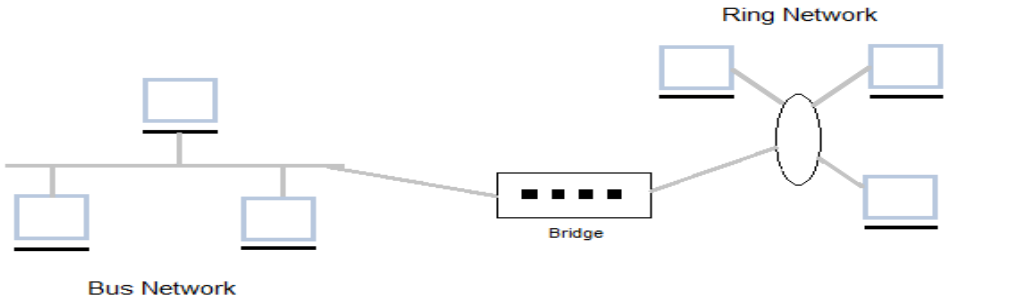
1. Local Area Network (LAN)
2. Metropolitan Area Network (MAN)
3. Wide Area Network (WAN)
4. Wireless
5. Inter Network (Internet)



Local Area Network (LAN)

It is also called LAN and designed for small physical areas such as an office, group of buildings or a factory. LANs are used widely as it is easy to design and to troubleshoot. Personal computers and workstations are connected to each other through LANs. We can use different types of topologies through LAN, these are Star, Ring, Bus, Tree etc.

LAN can be a simple network like connecting two computers, to share files and network among each other while it can also be as complex as interconnecting an entire building.
LAN networks are also widely used to share resources like printers, shared hard-drive etc.



(Different Topologies interconnected in a Local Area Network)

Characteristics of LAN

- LAN's are private networks, not subject to tariffs or other regulatory controls.
- LAN's operate at relatively high speed when compared to the typical WAN.
- There are different types of Media Access Control methods in a LAN, the prominent ones are Ethernet, Token ring.
- It connects computers in a single building, block or campus, i.e. they work in a restricted geographical area.

Applications of LAN

- One of the computer in a network can become a server serving all the remaining computers called clients. Software can be stored on the server and it can be used by the remaining clients.
- Connecting Locally all the workstations in a building to let them communicate with each other locally without any internet access.
- Sharing common resources like printers etc are some common applications of LAN.

Advantages of LAN

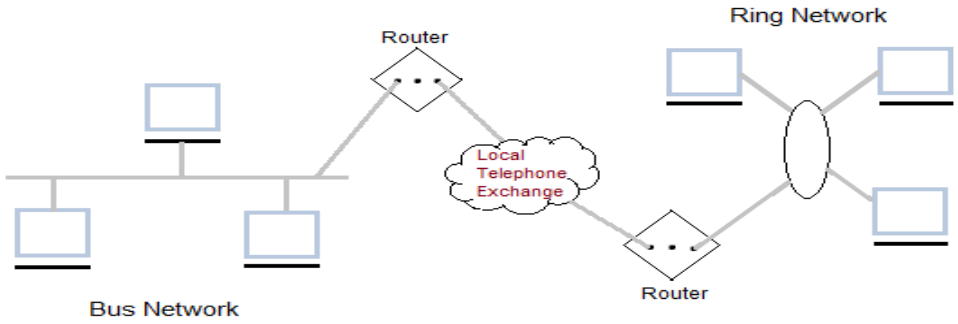
- Resource Sharing
- Software Applications Sharing
- Easy and Cheap Communication
- Centralized Data
- Data Security
- Internet Sharing

Disadvantages of LAN

- High Setup Cost
- Privacy Violations
- Data Security Threat
- LAN Maintenance Job
- Covers Limited Area

Metropolitan Area Network (MAN)

It was developed in 1980s.It is basically a bigger version of LAN. It is also called MAN and uses the similar technology as LAN. It is designed to extend over the entire city. It can be means to connecting several LANs into a larger network or it can be a single cable. It is mainly hold and operated by single private company or a public company.



Characteristics of MAN

- It generally covers towns and cities (50 km)
- Communication medium used for MAN are optical fibers, cables etc.
- Data rates adequate for distributed computing applications.

Advantages of MAN

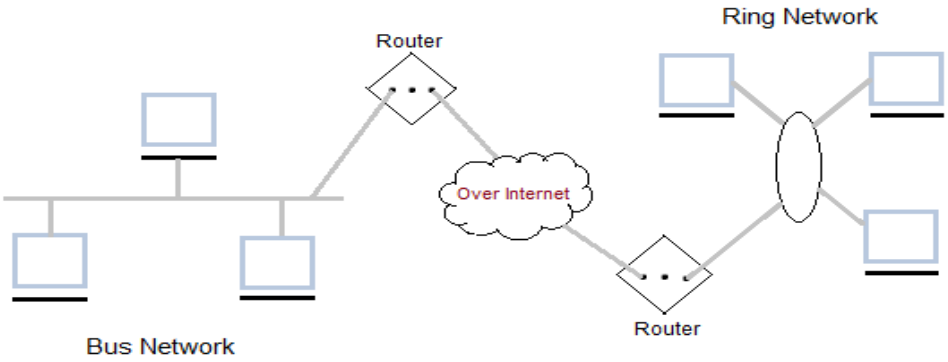
- Extremely efficient and provide fast communication via high-speed carriers, such as fibre optic cables.
- It provides a good back bone for large network and provides greater access to WANs.
- The dual bus used in MAN helps the transmission of data in both directions simultaneously.
- A MAN usually encompasses several blocks of a city or an entire city.

Disadvantages of MAN

- More cable required for a MAN connection from one place to another.
- It is difficult to make the system secure from hackers and industrial espionage(spying) graphical regions.

Wide Area Network (WAN)

It is also called WAN. WAN can be private or it can be public leased network. It is used for the network that covers large distance such as cover states of a country. It is not easy to design and maintain. Communication medium used by WAN are PSTN or Satellite links. WAN operates on low data rates.



Characteristics of WAN

- It generally covers large distances (states, countries, continents).
- Communication medium used are satellite, public telephone networks which are connected by routers.

Advantages of WAN

- Covers a large geographical area so long distance business can connect on the one network.
- Shares software and resources with connecting workstations.
- Messages can be sent very quickly to anyone else on the network. These messages can have picture, sounds or data included with them (called attachments).
- Expensive things (such as printers or phone lines to the internet) can be shared by all the computers on the network without having to buy a different peripheral for each computer.
- Everyone on the network can use the same data. This avoids problems where some users may have older information than others.

Disadvantages of WAN

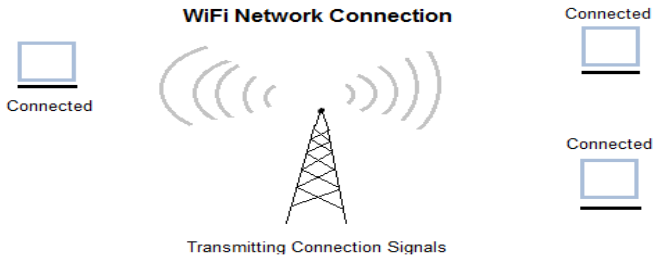
- Need a good firewall to restrict outsiders from entering and disrupting the network.
- Setting up a network can be an expensive, slow and complicated. The bigger the network the more expensive it is.
- Once set up, maintaining a network is a full-time job which requires network supervisors and technicians to be employed.
- Security is a real issue when many different people have the ability to use information from other computers. Protection against hackers and viruses adds more complexity and expense.

Wireless Network

Digital wireless communication is not a new idea. Earlier, **Morse code** was used to implement wireless networks. Modern digital wireless systems have better performance, but the basic idea is the same.

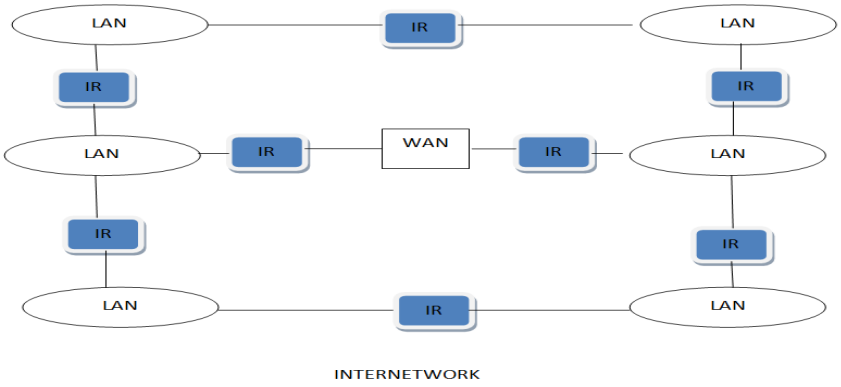
Wireless Networks can be divided into three main categories:

1. **System interconnection**
2. **Wireless LANs**
3. **Wireless WANs**



Inter Network

Inter Network or Internet is a combination of two or more networks. Inter network can be formed by joining two or more individual networks by means of various devices such as routers, gateways and bridges.

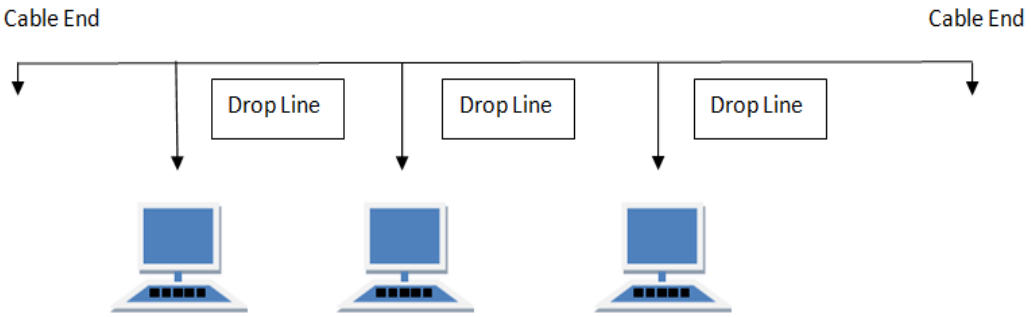


Types of Network Topology

Network Topology is the schematic description of a network arrangement, connecting various nodes (sender and receiver) through lines of connection.

BUS Topology

Bus topology is a network type in which every computer and network device is connected to single cable. When it has exactly two endpoints, then it is called **Linear Bus topology**.



Features of Bus Topology

1. It transmits data only in one direction.
2. Every device is connected to a single cable

Advantages of Bus Topology

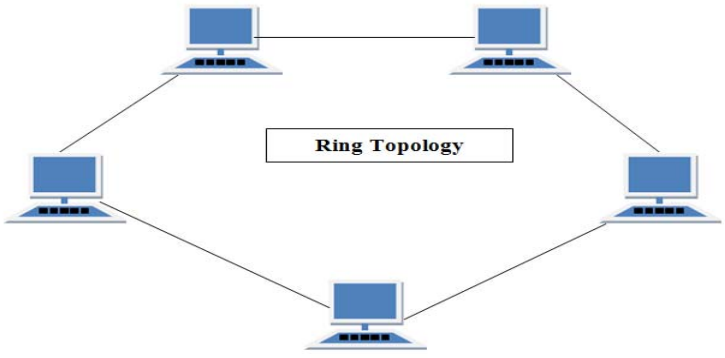
1. It is cost effective.
2. Cable required is least compared to other network topology.
3. Used in small networks.
4. It is easy to understand.
5. Easy to expand joining two cables together.

Disadvantages of Bus Topology

1. Cables fails then whole network fails.
2. If network traffic is heavy or nodes are more the performance of the network decreases.
3. Cable has a limited length.
4. It is slower than the ring topology.

RING Topology

It is called ring topology because it forms a ring as each computer is connected to another computer, with the last one connected to the first. Exactly two neighbours for each device.



Features of Ring Topology

1. A number of repeaters are used for Ring topology with large number of nodes, because if someone wants to send some data to the last node in the ring topology with 100 nodes, then the data will have to pass through 99 nodes to reach the 100th node. Hence to prevent data loss repeaters are used in the network.

2. The transmission is unidirectional, but it can be made bidirectional by having 2 connections between each Network Node, it is called **Dual Ring Topology**.
3. In Dual Ring Topology, two ring networks are formed, and data flow is in opposite direction in them. Also, if one ring fails, the second ring can act as a backup, to keep the network up.
4. Data is transferred in a sequential manner that is bit by bit. Data transmitted, has to pass through each node of the network, till the destination node.

Advantages of Ring Topology

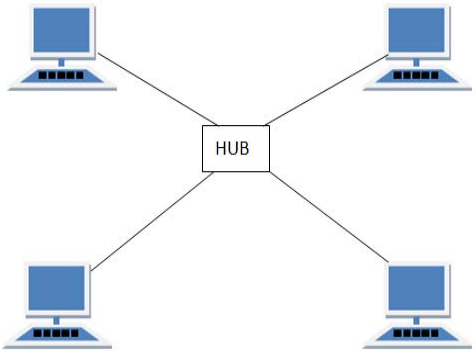
1. Transmitting network is not affected by high traffic or by adding more nodes, as only the nodes having tokens can transmit data.
2. Cheap to install and expand

Disadvantages of Ring Topology

1. Troubleshooting is difficult in ring topology.
2. Adding or deleting the computers disturbs the network activity.
3. Failure of one computer disturbs the whole network.

STAR Topology

In this type of topology all the computers are connected to a single hub through a cable. This hub is the central node and all others nodes are connected to the central node.



Features of Star Topology

1. Every node has its own dedicated connection to the hub.
2. Hub acts as a repeater for data flow.
3. Can be used with twisted pair, Optical Fibre or coaxial cable.

Advantages of Star Topology

1. Fast performance with few nodes and low network traffic.
2. Hub can be upgraded easily.
3. Easy to troubleshoot.
4. Easy to setup and modify.
5. Only that node is affected which has failed, rest of the nodes can work smoothly.

Disadvantages of Star Topology

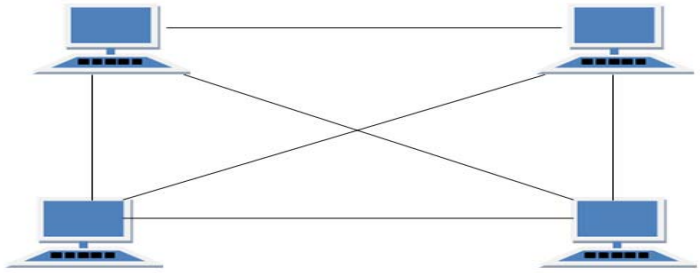
1. Cost of installation is high.
2. Expensive to use.
3. If the hub fails then the whole network is stopped because all the nodes depend on the hub.
4. Performance is based on the hub that is it depends on its capacity

MESH Topology

It is a point-to-point connection to other nodes or devices. All the network nodes are connected to each other. Mesh has n(n-1)/2 physical channels to link n devices.

There are two techniques to transmit data over the Mesh topology, they are :

1. Routing
2. Flooding



Types of Mesh Topology

1. **Partial Mesh Topology :** In this topology some of the systems are connected in the same fashion as mesh topology but some devices are only connected to two or three devices.
2. **Full Mesh Topology :** Each and every nodes or devices are connected to each other.

Features of Mesh Topology

1. Fully connected.
2. Robust.
3. Not flexible.

Advantages of Mesh Topology

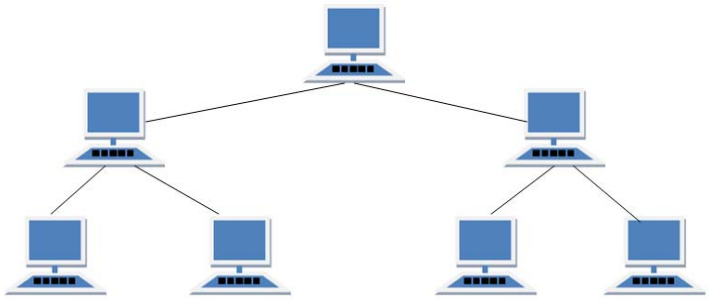
1. Each connection can carry its own data load.
2. It is robust.
3. Fault is diagnosed easily.
4. Provides security and privacy.

Disadvantages of Mesh Topology

1. Installation and configuration is difficult.
2. Cabling cost is more.
3. Bulk wiring is required.

TREE Topology

It has a root node and all other nodes are connected to it forming a hierarchy. It is also called hierarchical topology. It should at least have three levels to the hierarchy.



Features of Tree Topology

1. Ideal if workstations are in groups.
2. Used in Wide Area Network.

Advantages of Tree Topology

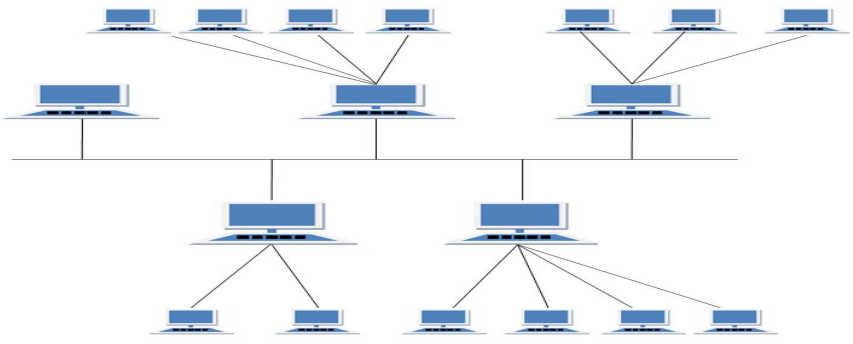
1. Extension of bus and star topologies.
2. Expansion of nodes is possible and easy.
3. Easily managed and maintained.
4. Error detection is easily done.

Disadvantages of Tree Topology

1. Heavily cabled.
2. Costly.
3. If more nodes are added maintenance is difficult.
4. Central hub fails, network fails.

HYBRID Topology

It is two different types of topologies which is a mixture of two or more topologies. For example, if in an office in one department ring topology is used and in another star topology is used, connecting these topologies will result in Hybrid Topology (ring topology and star topology).



Features of Hybrid Topology

1. It is a combination of two or topologies
2. Inherits the advantages and disadvantages of the topologies included

Advantages of Hybrid Topology

1. Reliable as Error detecting and troubleshooting is easy.
2. Effective.
3. Scalable as size can be increased easily.
4. Flexible.

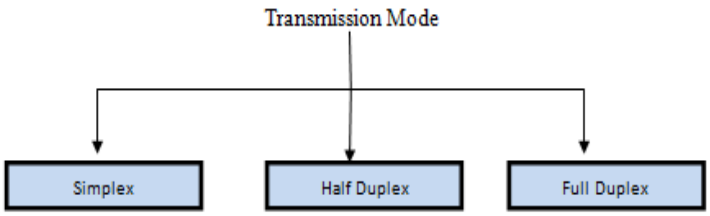
Disadvantages of Hybrid Topology

1. Complex in design.
2. Costly.

Transmission Modes in Computer Networks

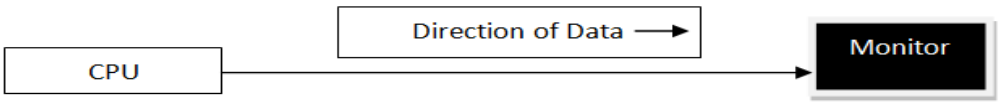
Transmission mode refers to the mechanism of transferring of data between two devices connected over a network. It is also called **Communication Mode**. These modes direct the direction of flow of information. There are three types of transmission modes. They are:

1. Simplex Mode
2. Half duplex Mode
3. Full duplex Mode



SIMPLEX Mode

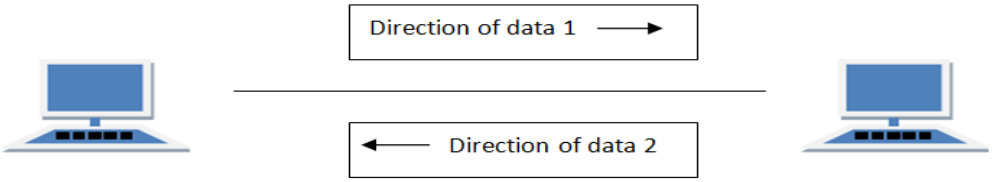
Examples of simplex Mode are loudspeakers, television broadcasting, television and remote, keyboard and monitor etc.



HALF DUPLEX Mode

Half-duplex data transmission means that data can be transmitted in both directions on a signal carrier, but not at the same time.

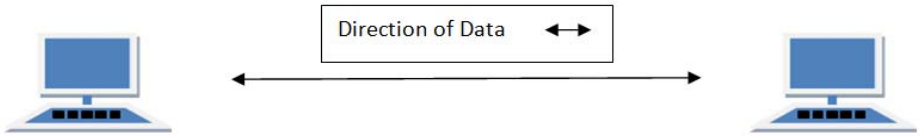
Example of half duplex is a walkie- talkie in which message is sent one at a time but messages are sent in both the directions.



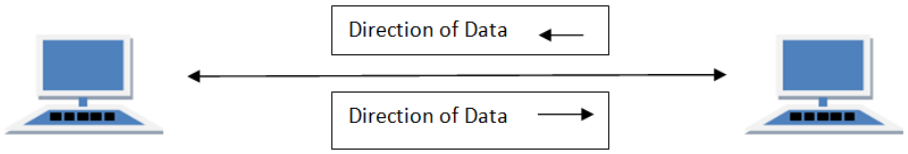
FULL DUPLEX Mode

In full duplex system we can send data in both the directions as it is bidirectional at the same time in other words, data can be sent in both directions simultaneously.

Example of Full Duplex is a Telephone Network in which there is communication between two persons by a telephone line, using which both can talk and listen at the same time.



In full duplex system there can be two lines one for sending the data and the other for receiving data.

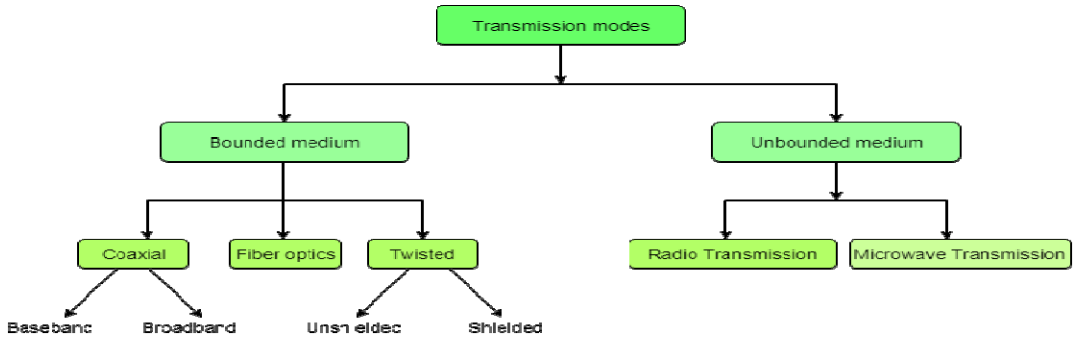


Transmission Mediums in Computer Networks

Data is represented by computers and other telecommunication devices using signals. Signals are transmitted in the form of electromagnetic energy from one device to another. Electromagnetic signals travel through vacuum, air or other transmission mediums to move from one point to another (from sender to receiver).

Electromagnetic energy (includes electrical and magnetic fields) consists of power, voice, visible light, radio waves, ultraviolet light, gamma rays etc.

Transmission medium is the means through which we send our data from one place to another. The first layer (physical layer) of Communication Networks OSI Seven-layer model is dedicated to the transmission media, we will study the OSI Model later.



Factors to be considered while selecting a Transmission Medium

1. Transmission Rate
2. Cost and Ease of Installation
3. Resistance to Environmental Conditions
4. Distances

Bounded or Guided Transmission Media

Guided media, which are those that provide a conduit from one device to another, include **Twisted-Pair Cable**, **Coaxial Cable**, and **Fiber-Optic Cable**.

Twisted Pair Cable

This cable is the most commonly used and is cheaper than others. It is lightweight, cheap, can be installed easily, and they support many different types of network. Some important points :

- Its frequency range is 0 to 3.5 kHz.
- Typical attenuation is 0.2 dB/Km @ 1kHz.
- Typical delay is 50 µs/km.
- Repeater spacing is 2km.

Twisted Pair is of two types:

- **Unshielded Twisted Pair (UTP)**
- **Shielded Twisted Pair (STP)**

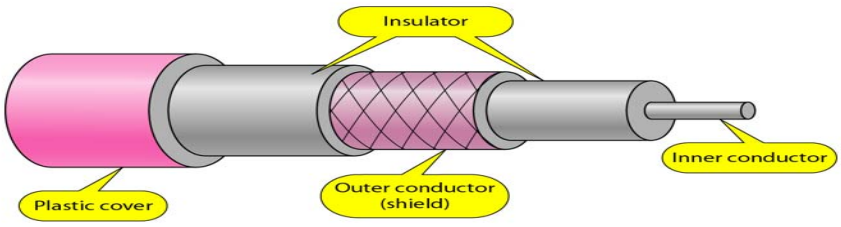
Applications of Shielded Twisted Pair Cable

- In telephone lines to provide voice and data channels. The DSL lines that are used by the telephone companies to provide high-data-rate connections also use the high-bandwidth capability of unshielded twisted-pair cables.
- Local Area Network, such as 10Base-T and 100Base-T, also use twisted-pair cables.

Coaxial Cable

Coaxial is called by this name because it contains two conductors that are parallel to each other. Copper is used in this as centre conductor which can be a solid wire or a standard one. It is surrounded by PVC installation, a sheath which is encased in an outer conductor of metal foil, braid or both.

Outer metallic wrapping is used as a shield against noise and as the second conductor which completes the circuit. The outer conductor is also encased in an insulating sheath. The outermost part is the plastic cover which protects the whole cable.



There are two types of Coaxial cables:

1. BaseBand

This is a 50 ohm (Ω) coaxial cable which is used for digital transmission. It is mostly used for LAN's. Baseband transmits a single signal at a time with very high speed. The major drawback is that it needs amplification after every 1000 feet.

2. BroadBand

This uses analog transmission on standard cable television cabling. It transmits several simultaneous signals using different frequencies. It covers large area when compared with Baseband Coaxial Cable.

Advantages of Coaxial Cable

- Bandwidth is high
- Used in long distance telephone lines.
- Transmits digital signals at a very high rate of 10Mbps.
- Much higher noise immunity
- Data transmission without distortion.
- The can span to longer distance at higher speeds as they have better shielding when compared to twisted pair cable

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Disadvantages of Coaxial Cable

- Single cable failure can fail the entire network.
- Difficult to install and expensive when compared with twisted pair.
- If the shield is imperfect, it can lead to grounded loop.

Applications of Coaxial Cable

- Coaxial cable was widely used in analog telephone networks, where a single coaxial network could carry 10,000 voice signals.
- Cable TV networks also use coaxial cables. In the traditional cable TV network, the entire network used coaxial cable. Cable TV uses RG-59 coaxial cable.
- In traditional Ethernet LANs. Because of it high bandwidth, and consequence high data rate, coaxial cable was chosen for digital transmission in early Ethernet LANs. The 10Base-2, or Thin Ethernet, uses RG-58 coaxial cable with BNC connectors to transmit data at 10Mbps with a range of 185 m.

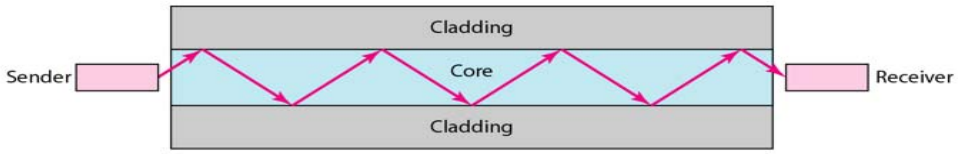
Fiber Optic Cable

A fiber-optic cable is made of glass or plastic and transmits signals in the form of light.

For better understanding we first need to explore several aspects of the **nature of light**.

Light travels in a straight line if it is mobbing through a single uniform substance. If ray of light travelling through one substance suddenly enters another substance (of a different density), the ray changes direction.

Optical fibers use reflection to guide light through a channel. A glass or plastic core is surrounded by a cladding of less dense glass or plastic. The difference in density of the two materials must be such that a beam of light moving through the core is reflected off the cladding instead of being refracted into it.



Internal view of an Optical fibre

Advantages of Fibre Optic Cable

Fibre optic has several advantages over metallic cable:

- Higher bandwidth
- Less signal attenuation
- Immunity to electromagnetic interference
- Resistance to corrosive materials
- Light weight
- Greater immunity to tapping

Disadvantages of Fibre Optic Cable

There are some disadvantages in the use of optical Fibre:

- Installation and maintenance
- Unidirectional light propagation
- High Cost

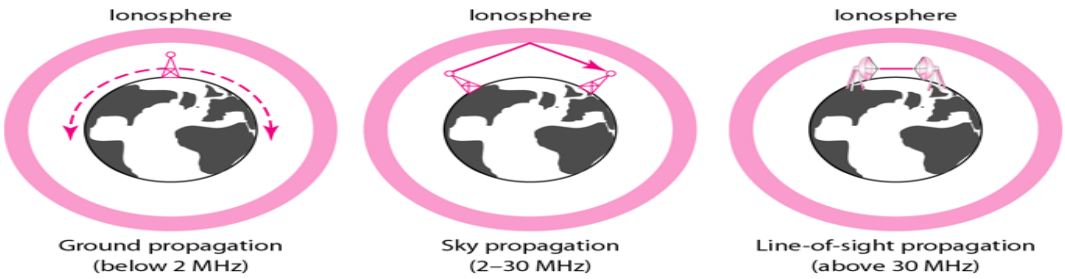
Applications of Fibre Optic Cable

- Often found in backbone networks because its wide bandwidth is cost-effective.
- Some cable TV companies use a combination of optical fibre and coaxial cable thus creating a hybrid network.
- Local-area Networks such as 100Base-FX network and 1000Base-X also use fibre-optic cable.

UnBounded or UnGuided Transmission Media

Unguided medium transport electromagnetic waves without using a physical conductor. This type of communication is often referred to as wireless communication. Signals are normally broadcast through free space and thus are available to anyone who has a device capable of receiving them.

Unguided signals can travel from the source to the destination in several ways: **Gound propagation**, **Sky propagation** and **Line-of-sight propagation** as shown in below figure.



We can divide wireless transmission into three broad groups:

1. Radio waves
2. Micro waves
3. Infrared waves

Radio Waves

Electromagnetic waves ranging in frequencies between 3 KHz and 1 GHz are normally called radio waves.

Radio waves are omnidirectional. When an antenna transmits radio waves, they are propagated in all directions. This means that the sending and receiving antennas do not have to be aligned. A sending antenna send waves that can be received by any receiving antenna. The omnidirectional property has disadvantage, too. The radio waves transmitted by one antenna are susceptible to interference by another antenna that may send signal suing the same frequency or band.

Radio waves, particularly with those of low and medium frequencies, can penetrate walls. This characteristic can be both an advantage and a disadvantage. It is an advantage because, an AM radio can receive signals inside a building. It is a disadvantage because we cannot isolate a communication to just inside or outside a building.

Applications of Radio Waves

- The omnidirectional characteristics of radio waves make them useful for multicasting in which there is one sender but many receivers.
- AM and FM radio, television, maritime radio, cordless phones, and paging are examples of multicasting.

Micro Waves

Electromagnetic waves having frequencies between 1 and 300 GHz are called micro waves. Micro waves are unidirectional. When an antenna transmits microwaves, they can be narrowly focused. This means that the sending and receiving antennas need to be aligned. The unidirectional property has an obvious advantage. A pair of antennas can be aligned without interfering with another pair of aligned antennas.

The following describes some characteristics of microwaves propagation:

- Microwave propagation is line-of-sight. Since the towers with the mounted antennas need to be in direct sight of each other, towers that are far apart need to be very tall.

- Very high-frequency microwaves cannot penetrate walls. This characteristic can be a disadvantage if receivers are inside the buildings.
- The microwave band is relatively wide, almost 299 GHz. Therefore, wider sub-bands can be assigned, and a high date rate is possible.
- Use of certain portions of the band requires permission from authorities.

Applications of Micro Waves

Microwaves, due to their unidirectional properties, are very useful when unicast(one-to-one) communication is needed between the sender and the receiver. They are used in cellular phones, satellite networks and wireless LANs.

Advantages of Microwave Transmission

- Used for long distance telephone communication
- Carries 1000's of voice channels at the same time

Disadvantages of Microwave Transmission

- It is very costly

Infrared Waves

Infrared waves, with frequencies from 300 GHz to 400 THz, can be used for short-range communication. Infrared waves, having high frequencies, cannot penetrate walls. This advantageous characteristic prevents interference between one system and another, a short-range communication system in on room cannot be affected by another system in the next room.

When we use infrared remote control, we do not interfere with the use of the remote by our neighbours. However, this same characteristic makes infrared signals useless for long-range communication. In addition, we cannot use infrared waves outside a building because the sun's rays contain infrared waves that can interfere with the communication.

Applications of Infrared Waves

- The infrared band, almost 400 THz, has an excellent potential for data transmission. Such a wide bandwidth can be used to transmit digital data with a very high data rate.

- The Infrared Data Association(IrDA), an association for sponsoring the use of infrared waves, has established standards for using these signals for communication between devices such as keyboards, mouse, PCs and printers.
- Infrared signals can be used for short-range communication in a closed area using line-of-sight propagation.

ii) Internet & its Application:

INTERNET

The **Internet** is a collection of computers connected by network cables or through satellite links. The internet is a worldwide computer network that interconnects millions of computing devices throughout the world. Most of these computing devices are traditional desktop PCs, Unix-based workstations, and so-called servers that store and transmit information such as Web (WWW) pages and e-mail.

The **TCP** (Transmission Control Protocol) and **IP** (Internet Protocol) are two of the mostimportant protocols in the Internet. The Internet 's principal protocols are collectively known as TCP/IP. End systems are connected by communication links.

The Internet allows distributed applications running on its end systems to exchange data with each other. These applications include remote login, file transfer, electronic mail, audio and video streaming, real-time audio and video conferencing, distributed games, the World Wide Web etc.

World Wide Web

In 1989, Tim Berners-Lee at CERN proposed a protocol to exchange documents with colleagues around the world. The idea was that users could search for and retrieve any document on the Internet. The form of the documents was *hypertext*. This meant any given document could have links to other documents on the Internet. In a strict sense, the World Wide Web was this interconnected system of documents.

Web Browsers

A browser is a special software program also known as a client that requests servers for a specific web document and renders it on the computer terminal for the user. One of the oldest browsers is *Lynx*. This is a text only browser. The earliest graphical browser was Mosaic developed at the National Center for Supercomputer Applications (NCSA) at the University of Illinois. There are other browsers available – Mozilla, Opera, Chrome, IE, and Safari. The browsers communicate with the servers using the standard Hypertext Transfer Protocol (HTTP).

Web Servers

A web server is a software program that provides documents to browsers. Apache is the most widely used web server with 68% of the market share. Second is Microsoft's Internet Information Server (IIS) with about 21% of the market share. And the remainder is spread over many other servers. A web browser initiates a request with a server by sending it the URL of a document. The server searches, retrieves and sends the document.

URL

Uniform (or universal) resource locators are used to identify documents or resources on the Internet. A **URL** has two main components: Protocol identifier and Resource name. For the **URL**https://www.affairscloud.com, the **Protocol Identifier is http** and the **Resource Name** is**affairscloud.com.**

HTTP

HTTP stands for **Hypertext Transfer Protocol**. It is an application protocol for distributed, collaborative, hypermedia information systems. it is the foundation of data communication for the World Wide Web. Hypertext is structured text that uses logical links (hyperlinks) between nodes containing text.

DNS

DNS stands for **Domain Name Servers.** They are the Internet's equivalent of a phone book. They maintain a directory of domain names and translate them to Internet Protocol (IP) addresses. This is necessary because, although domain names are easy for people to remember, computers or machines, access websites based on IP addresses.

E-Commerce

E-Commerce refers to Electronic Commerce. It is nothing but trading of products or services using internet. The companies such as Flipkart, Snapdeal, Alibaba are all E-Commerce companies.

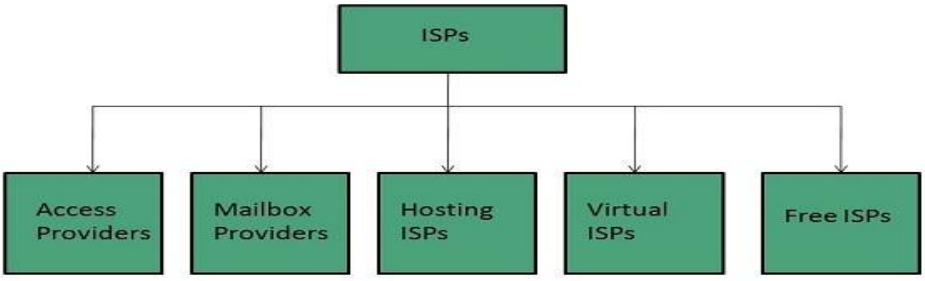
Internet Service Providers (ISP)

Internet Service Provider (ISP) is a company offering access to internet. They offer various services:

- Internet Access
- Domain name registration
- Dial-up access
- Leased line access

ISP Types

ISPs can broadly be classified into five categories as shown in the following diagram:



Connection Types

There exist several ways to connect to the internet. Following are these connection types available:

1. Dial-up Connection
2. ISDN
3. DSL
4. Cable TV Internet connections
5. Satellite Internet connections
6. Wireless Internet Connections

Dial-up Connection

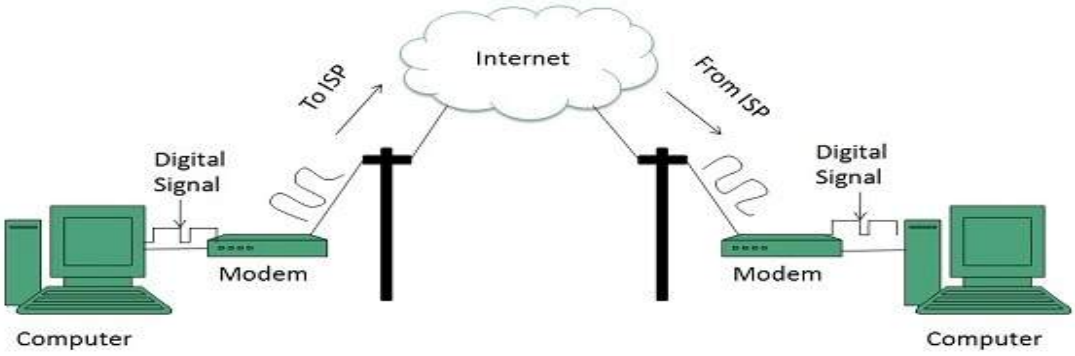
Dial-up connection uses telephone line to connect PC to the internet. It requires a modem to setup dial-up connection. This modem works as an interface between PC and the telephone line.

There is also a communication program that instructs the modem to make a call to specific number provided by an ISP.

Dial-up connection uses either of the following protocols:

1. Serial Line Internet Protocol (SLIP)
2. Point to Point Protocol (PPP)

The following diagram shows the accessing internet using modem:



ISDN

ISDN is acronym of **Integrated Services Digital Network.** It establishes the connection using the phone lines which carry digital signals instead of analog signals.

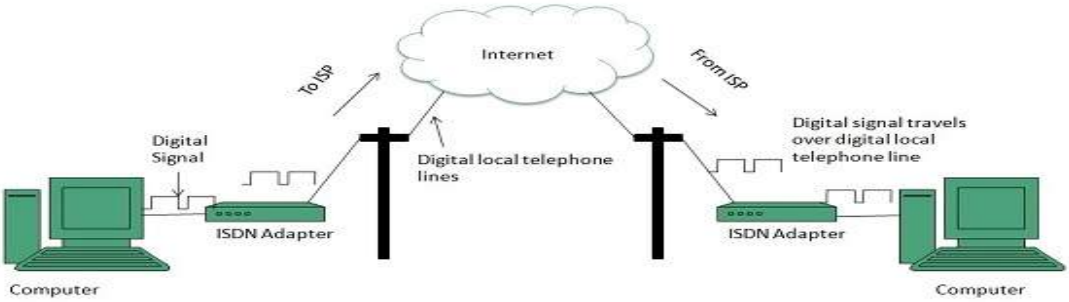
There are two techniques to deliver ISDN services:

1. Basic Rate Interface (BRI)
2. Primary Rate Interface (PRI)

Key points:

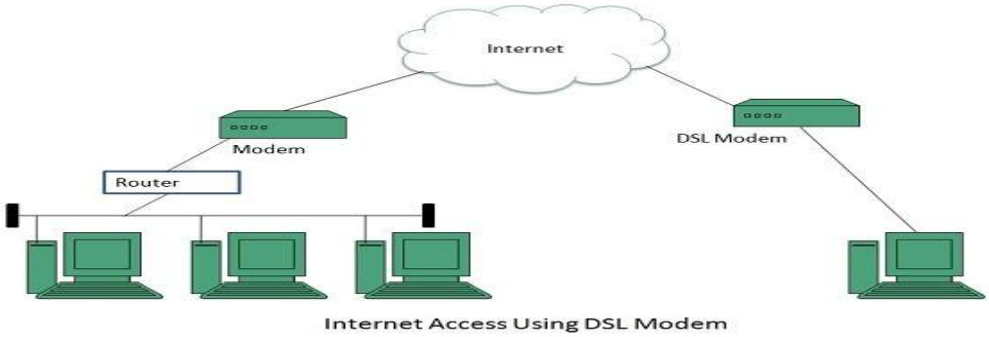
- The BRI ISDN consists of three distinct channels on a single ISDN line: t1o 64kbps B (Bearer) channel and one 16kbps D (Delta or Data) channels.
- The PRI ISDN consists of 23 B channels and one D channels with both have operating capacity of 64kbps individually making a total transmission rate of 1.54Mbps.

The following diagram shows accessing internet using ISDN connection:



DSL

DSL is acronym of **Digital Subscriber Line.** It is a form of broadband connection as it provides connection over ordinary telephone lines.



Internet Access Using DSL Modem

Cable TV Internet Connection

Cable TV Internet connection is provided through Cable TV lines. It uses coaxial cable which is capable of transferring data at much higher speed than common telephone line.

Key Points:

- A cable modem is used to access this service, provided by the cable operator.
- The Cable modem comprises of two connections: one for internet service and other for Cable TV signals.
- Since Cable TV internet connections share a set amount of bandwidth with a group of customers, therefore, data transfer rate also depends on number of customers using the internet at the same time.

The following diagram shows that how internet is accessed using Cable TV connection:

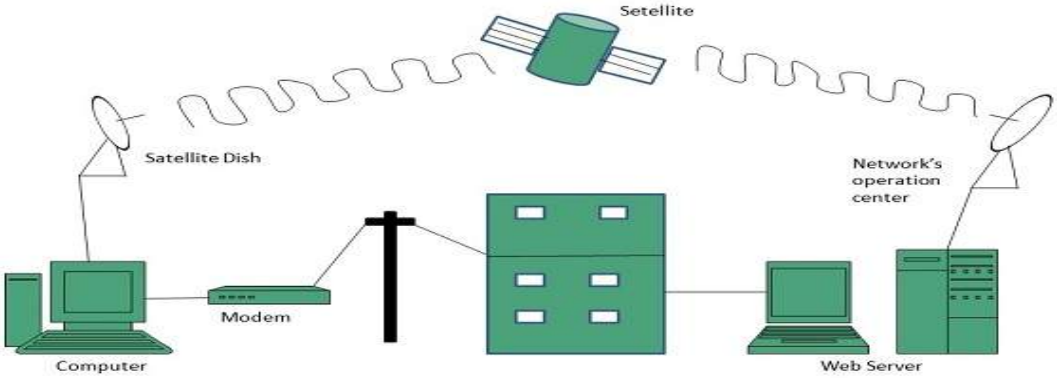
Satellite Internet Connection

Satellite Internet connection offers high speed connection to the internet. There are two types of satellite internet connection: one-way connection or two-way connection.

In one-way connection, we can only download data but if we want to upload, we need a dialup access through ISP over telephone line.

In two-way connection, we can download and upload the data by the satellite. It does not require any dialup connection.

The following diagram shows how internet is accessed using satellite internet connection:



Wireless Internet Connection

Wireless Internet Connection makes use of radio frequency bands to connect to the internet and offers a very high speed. The wireless internet connection can be obtained by either WiFi or Bluetooth.

Key Points:

- Wi Fi wireless technology is based on IEEE 802.11 standards which allow the electronic device to connect to the internet.
- Bluetooth wireless technology makes use of short-wavelength radio waves and helps to create personal area network (PAN).

Transmission Control Protocol (TCP)

TCP is a connection-oriented protocol and offers end-to-end packet delivery. It acts as back bone for connection. It exhibits the following key features:

- Transmission Control Protocol (TCP) corresponds to the Transport Layer of OSI Model.
- TCP is a reliable and connection-oriented protocol.
- TCP offers:
  - Stream Data Transfer.
  - Reliability.
  - Efficient Flow Control
  - Full-duplex operation.
  - Multiplexing.

Internet Protocol (IP)

Internet Protocol is **connectionless** and **unreliable** protocol. It ensures no guarantee of successfully transmission of data.To make it reliable, it must be paired with reliable protocol such as TCP at the transport layer.Internet protocol transmits the data in form of a datagram as shown in the following diagram:

User Datagram Protocol (UDP)

Like IP, UDP is connectionless and unreliable protocol. It doesn't require making a connection with the host to exchange data. Since UDP is unreliable protocol, there is no mechanism for ensuring that data sent is received.UDP transmits the data in form of a datagram. The UDP datagram consists of five parts as shown in the following diagram:

File Transfer Protocol (FTP)

FTP is used to copy files from one host to another. FTP offers the mechanism for the same in following manner:

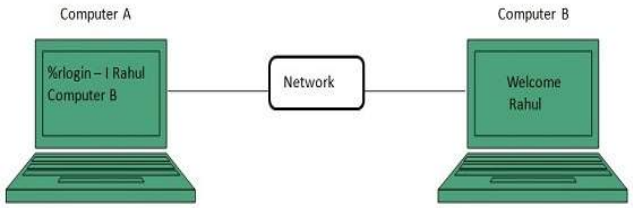
- FTP creates two processes such as Control Process and Data Transfer Process at both ends i.e. at client as well as at server.
- FTP establishes two different connections: one is for data transfer and other is for control information.
- FTP uses **port 21** for the control connection and **Port 20** for the data connection.

Trivial File Transfer Protocol (TFTP)

Trivial File Transfer Protocol is also used to transfer the files, but it transfers the files without authentication. Unlike FTP, TFTP does not separate control and data information. Since there is no authentication exists, TFTP lacks in security features therefore it is not recommended to use TFTP.

Telnet

Telnet is a protocol used to log in to remote computer on the internet. There are several Telnet clients having user friendly user interface. The following diagram shows a person is logged in to computer A, and from there, he remotes logged into computer B.



Hyper Text Transfer Protocol (HTTP)

HTTP is a communication protocol. It defines mechanism for communication between browser and the web server. It is also called request and response protocol because the communication between browser and server takes place in request and response pairs.

DNS

When **DNS** was not into existence, one had to download a **Host file** containing host names and their corresponding IP address. But with increase in number of hosts of internet, the size of host

file also increased. This resulted in increased traffic on downloading this file. To solve this problem the DNS system was introduced.

Domain Name System helps to resolve the host name to an address. It uses a hierarchical naming scheme and distributed database of IP addresses and associated names

IP Address

IP address is a unique logical address assigned to a machine over the network. An IP address exhibits the following properties:

- IP address is the unique address assigned to each host present on Internet.
- IP address is 32 bits (4 bytes) long.
- IP address consists of two components: **network component** and **host component**.
- Each of the 4 bytes is represented by a number from 0 to 255, separated with dots. For example, 137.170.4.124

IP address is 32-bit number while on the other hand domain names are easy to remember names. For example, when we enter an email address we always enter a symbolic string such as webmaster@tutorialspoint.com.

Uniform Resource Locator (URL)

Uniform Resource Locator (URL) refers to a web address which uniquely identifies a document over the internet.

This document can be a web page, image, audio, video or anything else present on the web.

For example, **www.tutorialspoint.com/internet_technology/index.html** is an URL to the index.html which is stored on tutorialspoint web server under internet_technology directory.

URL Types

There are two forms of URL as listed below:

- Absolute URL
- Relative URL

Difference between Absolute and Relative URL

Absolute URL	Relative URL
Used to link web pages on different websites	Used to link web pages within the same website.
Difficult to manage.	Easy to Manage
Changes when the server name or directory name changes	Remains same even of we change the server name or directory name.
Take time to access	Comparatively faster to access.

Domain Name System Architecture

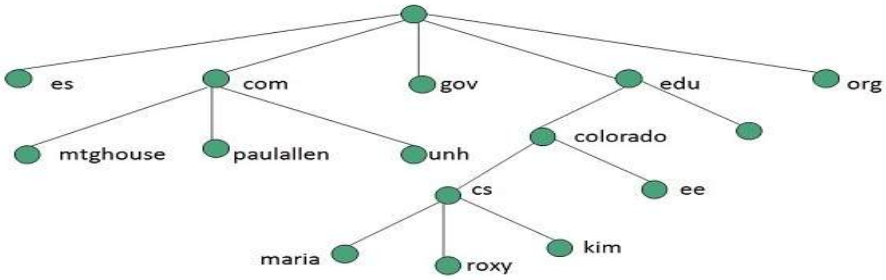
The Domain name system comprises of **Domain Names, Domain Name Space, Name Server** that have been described below:

Domain Names

Domain Name is a symbolic string associated with an IP address. There are several domain names available; some of them are generic such as **com, edu, gov, net** etc, while some country level domain names such as **au, in, za, us** etc.

Domain Name Space

The domain name space refers a hierarchy in the internet naming structure. This hierarchy has multiple levels (from 0 to 127), with a root at the top. The following diagram shows the domain name space hierarchy:



In the above diagram each subtree represents a domain. Each domain can be partitioned into sub domains and these can be further partitioned and so on.

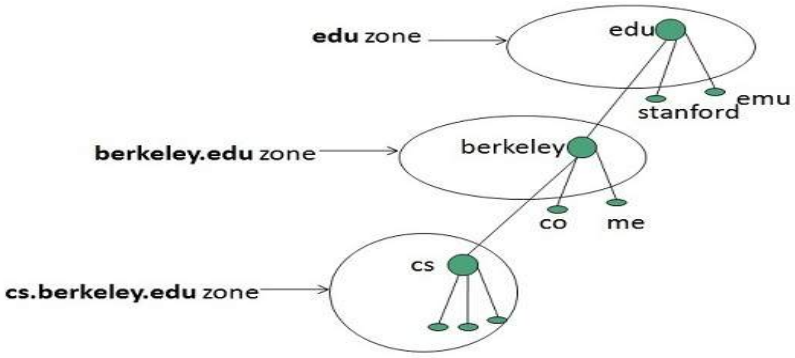
Name Server

Name server contains the DNS database. This database comprises of various names and their corresponding IP addresses. Since it is not possible for a single server to maintain entire DNS database, therefore, the information is distributed among many DNS servers.

- Hierarchy of server is same as hierarchy of names.
- The entire name space is divided into the zones

Zones

Zone is collection of nodes (sub domains) under the main domain. The server maintains a database called zone file for every zone.



If the domain is not further divided into sub domains, then domain and zone refers to the same thing.

The information about the nodes in the sub domain is stored in the servers at the lower levels however; the original server keeps reference to these lower levels of servers.

TYPES OF NAME SERVERS

Following are the three categories of Name Servers that manages the entire Domain Name System:

- Root Server
- Primary Server
- Secondary Server

DNS Working

DNS translates the domain name into IP address automatically. Following steps will take you through the steps included in domain resolution process:

- When we type **www.tutorialspoint.com** into the browser, it asks the local DNS Server for its IP address.

  Here the local DNS is at ISP end.
- When the local DNS does not find the IP address of requested domain name, it forwards the request to the root DNS server and again enquires about IP address of it.
- The root DNS server replies with delegation that **I do not know the IP address of www.tutorialspoint.com but know the IP address of DNS Server.**
- The local DNS server then asks the com DNS Server the same question.
- The **com** DNS Server replies the same that it does not know the IP address of www.tutorialspont.com but knows the address of tutorialspoint.com.
- Then the local DNS asks the tutorialspoint.com DNS server the same question.
- Then tutorialspoint.com DNS server replies with IP address of www.tutorialspoint.com.
- Now, the local DNS sends the IP address of www.tutorialspoint.com to the computer that sends the request.

iii) Network security on internet:

VIRUS OR THREAT

The term “computer virus” is used to describe a computer program that can replicate itself and infect a computer. Much like its namesake, the biological virus, a computer virus must rely on the user of one computer to be spread it to another computer. Although the terms have grown to become somewhat interchangeable, especially by computer novices, not all malware (or, malicious software) are viruses, but a virus is a form of malware. (It’s like saying Kleenex is a tissue, but not all tissues are Kleenex.) Some malware can be distributed to millions of computers by its creators, replicating itself when computer users unwittingly passes on the program, usually through infected e-mails.

Computer Virus Prevention and Protection

There’s no way to stop viruses from being created. There will always be a young programmer wanting to prove that they can “play with the big boys,” or a hacker who wants to

just see chaos and damage. And, just like real-world vandalism, someone who creates viruses can start their “career” with a harmless prank but grow into causing millions of dollars of damage by deleting massive files from multiple corporations.
The best way to protect home computers against viruses is to have updated antivirus software, keep computers and software updated with the latest patches, and monitor the behavior of all users of a computer, including learning what types of files can be harboring viruses (such as Microsoft word documents in a massively forwarded e-mail). There will always be viruses but staying vigilant will help keep a computer from becoming infected.

COOKIES

Cookies are messages that web servers pass to your web browser when you visit Internet sites. Your browser stores each message in a small file, called cookie.txt. When you request another page from the server, your browser sends the cookie back to the server. These files typically contain information about your visit to the web page, as well as any information you've volunteered, such as your name and interests.
The term "cookie" is an allusion to a Unix program called Fortune Cookie that produces a different message, or fortune, each time it runs.

Examples of cookies

Cookies are most commonly used to track website activity. When you visit some sites, the server gives you a cookie that acts as your identification card. Upon each return visit to that site, your browser passes that cookie back to the server. In this way, a web server can gather information about which web pages are used the most, and which pages are gathering the most repeat hits.
Cookies are also used for online shopping. Online stores often use cookies that record any personal information you enter, as well as any items in your electronic shopping cart, so that you don't need to re-enter this information each time you visit the site.
Servers can use cookies to provide personalized web pages. When you select preferences at a site that uses this option, the server places the information in a cookie. When you return, the server uses the information in the cookie to create a customized page for you.

Security concerns

Only the website that creates a cookie can read it, so other servers do not have access to your information. Additionally, web servers can use only information that you provide or choices that you make while visiting the website as content in cookies.
Webmasters have always been able to track access to their sites, but cookies make it easier to do so. In some cases, cookies come not from the site you're visiting, but from advertising companies that manage the banner ads for a set of sites (such as DoubleClick.com). These advertising companies can develop detailed profiles of the people who select ads across their customers' sites.
Accepting a cookie does not give a server access to your computer or any of your personal information (except for any information that you may have purposely given, as with online

shopping). Also, it is not possible to execute code from a cookie, and not possible to use a cookie to deliver a virus.

Viewing and controlling cookies

For privacy reasons, you may wish to view the cookies currently stored in your browser or control which sites you accept cookies from. You may also decide how long they may be stored and used. Most modern browsers offer the ability to control cookie settings; consult your browser's help files, and see:

FIREWALL

In computing, a **firewall** is a network security system that monitors, and controls incoming and outgoing network traffic based on predetermined security rules. A firewall typically establishes a barrier between a trusted internal network and untrusted external network, such as the Internet.

Firewalls are often categorized as either **network firewalls** or **host-based firewalls**. Network firewalls filter traffic between two or more networks and run on network hardware. Host-based firewalls run on host computers and control network traffic in and out of those machines.

What is a Digital Signature?

A digital signature is an electronic form of a signature that can be used to authenticate the identity of the sender of a message or the signer of a document, and also ensure that the original content of the message or document that has been sent is unchanged. Digital signatures are easily transportable and cannot be imitated by someone else. The ability to ensure that the original signed message arrived means that the sender cannot easily disclaim it later.

Cyber Crime

As Internet usage is growing daily the world is coming closer. The World Wide Web sounds like a vast phenomenon but surprisingly one of its qualities is bringing the world closer making it a smaller place to live in for its users. However, it has also managed to create another problem for people who spend long hours browsing the Cyber World – which is cybercrimes. While law enforcement agencies are trying to tackle this problem, it is growing steadily, and many people have become victims of hacking, theft, identity theft and malicious software. One of the best ways to avoid being a victim of cybercrimes and protecting your sensitive information is by making use of impenetrable security that uses a unified system of software and hardware to authenticate any information that is sent or accessed over the Internet. However, before you can understand more about this system, let us find out more about cybercrimes.

Types of Cyber Crimes

When any crime is committed over the Internet it is referred to as a cyber-crime. There are many types of cyber-crime and the most common ones are explained below:

Hacking: This is a type of crime wherein a person's computer is broken into so that his personal or sensitive information can be accessed. In the United States, hacking is classified as a felony and punishable as such. This is different from ethical hacking, which many organizations use to check their Internet security protection. In hacking, the criminal uses a variety of software to enter a person's computer and the person may not be aware that his computer is being accessed from a remote location.

Theft: This crime occurs when a person violates copyrights and downloads music, movies, games and software. There are even peer sharing websites which encourage software piracy and many of these websites are now being targeted by the FBI. Today, the justice system is addressing this cyber-crime and there are laws that prevent people from illegal downloading.

Cyber Stalking: This is a kind of online harassment wherein the victim is subjected to a barrage of online messages and emails. Typically, these stalkers know their victims and instead of resorting to offline stalking, they use the Internet to stalk. However, if they notice that cyber stalking is not having the desired effect, they begin offline stalking along with cyber stalking to make the victims' lives more miserable.

Identity Theft: This has become a major problem with people using the Internet for cash transactions and banking services. In this cyber-crime, a criminal accesses data about a person's bank account, credit cards, Social Security, debit card and other sensitive information to siphon money or to buy things online in the victim's name. It can result in major financial losses for the victim and even spoil the victim's credit history.

Malicious Software: These are Internet-based software or programs that are used to disrupt a network. The software is used to gain access to a system to steal sensitive information or data or causing damage to software present in the system.

Child soliciting and Abuse: This is also a type of cyber-crime wherein criminals solicit minors via chat rooms for child pornography. The FBI has been spending a lot of time monitoring chat rooms frequented by children with the hopes of reducing and preventing child abuse and soliciting.

Definition - What does **Cyberlaw** mean?

Cyberlaw is the area of law that deals with the Internet's relationship to technological and electronic elements, including computers, software, hardware and information systems (IS).

Cyberlaw is also known as Cyber Law or Internet Law.

Cyberlaws prevent or reduce large scale damage from cybercriminal activities by protecting information access, privacy, communications, intellectual property (IP) and freedom of speech related to the use of the Internet, websites, email, computers, cell phones, software and hardware, such as data storage devices.

The increase in Internet traffic has led to a higher proportion of legal issues worldwide. Because cyberlaws vary by jurisdiction and country, enforcement is challenging, and restitution ranges from fines to imprisonment.

UNIT – 2
Programming

i) Programming fundamentals

Access Modifiers in java

There are two types of modifiers in java: **access modifiers** and **non-access modifiers**.

The access modifiers in java specifies accessibility (scope) of a data member, method, constructor or class.

There are 4 types of java access modifiers:

1. private
2. default
3. protected
4. public

There are many non-access modifiers such as static, abstract, synchronized, native, volatile, transient etc. Here, we will learn access modifiers.

1) Private access modifier

The private access modifier is accessible only within class.

Simple example of private access modifier

Role of Private Constructor

If you make any class constructor private, you cannot create the instance of that class from outside the class. For example:

Note: A class cannot be private or protected except nested class.

2) default access modifier

If you don't use any modifier, it is treated as **default** bydefault. The default modifier is accessible only within package.

Example of default access modifier

3) protected access modifier

The **protected access modifier** is accessible within package and outside the package but through inheritance only.The protected access modifier can be applied on the data member, method and constructor. It can't be applied on the class.

Example of protected access modifier

4) public access modifier

The **public access modifier** is accessible everywhere. It has the widest scope among all other modifiers.

Example of public access modifier

Understanding all java access modifiers

Let's understand the access modifiers by a simple table.

Access Modifier	within class	within package	outside package by subclass only	outside package
Private	Y	N	N	N
Default	Y	Y	N	N
Protected	Y	Y	Y	N
Public	Y	Y	Y	Y

Inheritance in Java

Inheritance in java is a mechanism in which one object acquires all the properties and behaviors of parent object. It is an important part of OOPs (Object Oriented programming system).

The idea behind inheritance in java is that you can create new classes that are built upon existing classes. When you inherit from an existing class, you can reuse methods and fields of parent class. Moreover, you can add new methods and fields in your current class also.

Inheritance represents the **IS-A relationship**, also known as *parent-child* relationship.

Why use inheritance in java?

- For Method Overriding (so runtime polymorphism can be achieved).
- For Code Reusability.

Terms used in Inheritance

- **Class:** A class is a group of objects which have common properties. It is a template or blueprint from which objects are created.
- **Sub Class/Child Class:** Subclass is a class which inherits the other class. It is also called a derived class, extended class, or child class.
- **Super Class/Parent Class:** Superclass is the class from where a subclass inherits the features. It is also called a base class or a parent class.
- **Reusability:** As the name specifies, reusability is a mechanism which facilitates you to reuse the fields and methods of the existing class when you create a new class. You can use the same fields and methods already defined in previous class.

Syntax of Java Inheritance

```
1. class Subclass-name extends Superclass-name
2. {
3.   //methods and fields
4. }
```

The **extends keyword** indicates that you are making a new class that derives from an existing class. The meaning of "extends" is to increase the functionality.

In the terminology of Java, a class which is inherited is called parent or super class and the new class is called child or subclass.

Java Inheritance Example

Types of inheritance in java

Based on class, there can be three types of inheritance in java: single, multilevel and hierarchical.In java programming, multiple and hybrid inheritance is supported through interface only. We will learn about interfaces later.

> *Note: Multiple inheritance is not supported in java through class.*

When a class extends multiple classes i.e. known as multiple inheritance. Give Example:

Why multiple inheritance is not supported in java?

To reduce the complexity and simplify the language, multiple inheritance is not supported in java.

Consider a scenario where A, B and C are three classes. The C class inherits A and B classes. If A and B classes have same method and you call it from child class object, there will be ambiguity to call method of A or B class.

Since compile time errors are better than runtime errors, java renders compile time error if you inherit 2 classes. So, whether you have same method or different, there will be compile time error now.

Java String

In Java, string is basically an object that represents sequence of char values. An array of characters works same as Java string. For example:

1. **char**[] ch={'j','a','v','a','t','p','o','i','n','t'};
2. String s=**new** String(ch);

is same as:

1. String s="javatpoint";

Java String class provides a lot of methods to perform operations on string such as compare(), concat(), equals(), split(), length(), replace(), compareTo(), intern(), substring() etc.

The java.lang.String class implements *Serializable*, *Comparable* and *CharSequence* interfaces.

What is String in java

Generally, String is a sequence of characters. But in Java, string is an object that represents a sequence of characters. The java.lang.String class is used to create a string object.

How to create a string object?

There are two ways to create String object:

1. By string literal
2. By new keyword

1) String Literal

Java String literal is created by using double quotes. For Example:

1. String s="welcome";

Each time you create a string literal, the JVM checks the "string constant pool" first. If the string already exists in the pool, a reference to the pooled instance is returned. If the string doesn't exist in the pool, a new string instance is created and placed in the pool. For example:

1. String s1="Welcome";
2. String s2="Welcome";//It doesn't create a new instance

In the above example, only one object will be created. Firstly, JVM will not find any string object with the value "Welcome" in string constant pool, that is why it will create a new object. After that it will find the string with the value "Welcome" in the pool, it will not create a new object but will return the reference to the same instance.

> *Note: String objects are stored in a special memory area known as the "string constant pool".*

Why Java uses the concept of String literal?

To make Java more memory efficient (because no new objects are created if it exists already in the string constant pool).

2) By new keyword

1. String s=**new** String("Welcome");//creates two objects and one reference variable

In such case, JVM will create a new string object in normal (non-pool) heap memory, and the literal "Welcome" will be placed in the string constant pool. The variable s will refer to the object in a heap (non-pool).

Java String Example

The java.lang.String class provides many useful methods to perform operations on sequence of char values.

Immutable String in Java

In java, **string objects are immutable**. Immutable simply means unmodifiable or unchangeable.Once string object is created its data or state can't be changed but a new string object is created.

Let's try to understand the immutability concept by the example given below:

```
1. class Testimmutablestring{
2.  public static void main(String args[]){
3.    String s="Sachin";
4.    s.concat(" Tendulkar");//concat() method appends the string at the end
5.    System.out.println(s);//will print Sachin because strings are immutable objects
```

```
6.  }
7. }
```

Output:Sachin

Now it can be understood by the diagram given below. Here Sachin is not changed but a new object is created with sachintendulkar. That is why string is known as immutable.

As you can see in the above figure that two objects are created but s reference variable still refers to "Sachin" not to "Sachin Tendulkar".

But if we explicitely assign it to the reference variable, it will refer to "Sachin Tendulkar" object.For example:

```
1. class Testimmutablestring1{
2.  public static void main(String args[]){
3.    String s="Sachin";
4.    s=s.concat(" Tendulkar");
5.    System.out.println(s);
6.  }
7. }
```

Output:Sachin Tendulkar

In such case, s points to the "Sachin Tendulkar". Please notice that still sachin object is not modified.

Java String compare

We can compare string in java based on content and reference.

It is used in **authentication** (by equals() method), **sorting** (by compareTo() method), **reference matching** (by == operator) etc.

There are three ways to compare string in java:

1. By equals() method
2. By = = operator
3. By compareTo() method

String Concatenation in Java

In java, string concatenation forms a new string *that is* the combination of multiple strings. There are two ways to concat string in java:

1. By + (string concatenation) operator
2. By concat() method

> *Note: After a string literal, all the + will be treated as string concatenation operator.*

Substring in Java

A part of string is called **substring**. In other words, substring is a subset of another string. In case of substring startIndex is inclusive and endIndex is exclusive.

Note: Index starts from 0.

You can get substring from the given string object by one of the two methods:

1. **public String substring(int startIndex):** This method returns new String object containing the substring of the given string from specified startIndex (inclusive).
2. **public String substring(int startIndex, int endIndex):** This method returns new String object containing the substring of the given string from specified startIndex to endIndex.

In case of string:

- **startIndex:** inclusive
- **endIndex:** exclusive

Java String class methods

The java.lang.String class provides a lot of methods to work on string. By the help of these methods, we can perform operations on string such as trimming, concatenating, converting, comparing, replacing strings etc.

Java String is a powerful concept because everything is treated as a string if you submit any form in window based, web based or mobile application.

Let's see the important methods of String class.

Java String toUpperCase() and toLowerCase() method

Java String trim() method

Java String startsWith() and endsWith() method

Java String charAt() method

Java String length() method

Java String intern() method

Java String valueOf() method

Java String replace() method

Java Math class

Java Math class provides several methods to work on math calculations like min(), max(), avg(), sin(), cos(), tan(), round(), ceil(), floor(), abs() etc.

Java Math Methods

The **java.lang.Math** class contains various methods for performing basic numeric operations such as the logarithm, cube root, and trigonometric functions etc. The various java math methods are as follows:

Basic math methods

Logarithmic Math Methods

Trigonometric Math Methods

Hyperbolic Math Methods

Angular Math Methods

Java JDBC Tutorial

Java JDBC is a Java API to connect and execute query with the database. JDBC API uses jdbc drivers to connect with the database.We can use JDBC API to access tabular data stored into any relational database.

Why Should We Use JDBC?

Before JDBC, ODBC API was the database API to connect and execute query with the database. But, ODBC API uses ODBC driver which is written in C language (i.e. platform dependent and unsecured). That is why Java has defined its own API (JDBC API) that uses JDBC drivers (written in Java language).

We can use JDBC API to handle database using Java program and can perform following activities:

1. Connect to the database
2. Execute queries and update statements to the database
3. Retrieve the result received from the database.

What is API

API (Application programming interface) is a document that contains description of all the features of a product or software. It represents classes and interfaces that software programs can follow to communicate with each other. An API can be created for applications, libraries, operating systems, etc.

JDBC Driver

JDBC Driver is a software component that enables java application to interact with the database. There are 4 types of JDBC drivers:

JDBC-ODBC bridge driver

Native-API driver (partially java driver)

Network Protocol driver (fully java driver)

Thin driver (fully java driver)

Java Database Connectivity with 5 Steps

There are 5 steps to connect any java application with the database using JDBC. These steps are as follows:

1. Register the driver class
2. Creating connection
3. Creating statement
4. Executing queries
5. Closing connection

Java Database Connectivity with MySQL

To connect Java application with the MySQL database, we need to follow 5 following steps.

In this example we are using MySql as the database. So we need to know following information's for the mysql database:

1. **Driver class:** The driver class for the mysql database is **com.mysql.jdbc.Driver**.
2. **Connection URL:** The connection URL for the mysql database is **jdbc:mysql://localhost:3306/sonoo** where jdbc is the API, mysql is the database, localhost is the server name on which mysql is running, we may also use IP address, 3306 is the port number and sonoo is the database name. We may use any database, in such case, we need to replace the sonoo with our database name.
3. **Username:** The default username for the mysql database is **root**.
4. **Password:** It is the password given by the user at the time of installing the mysql database. In this example, we are going to use root as the password.

   Let's first create a table in the mysql database, but before creating table, we need to create database first.

1. create database sonoo;
2. use sonoo;
3. create table emp(id **int**(10),name varchar(40),age **int**(3));

Example to Connect Java Application with mysql database

In this example, sonoo is the database name, root is the username and password both.

```
import java.sql.*;
class MysqlCon{
public static void main(String args[]){
try{
Class.forName("com.mysql.jdbc.Driver");
Connection con=DriverManager.getConnection(
"jdbc:mysql://localhost:3306/sonoo","root","root");
//here sonoo is database name, root is username and password
Statement stmt=con.createStatement();
ResultSet rs=stmt.executeQuery("select * from emp");
while(rs.next())
System.out.println(rs.getInt(1)+"  "+rs.getString(2)+"  "+rs.getString(3));
con.close();
}catch(Exception e){ System.out.println(e);}
}
}
```

The above example will fetch all the records of emp table.

To connect java application with the mysql database, **mysqlconnector.jar** file is required to be loaded.

Two ways to load the jar file:

1. Paste the mysqlconnector.jar file in jre/lib/ext folder
2. Set classpath

i) HTML based web page covering basic tag:

HTML Introduction

What is HTML?

HTML is the standard markup language for creating Web pages.

- HTML stands for Hyper Text Markup Language
- HTML describes the structure of Web pages using markup
- HTML elements are the building blocks of HTML pages
- HTML elements are represented by tags
- HTML tags label pieces of content such as "heading", "paragraph", "table", and so on
- Browsers do not display the HTML tags, but use them to render the content of the page

A Simple HTML Document

Example

```
<!DOCTYPE html>
<html>
<head>
<title>Page Title</title>
</head>
<body>
<h1>My First Heading</h1>
<p>My first paragraph.</p>
</body>
</html>
```

Example Explained

- The `<!DOCTYPE html>` declaration defines this document to be HTML5
- The `<html>` element is the root element of an HTML page
- The `<head>` element contains meta information about the document
- The `<title>` element specifies a title for the document
- The `<body>` element contains the visible page content
- The `<h1>` element defines a large heading
- The `<p>` element defines a paragraph

HTML Tags

HTML tags are element names surrounded by angle brackets:

<tagname>content goes here...</tagname>

- HTML tags normally come **in pairs** like `<p>` and `</p>`

- The first tag in a pair is the **start tag,** the second tag is the **end tag**
- The end tag is written like the start tag, but with a **forward slash** inserted before the tag name

Tip: The start tag is also called the **opening tag**, and the end tag the **closing tag**.

Web Browsers

The purpose of a web browser (Chrome, IE, Firefox, Safari) is to read HTML documents and display them.

The browser does not display the HTML tags, but uses them to determine how to display the document:

HTML Versions

Since the early days of the web, there have been many versions of HTML:

Version	Year
HTML 2.0	1995
HTML 3.2	1997
HTML 4.01	1999
XHTML	2000
HTML5	2014

HTML Headings

HTML headings are defined with the <h1> to <h6> tags.

<h1> defines the most important heading. <h6> defines the least important heading:

Example

```
<h1>This is heading 1</h1>
<h2>This is heading 2</h2>
<h3>This is heading 3</h3>
```

HTML Paragraphs

HTML paragraphs are defined with the <p> tag:

Example

```
<p>This is a paragraph.</p>
<p>This is another paragraph.</p>
```

HTML Links

HTML links are defined with the <a> tag:

Example

```
<a href="https://www.w3schools.com">This is a link</a>
```

The link's destination is specified in the href attribute. Attributes are used to provide additional information about HTML elements.

HTML Images

HTML images are defined with the <img> tag.

The source file (src), alternative text (alt), width, and height are provided as attributes:

Example

```
<img src="w3schools.jpg" alt="W3Schools.com" width="104" height="142">
```

HTML Buttons

HTML buttons are defined with the <button> tag:

Example

```
<button>Click me</button>
```

HTML Lists

HTML lists are defined with the <ul> (unordered/bullet list) or the <ol> (ordered/numbered list) tag, followed by <li> tags (list items):

Example

```
<ul>
  <li>Coffee</li>
  <li>Tea</li>
  <li>Milk</li>
</ul>
```

HTML Elements

An HTML element usually consists of a **start** tag and **end** tag, with the content inserted in between:

<tagname>Content goes here...</tagname>

The HTML **element** is everything from the start tag to the end tag:

My first paragraph.

HTML elements with no content are called empty elements. Empty elements do not have an end tag, such as the <br> element (which indicates a line break).

Nested HTML Elements

HTML elements can be nested (elements can contain elements).

All HTML documents consist of nested HTML elements.

Empty HTML Elements

HTML elements with no content are called empty elements.

 is an empty element without a closing tag (the <br> tag defines a line break).

Empty elements can be "closed" in the opening tag like this: <br />.

HTML5 does not require empty elements to be closed. But if you want stricter validation, or if you need to make your document readable by XML parsers, you must close all HTML elements properly.

Use Lowercase Tags

HTML tags are not case sensitive: <P> means the same as .

The HTML5 standard does not require lowercase tags, but W3C **recommends** lowercase in HTML, and **demands**lowercase for stricter document types like XHTML.

HTML Attributes

- All HTML elements can have **attributes**
- Attributes provide **additional information** about an element
- Attributes are always specified in **the start tag**
- Attributes usually come in name/value pairs like: **name="value"**

The href Attribute

HTML links are defined with the <a> tag. The link address is specified in the href attribute:

Example

This is a link

You will learn more about links and the <a> tag later in this tutorial.

The src Attribute

HTML images are defined with the <img> tag.

The filename of the image source is specified in the src attribute:

Example

<img src="img_girl.jpg">

The width and height Attributes

Images in HTML have a set of **size** attributes, which specifies the width and height of the image:

Example

<img src="img_girl.jpg" width="500" height="600">

The image size is specified in pixels: width="500" means 500 pixels wide.

HTML Forms

The <form> Element

The HTML <form> element defines a form that is used to collect user input:

<form>

.

form elements

.

</form>

An HTML form contains **form elements**.

Form elements are different types of input elements, like text fields, checkboxes, radio buttons, submit buttons, and more.

The <input> Element

The <input> element is the most important form element.

The <input> element can be displayed in several ways, depending on the **type** attribute.

Type	Description
<input type="text">	Defines a one-line text input field
<input type="radio">	Defines a radio button (for selecting one of many choices)
<input type="submit">	Defines a submit button (for submitting the form)

The Action Attribute

The action attribute defines the action to be performed when the form is submitted.

Normally, the form data is sent to a web page on the server when the user clicks on the submit button.

In the example above, the form data is sent to a page on the server called "/action_page.php". This page contains a server-side script that handles the form data:

<form **action="/action_page.php**">

If the action attribute is omitted, the action is set to the current page.

The Target Attribute

The target attribute specifies if the submitted result will open in a new browser tab, a frame, or in the current window.The default value is "_self" which means the form will be submitted in the current window.To make the form result open in a new browser tab, use the value "_blank":

Example

<form action="/action_page.php" **target="_blank"**>

Other legal values are "_parent", "_top", or a name representing the name of an iframe.

The Method Attribute

The method attribute specifies the HTTP method (**GET** or **POST**) to be used when submitting the form data:

Example

<form action="/action_page.php" **method="get"**>

or:

Example

<form action="/action_page.php" **method="post"**>

When to Use GET?

The default method when submitting form data is GET.

However, when GET is used, the submitted form data will be **visible in the page address field**:/action_page.php?firstname=Mickey&lastname=Mouse

Notes on GET:

- Appends form-data into the URL in name/value pairs
- The length of a URL is limited (about 3000 characters)
- Never use GET to send sensitive data! (will be visible in the URL)

- Useful for form submissions where a user wants to bookmark the result
- GET is better for non-secure data, like query strings in Google

When to Use POST?

Always use POST if the form data contains sensitive or personal information. The POST method does not display the submitted form data in the page address field.

Notes on POST:

- POST has no size limitations and can be used to send large amounts of data.
- Form submissions with POST cannot be bookmarked

The Name Attribute

Each input field must have a `name` attribute to be submitted.

If the `name` attribute is omitted, the data of that input field will not be sent at all.

This example will only submit the "Last name" input field:

Example

```
<form action="/action_page.php">
  First name:<br>
  <input type="text" value="Mickey"><br>
  Last name:<br>
  <input type="text" name="lastname" value="Mouse"><br><br>
  <input type="submit" value="Submit">
</form>
```

Grouping Form Data with <fieldset>

The `<fieldset>` element is used to group related data in a form.

The `<legend>` element defines a caption for the `<fieldset>` element.

Example

```
<form action="/action_page.php">
  <fieldset>
    <legend>Personal information:</legend>
    First name:<br>
    <input type="text" name="firstname" value="Mickey"><br>
    Last name:<br>
    <input type="text" name="lastname" value="Mouse"><br><br>
    <input type="submit" value="Submit">
  </fieldset>
</form>
```

This is how the HTML code above will be displayed in a browser:

Personal information:

First name:

Last name:

Mouse

Submit

Introduction to XML

XML is a software- and hardware-independent tool for storing and transporting data.

What is XML?

- XML stands for eXtensible Markup Language
- XML is a markup language much like HTML
- XML was designed to store and transport data
- XML was designed to be self-descriptive
- XML is a W3C Recommendation

XML Does Not DO Anything

Maybe it is a little hard to understand, but XML does not DO anything.

This note is a note to Tove from Jani, stored as XML:

```
<note>
  <to>Tove</to>
  <from>Jani</from>
  <heading>Reminder</heading>
  <body>Don't forget me this weekend!</body>
</note>
```

The XML above is quite self-descriptive:

- It has sender information.
- It has receiver information
- It has a heading
- It has a message body.

But still, the XML above does not DO anything. XML is just information wrapped in tags.

Someone must write a piece of software to send, receive, store, or display it:

Note

To: Tove

From: Jani

Reminder

Don't forget me this weekend!

The Difference Between XML and HTML

XML and HTML were designed with different goals:

- XML was designed to carry data - with focus on what data is
- HTML was designed to display data - with focus on how data looks
- XML tags are not predefined like HTML tags are

XML Does Not Use Predefined Tags

The XML language has no predefined tags.

The tags in the example above (like <to> and <from>) are not defined in any XML standard. These tags are "invented" by the author of the XML document.

HTML works with predefined tags like <p>, <h1>, <table>, etc.

With XML, the author must define both the tags and the document structure.

XML Simplifies Things

- It simplifies data sharing
- It simplifies data transport
- It simplifies platform changes
- It simplifies data availability

Many computer systems contain data in incompatible formats. Exchanging data between incompatible systems (or upgraded systems) is a time-consuming task for web developers. Large amounts of data must be converted, and incompatible data is often lost.

XML stores data in plain text format. This provides a software- and hardware-independent way of storing, transporting, and sharing data.

XML also makes it easier to expand or upgrade to new operating systems, new applications, or new browsers, without losing data.

With XML, data can be available to all kinds of "reading machines" like people, computers, voice machines, news feeds, etc.

XML is a W3C Recommendation

XML became a W3C Recommendation as early as in February 1998.

XML Tree Structure

XML documents are formed as **element trees**.

An XML tree starts at a **root element** and branches from the root to **child elements**.

All elements can have sub elements (child elements):

```
<root>
  <child>
    <subchild>.....</subchild>
  </child>
</root>
```

The terms parent, child, and sibling are used to describe the relationships between elements.

Parents have children. Children have parents. Siblings are children on the same level (brothers and sisters).

All elements can have text content (Harry Potter) and attributes (category="cooking").

UNIT - 3

Relational Database Management System

i) Database fundamentals

What is transaction?

A transaction is program module whose execution may change the content of database. Example: - Suppose a bank employee transfers Rs 500 from A's account to B's account. This very simple and small transaction involves several low-level tasks.

Account-A

```
Read (A)        //A=100
A=A-500
Write (A)       //A=500
```

Account-B

```
Read (B)        //B=2000
B=B+500
Write (B)       //B=2500
```

ACID Properties

A transaction is a very small unit of a program and it may contain several low level tasks. A transaction in a database system must maintain Atomicity, Consistency, Isolation, and Durability − commonly known as ACID properties − in order to ensure accuracy, completeness, and data integrity.

Atomicity − This property states that a transaction must be treated as an atomic unit, that is, either all of its operations are executed or none. There must be no state in a database where a transaction is left partially completed. States should be defined either before the execution of the transaction or after the execution/abortion/failure of the transaction.

Consistency − The database must remain in a consistent state after any transaction. No transaction should have any adverse effect on the data residing in the database. If the database was in a consistent state before the execution of a transaction, it must remain consistent after the execution of the transaction as well.

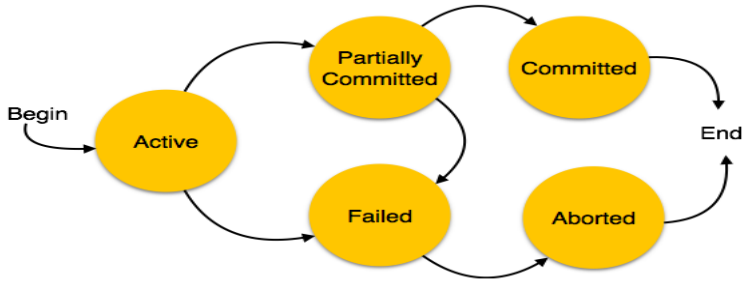
Durability − The database should be durable enough to hold all its latest updates even if the system fails or restarts. If a transaction updates a chunk of data in a database and commits,

then the database will hold the modified data. If a transaction commits but the system fails before the data could be written on to the disk, then that data will be updated once the system springs back into action.

Isolation − In a database system where more than one transaction are being executed simultaneously and in parallel, the property of isolation states that all the transactions will be carried out and executed as if it is the only transaction in the system. No transaction will affect the existence of any other transaction.

States of Transactions

A transaction in a database can be in one of the following states −



Active − In this state, the transaction is being executed. This is the initial state of every transaction.

Partially Committed − When a transaction executes its final operation, it is said to be in a partially committed state.

Failed − A transaction is said to be in a failed state if any of the checks made by the database recovery system fails. A failed transaction can no longer proceed further.

Aborted − If any of the checks fails and the transaction has reached a failed state, then the recovery manager rolls back all its write operations on the database to bring the database back to its original state where it was prior to the execution of the transaction. Transactions in this state are called aborted. The database recovery module can select one of the two operations after a transaction aborts −

- Restart the transaction
- Kill the transaction

Committed − If a transaction executes all its operations successfully, it is said to be committed. All its effects are now permanently established on the database system.

Committing and revoking a transaction using COMMIT & ROLLBACK

SQL Transaction Control (TC) commands are used to manage database transaction.

SQL COMMIT

SQL COMMIT command save new changes store into database.

Syntax:

COMMIT;

Example: SQL> COMMIT;

Commit complete.

SQL SAVEPOINT

SQL SAVEPOINT command create new save point. SAVEPOINT command save the current point with the unique name in the processing of a transaction.

Syntax:

SAVEPOINT savepoint_name;

Example: SQL> CREATE TABLE emp_data (no NUMBER (3), name VARCHAR (50),
Code VARCHAR (12));

Table created.

SQL> SAVEPOINT table_create;

Save point created.

SQL> insert into emp_dataVALUES (1,'aru', 'e123');

1 row created.

SQL> SAVEPOINT insert_1;

Savepoint created.

SQL> insert into emp_data values (2,'rubi', 'e321');

1 row created.

SQL> SAVEPOINT insert_2;

Savepoint created.

SQL> SELECT * FROM emp_data;

NO	NAME	CODE
1	aru	e123
2	rubi	e321

SQL ROLLBACK

SQL ROLLBACK command execute at the end of current transaction and undo/undone any changes made since the begin transaction.

Syntax:

ROLLBACK [To SAVEPOINT_NAME];

Example:

Above example we are create 3 SAVEPOINT table_create, insert_1 and insert_2. Now we are rollback to insert_1 SAVEPOINT.

SQL> ROLLBACK TO insert_1;

Rollback complete.

SQL> SELECT * FROM emp_data;

NO	NAME	CODE
1	**aru**	**e123**

SQL GROUP BY Statement:

The GROUP BY statement is often used with aggregate functions (COUNT, MAX, MIN, SUM, AVG) to group the result-set by one or more columns.

Group functions:

Function Name	Description
COUNT()	Return a count of the number of rows returned
SUM()	Return the sum
MAX()	Return the maximum value
MIN()	Return the minimum value
AVG()	Return the average value of the argument

Syntax:

```
SELECT column_name(s)
FROM table_name
WHERE condition
GROUP BY column_name(s)
ORDER BY column_name(s);
```

Example: The following SQL statement lists the number of customers in each country:

```
SELECT COUNT (Customer ID), Country
FROM Customers
GROUP BY Country;
```

Example: The total amount of the salary on each customer, then the GROUP BY query would be as follows.

```
SQL> SELECT NAME, SUM (SALARY) FROM CUSTOMERS
  GROUP BY NAME;
```

Using COUNT (*)

The COUNT (*) counts the number of rows including duplicates and NULLs. When the * is used for COUNT (), all records (rows) are Counted.

DISTINCT clause with COUNT ( )

SQL COUNT () function with DISTINCT clause eliminates the repetitive appearance of the same data. The DISTINCT can come only once in a given select statement.

Syntax :

```
SELECT COUNT(DISTINCT expr,[expr...]);
```

Example :

To get unique number of rows from the 'orders' table with following conditions -

1. Only unique cust_code will be counted,

2. Result will appear with the heading "Number of employees",

The following SQL statement can be used :

```
SELECT COUNT ( DISTINCT cust_code ) AS "Number of employees"
FROM orders;
```

Displaying data from multiple tables

The related tables of a large database are linked through the use of foreign and primary keys or what are often referred to as common columns. The ability to join tables will enable you to add more meaning to the result table that is produced.

Cartesian product

Cartesian product (also known as a Cartesian join or cross join) - Replicates each row from the first table with every row from the second table. Creates a join between tables by displaying every possible record combination.

Syntax:

SELECT table1.column1, table2.column2 FROM table1, table2;

Union

The SQL UNION clause/operator is used to combine the results of two or more SELECT statements without returning any duplicate rows.

To use this UNION clause, each SELECT statement must have

- The same number of columns selected
- The same number of column expressions
- The same data type and
- Have them in the same order

But they need not have to be in the same length.

Syntax:

The basic syntax of a **UNION** clause is as follows −

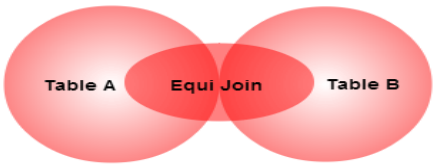
```
SELECT column1 [, column2 ]
FROM table1 [, table2 ]
[WHERE condition]

UNION

SELECT column1 [, column2 ]
FROM table1 [, table2 ]
[WHERE condition]
```

Equi-join

SQL Equi join is a specific type comparison base join (equally comparison) not allowing other comparison operator such as <, > <= etc. And create record set results that are combining columns value from the tables (two or more table).



Equi Join

Syntax:

```
SELECT *    FROM table1, table2
                WHERE table1.col1 = table2.col1;
```

ii) Introduction to MYSQL

ORDER BY CLAUSE [Sorting in ascending / descending order]

When you use the SELECT statement to query data from a table, the result set is not sorted in any orders. To sort the result set, you use the ORDER BY clause. The ORDER BY clause allows you to:

- Sort a result set by a single column or multiple columns.
- Sort a result set by different columns in ascending or descending order.

Syntax of the ORDER BY clause:

```
SELECT column1, column2,...FROM  tablel
    ORDER BY column1 [ASC|DESC], column2 [ASC|DESC]...
```

The ASC stands for ascending and the DESC stands for descending. By default, the ORDER BY clause sorts the result set in ascending order if you don't specify ASC or DESC explicitly.

Manipulating data of a table / relation

Update command to change exiting data of a table

In its simplest form, the syntax for the UPDATE statement when updating one table in MySQL is:

```
UPDATE table name
SET Col1=expression1,
Col2=expression2
.....
WHERE <Condition>;
```

Delete command for removing rows from a table

1. **Delete all rows/records from table**
   Syntax: DELETE FROM table name;

2. **Delete some selected rows/records from table**
   Syntax: DELETE FROM table name WHERE [condition];

Restructuring a table

1. **ALTER TABLE for adding new columns**
   Syntax: ALTER TABLE tablename ADD columnname datatype;

2. **ALTER TABLE for deleting columns**

   Syntax: ALTER TABLE table name DROP COLUMN column name;

String function

ASCII ()

Returns the numeric value of the leftmost character of the string str. Returns 0 if str is the empty string. Returns NULL if str is NULL. ASCII () works for characters with numeric values from 0 to 255.

CHAR ( )

CHAR() interprets each argument N as an integer and returns a string consisting of the characters given by the code values of those integers.

CONCAT ( )

Syntax: CONCAT (str1, str2...)
Returns the string that result from concatenating the arguments. May have one or more arguments. If all arguments are non-binary strings, the result is a non-binary string. If the arguments include any binary strings, the result is a binary string.

INSTR ( )

INSTR () takes a string and a substring of it as arguments, and returns an integer which indicates the position of the first occurrence of the substring within the string
Syntax: INSTR (str,substr)
mysql>SELECT INSTR('myteststring','st');
Output : 5

LCASE ( )

LCASE () converts the characters of a string to lower case characters.
Syntax: LCASE (str)
mysql> SELECT LCASE('STRING');
Output : string

UCASE ( )

UCASE () converts the characters of a string to Upper case characters.
Syntax: UCASE (str)
mysql> SELECT UCASE('string');
Output : STRING

LENGTH ( )

LENGTH() returns the length of a given string.
Syntax : LENGTH(str)
mysql> SELECT LENGTH('text');
Output : 4

LTRIM ( )

LTRIM() removes the leading space characters of a string passed as argument.
Syntax : LTRIM(str)
Example : SELECT LTRIM(' Hello')
Output : Hello (leading spaces have been exclude)

MID ( )

MID() extracts a substring from a string. The actual string, position to start extraction and length of the extracted string - all are specified as arguments.
Syntax : MID(str,pos,len)
Example : SELECT MID('ITresource',4,3);
Output : eso

RIGHT ( )

RIGHT () extracts a specified number of characters from the right side of a given string.
Syntax : RIGHT(str,len)
mysql> SELECT RIGHT('ITresource',8);
Output : resource

RTRIM ( )

RTRIM(str) function returns the string str with trailing space characters removed.
Syntax: RTRIM(str)
mysql> SELECT RTRIM(' helloindia ');
Output:helloindia

TRIM ( )

SUBSTR ( )

SUBSTR () returns the specified number of characters from a particular position of a given string.
SUBSTR () is a synonym for SUBSTRING ().
Syntax : SUBSTR(str,pos,len)
mysql> SELECT SUBSTR('ITresource',4,3);
Output : eso

Mathematical functions

POWER ()

The POWER () function returns *m* raised to the *nth* power.
Syntax: POWER (*m*, *n*)
mysql> SELECT POWER (2, 3);
Output: 8

ROUND ()

ROUND () rounds a number specified as an argument up to a number specified as another argument.
Syntax: ROUND (N,[D]);
mysql> SELECT ROUND (4.43);
Output: 4

TRUNCATE ()

TRUNCATE () returns a number after truncated to certain decimal places. The number and the number of decimal places are specified as arguments of the TRUNCATE function.

Syntax: TRUNCATE (N, D);
mysql> SELECT TRUNCATE(2.465,1);
Output:2.4

Date & Time functions:

CURDATE ()

This function returns the current date as a "YYYY-MM-DD" format.
Syntax: CURDATE ()
mysql> SELECT CURDATE ();
Output: 2018-08-17

DATE ()

DATE () takes the DATE part out from a datetime expression.
Syntax: DATE (expr);

Where **expr** is a datetime.
mysql> SELECT DATE('2018-08-17 11:31:31') as required DATE;
Output: required DATE
2018-08-17

MONTH ()

Return the month portion of a date

Syntax: MONTH (*date*);

mysql>SELECT MONTH ("2018-08-17");

Output: 08

DAYOFMONTH ()

Return the day of the month from a date.
Syntax: DAYOFMONTH (date);
mysql>SELECT DATOFMONTH ('2018-08-17');
Output: 17

DAYOFYEAR ()

Returns the day of the year for date, in the range 1 to 366.
Syntax: DAYOFYEAR (date);
mysql>SELECT DAYOFYEAR ('2018-02-03');
Output: 34

SYSDATE ()

Returns the current date and time as a value in 'YYYY-MM-DD HH:MM:SS
Syntax: SELECT SYSDATE ();
mysql> SELECT SYSDATE ();
Output: 2018-08-17 11:15:14

UNIT - 4
IT Applications

i) E-business

Definition:

E-business (electronic business) is the conduct of business processes on the Internet. These electronic business processes include buying and selling products, supplies and services; servicing customers; processing payments; managing production control; collaborating with business partners; sharing information; running automated employee services; recruiting; and more.

E-Commerce

Definition:

E-commerce is the activity of buying or selling of products on online services or over the Internet. Electronic commerce draws on technologies such as mobile commerce, electronic funds transfer, supply chain management, Internet marketing, online transaction processing, electronic data interchange (EDI), inventory management systems, and automated data collection systems.

Its type with benefits

There are 6 basic types of e-commerce:

1. Business-to-Business (B2B)
2. Business-to-Consumer (B2C)
3. Consumer-to-Consumer (C2C)
4. Consumer-to-Business (C2B).
5. Business-to-Administration (B2A)
6. Consumer-to-Administration (C2A)

1. Business-to-Business (B2B)

Business-to-Business (B2B) e-commerce encompasses all electronic transactions of goods or services conducted between companies. Producers and traditional commerce wholesalers typically operate with this type of electronic commerce.

2. Business-to-Consumer (B2C)

The Business-to-Consumer type of e-commerce is distinguished by the establishment of electronic business relationships between businesses and final consumers. It corresponds to the retail section of e-commerce, where traditional retail trade normally operates.

These types of relationships can be easier and more dynamic, but also more sporadic or discontinued. This type of commerce has developed greatly, due to the advent of the web, and there are already many virtual stores and malls on the Internet, which sell all kinds of consumer goods, such as computers, software, books, shoes, cars, food, financial products, digital publications, etc.
When compared to buying retail in traditional commerce, the consumer usually has more information available in terms of informative content and there is also a widespread idea that you'll be buying cheaper, without jeopardizing an equally personalized customer service, as well as ensuring quick processing and delivery of your order.

3. Consumer-to-Consumer (C2C)

Consumer-to-Consumer (C2C) type e-commerce encompasses all electronic transactions of goods or services conducted between consumers. Generally, these transactions are conducted through a third party, which provides the online platform where the transactions are actually carried out.

4. Consumer-to-Business (C2B)

In C2B there is a complete reversal of the traditional sense of exchanging goods. This type of e-commerce is very common in crowd sourcing based projects. A large number of individuals make their services or products available for purchase for companies seeking precisely these types of services or products.

Examples of such practices are the sites where designers present several proposals for a company logo and where only one of them is selected and effectively purchased. Another platform that is very common in this type of commerce are the markets that sell royalty-free photographs, images, media and design elements, such as iStockphoto.

5. Business-to-Administration (B2A)

This part of e-commerce encompasses all transactions conducted online between companies and public administration. This is an area that involves a large amount and a variety of services, particularly in areas such as fiscal, social security, employment, legal documents and registers, etc. These types of services have increased considerably in recent years with investments made in e-government.

6. Consumer-to-Administration (C2A)

The Consumer-to-Administration model encompasses all electronic transactions conducted between individuals and public administration.

Examples of applications include:

- Education – disseminating information, distance learning, etc.
- Social Security – through the distribution of information, making payments, etc.
- Taxes – filing tax returns, payments, etc.
- Health – appointments, information about illnesses, payment of health services, etc.

Both models involving Public Administration (B2A and C2A) are strongly associated to the idea of efficiency and easy usability of the services provided to citizens by the government, with the support of information and communication technologies.

Advantages of e-commerce

The main advantage of e-commerce is its ability to reach a global market, without necessarily implying a large financial investment. The limits of this type of commerce are not defined geographically, which allows consumers to make a global choice, obtain the necessary information and compare offers from all potential suppliers, regardless of their locations.

By allowing direct interaction with the final consumer, e-commerce shortens the product distribution chain, sometimes even eliminating it completely. This way, a direct channel between the producer or service provider and the final user is created, enabling them to offer products and services that suit the individual preferences of the target market.

E-commerce allows suppliers to be closer to their customers, resulting in increased productivity and competitiveness for companies; as a result, the consumer is benefited with an improvement in quality service, resulting in greater proximity, as well as a more efficient pre and post-sales support. With these new forms of electronic commerce, consumers now have virtual stores that are open 24 hours a day.

Cost reduction is another very important advantage normally associated with electronic commerce. The more trivial a particular business process is, the greater the likelihood of its success, resulting in a significant reduction of transaction costs and, of course, of the prices charged to customers.

Disadvantages of e-commerce

The main disadvantages associated with e-commerce are the following:

- Strong dependence on information and communication technologies (ICT);
- Lack of legislation that adequately regulates the new e-commerce activities, both nationally and internationally;
- Market culture is averse to electronic commerce (customers cannot touch or try the products);
- The users' loss of privacy, the loss of regions' and countries' cultural and economic identity;
- Insecurity in the conduct of online business transactions.

DIFFERENCE BETWEEN E-BUSINESS AND E-COMMERCE:

E-business and e-commerce are terms that are sometimes used interchangeably, and sometimes they are used to differentiate one vendor's product from another. In both cases, the e stands for "electronic networks" and describes the application of electronic network technology - including Internet and electronic data interchange (EDI) - to improve and change business processes (Bartels,2000).

E-commerce or electronic commerce is carrying out business communications and transactions through computers and over networks. It involves buying and selling of goods and services through digital communication. E-commerce also includes transactions on the World Wide Web and the Internet and means such as electronic funds transfer, smart cards and digital cash. E-commerce covers outward facing processes that interact with customers, suppliers and external partners such as sales, marketing, delivery, customer service, purchasing of raw materials and supplies for production.

E-business websites

E-Business salient features

Some of the features of Online Business are as follows:

- It is easy to set up
- There are no geographical boundaries

- Much cheaper than traditional business
- There are flexible business hours
- Marketing strategies cost less
- Online business receive subsidies from the government
- There are a few security and integrity issues
- There is no personal touch
- Buyer and seller don't meet
- Delivery of products takes time
- There is a transaction risk
- Anyone can buy anything from anywhere at anytime
- The transaction risk is higher than traditional business

E-Business Social impacts

E-commerce has become integral part of modern society .Today many consumers can simply use their computers, Smartphone's or portable electronic devices to shop online .

- **Combine personal life with professional life**
  Growth in e-commerce has enabled many workers to perform some or all of their work even from phone resulting in work life balances this is extremely useful particularly to combine personal life with professional life.
- **Raise standard of living**
  On an individual level citizens having internet facility may perform transaction worldwide their by raising their own standard of living.
- **Create lucrative jobs**
  E-Commerce helps in creating more and more lucrative jobs at all the levels; some of these jobs may be very high paying also. It provides new business opportunities to an entrepreneur to venture and establish an enterprise with global market access.
- **Beneficial to rural community**
  E-Commerce is beneficial to the majority of rural community. It brings unanticipated effects on cultural and social norms.
- **Indian middle classes**
  It has been found that e-commerce is of prime importance mainly to Indian middle classes because they have the financial and cultural capacity to make the best use of e-commerce.
- **Converting traditional society to digital society**
  E-Commerce has the potential of converting traditional society into a digital society. Digital world has also revolutionized the social concerns in a society. The growing reach in terms of internet connectivity of end consumers when buying online beyond the metros and big cities are key drivers of e-commerce boon in India.
- **Considerable benefits**
  The society is now aware of the considerable benefits of e-commerce. These are:-

- ❖ Convenience of home shopping.
- ❖ Wider range of goods and services.
- ❖ The convenience of consolidated.
- ❖ Easy delivery of goods and services.
- ❖ Convenient and secure payment.
- ❖ Lower prices.

E business challengers

Challenge #1: Lack of Verification Measures

Once a customer signs up in an e-commerce portal, the portal is unaware about the customer except the information he/she entered. the credibility of the customer is questionable. This heightens when the customer issues a Cash-on-Delivery (COD) purchase because the business is unsure whether the customer is genuine or not. These have resulted in huge revenue losses for many e-commerce players.

Challenge #2: Product Returns and Refunds

When products are returned because customers are unsatisfied with the product, it scars the business with heavy loss on shipment and reputation. Cost of logistics has always been an issue for e-commerce players especially for those who deliver for free.

Challenge #3: Customer Issues Going Unnoticed

Being in an industry where customers can take their business elsewhere in a blink of an eye, customer service goes a long way. E-commerce business receives a lot of inbound interaction with more than 75% being complaints or concerns. When these concerns go unnoticed, it com promises the standard of quality of your business, and tarnishes your image.

Challenge #4: Ease of use and technology

Ease of use and advancements in technology have given consumers more power and increased global competition in the e-Commerce sector. Omni-channel retailing is the way forward for e-Commerce. This places pressure on companies to deal with technical issues of running an online store like: server issues, bandwidth issues, dynamic IP address, data privacy and security issues. The transition from a multi-channel business to an Omni-channel is another aspect that is not easily adopted by many companies.

II) WHAT IS FRONT END DEVELOPMENT?

Definition: Front end development manages everything that users visually see first in their browser or application. Front end developers are responsible for the look and feel of a site.

Front end development is mostly focused on what some may coin the "client side" of development. Front end developers will be engaged in analyzing code, design, and debugging applications along with ensuring a seamless user experience. You manage what people first see in their browser. As a front end developer you are responsible for the look, feel and ultimately design of the site.

FRONT END PROGRAMMING LANGUAGES

- HTML
- Java
- JavaScript
- .Net etc...

WHAT IS BACK END DEVELOPMENT?

Definition: Back end development refers to the server side of an application and everything that communicates between the database and the browser.

BACK END PROGRAMMING LANGUAGES

- Oracle
- Sybase
- SQLServer
- MySQL
- Microsoft Access
- Ingress
- DB2 etc...

Database connectivity

In computer science, a **database connection** is the means by which a database server and its client software communicate with each other. The term is used whether or not the client and the server are on different machines. The client uses a database connection to send commands to and receive replies from the server

Module Questions

UNIT-I

SET-I

Q.No.1 Write Short notes on switch and gateway.

Q.No.2 Explain about the types of Computer Network.

Q.No.3 What are the wired technologies use in network communications.

Q.No.4 What are the internet access methods?

Q.No.5 What are the cyber-crimes taking place now a day?

SET-II

Q.No.1 Write Short notes on Router and Repeater.

Q.No.2 What are the wireless technologies use in network communications.

Q.No.3 Explain about TCP/IP, FTP and Telnet protocols.

Q.No.4 Explain about Internet addressing.

Q.No.5 How digital Signature is useful in preventing information theft.

Unit-II

SET-I

Q.No.1 Explain with example about the private and public access specifier.

Q.No.2 What is inheritance and its types?

Q.No.3 What are the steps of connecting and accessing data from a database in java.

Q.No.4 Explain about the elements of a FORM in HTML.

Q.No.5 Write about the tags used to define a list.

SET-II

Q.No.1 Explain with example about the default and protected access specifier.

Q.No.2 Why multiple inheritance is not supported in java.

Q.No.3 Write about five of the string class methods.

Q.No.4 What are the difference between get and post methods in HTML Form.

Q.No.5 How many ways strings could be compared in java, explain?

Unit-III

1. What is Transaction? What are the states of Transaction?
2. Discuss ACID properties of transaction.
3. Discuss COMMIT and ROLLBACK of transaction.
4. Explain Cartesian product, Union and Equi-Join operations.
5. Discuss String Functions of MySQL.

Unit-IV

1. What is E-commerce and E-Business?
2. Discuss types of E-Commerce?
3. Discuss about different E-Commerce web sites.
4. Explain social impact of E-Commerce.
5. What is front end and back end? Explain database connectivity.

Information Technology

Test-I
UNIT-1

F.M:35 **TIME:1.5 HOURS**

GROUP-A

(Answer All Questions) **[11x1]**

1. (a) What is a Router?

   (b) What are the types of Computer Network?

   (c) What is a Bluetooth technology?

   (d) What is an ISP?

   (e) What is the role of internet protocols?

   (f) URL stands for what?

   (g) What is a Search Engine?

   (h) What is Hacking?

   (i) What is a online Fraud?

   (j) Why Cyber Laws are required?

   (k) What is an IP address?

GROUP-B

(Answer Any Four) **[4x2]**

2. (a) What are the types of Communication media?

   (b) Explain MAC.

   (c) Explain two of the Internet Protocols.

   (d) What are the disadvantages of LAN?

   (e) Explain Web Server.

GROUP-C

(Answer Any two) **[2x4]**

3. (a) What are the transmission modes in computer network?

   (b) What are the components of Data Communication?

   (c) What are the types of name server, explain there working.

GROUP-D

(Answer Any one) **[1x6]**

4. (a) Explain wired Communication technologies.

   (b) Explain about four of the cybercrimes those are taking place now a days.