Shiksha Mandal's

# G. S. College of Commerce, Wardha

## Department of B.Com. Computer Application

## B.C.C.A. Part I (Sem. I)

## FUNDAMENTALS OF COMPUTER

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# Introduction to Operating System

An operating system is an essential component of computer system. It is a large set of large and complex program that acts as an interface between the computer hardware and its user. It is serves twin objectives interpreting the user program instruction to the hardware as well as providing co-ordination services necessary to unable a group of peripherals to share computer system resources efficiently.

There are two common perspective of what an operating system is:

**One view is that:**

An Operating System is a user interface i.e. a program that acts as an interface between the user and the computer hardware.

A program that controls the execution of application program.

An interface between application and hardware.

**Another view is that:**

An Operating System is a resource manager i.e. a program designed to manage the computer resources like CPU, memory and peripherals efficiently.

**Some formal definition.**

1. "An operating system is an integrated set of system programs whose major function is to manage resource (like CPU, Memory, Disk etc.), control input and output, schedule jobs, handle errors, provide security, act as an interface between the user and machine."
2. "An operating system directs the processor in how to use the system resource and when to execute other programs."
3. "A portion of the Operating system, called the 'Kernel' is resident in the main memory. The kernel contains the most frequently used functions of operating system."

**Need of Operating System:**

The Operating system implements many necessary features that are used by almost every program. It is a good investment to implement then once in OS rather than in each application program. An OS is useful because it contains a library of reusable services. As we know that a general purpose computer must be able to run a wide range of programs. For such a system an OS is the most natural way to go. Otherwise, each application would have to program its own operating system services. Thus, we conclude that for a general purpose computer system, it is essential to have an Operating System.

**Uses of Operating System:**

1) Easy interaction between the human and computer.
2) Starting computer operation automatically when power is turn on.
3) Loading and scheduling users program.
4) Controlling input and output.
5) Controlling program execution.
6) Managing use of main memory.
7) Allocate system resources.
8) Detect the equipment failure.
9) Providing security to users program.
10) Utilities

**Function of Operating system**

The major operating system functions are

1) Process management
2) Memory management
3) Device management
4) Information management

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**1) Process Management**

The process is basically a program in execution. In a simple case, a single process may be associated with a single user's job. A processor is a hardware device which is capable of executing a sequence of instructions. At various times a process may be in the operating systems, user program or shared program. Processor management is concerned with the management of physical processors.

OS has following functions related to the process management:

a) **Process Creation:** It involves loading of the program from secondary storage to the memory and to start its execution.
b) **Process Scheduling:** It Means a process is transferred from the ready-state to a run-state
c) **Process Suspending:** It involves transferring a process from run-state to wait-state.
d) **Process Resuming:** It means transferring a process from wait-state to a ready-state when the I/O request has been completed or an event occurs.

**2) Memory Management :**

Memory means the main memory (RAM). For a program to get executed, it must be mapped to absolute addresses and loaded into memory. So, efficient memory utilization is very necessary here. This is done by Operating system. The principle storage management responsibilities are as follows:

1) **Process isolation:** It means the controlling of one process that interacts with dates and memory of other process.
2) **Automatic allocation and management:** Memory should be allocated dynamically based on the priorities of the process. Otherwise the process waiting will increase which will decrease CPU and memory utilization.
3) **Support of modular programming:** Instead of loading, one big monolithic program, we can load only some modules. This will increase CPU and memory utilization.
4) **Protection and access control:** Don't apply protection techniques and access control to all the process. It is better to apply it to important applications only. This will save the execution time.

**3) Device Management**

A contemporary computer system includes a wide assortment of "Input / Output" device. Called peripheral devices. Such as printers, card readers, magnetic tape unit, magnetic disks, etc. a large computer installation may put half of system cost to peripherals, so, it may be used in efficient manner.

**Device Characteristics**

a) The speed of one I/O device is different from another. For instance cartridge tape is slow than floppy disk in terms of retrieving data, hard disk is faster than printers, etc.
b) Data can be represented in different forms on different I/O devices. For instance, some use ASCII code, where as others use EDCDIC, BCD, etc.
c) Device are shareable or non-shareable.
d) Data can be transferred in the various forms, such as characters, words, bytes records, etc.

**4) Information Management**

A computer stores information in the form of files. The operating system provide the convenient ways for storing and accessing the information from files. The information management component of operating system is structured as follows to effectively support these requirement.

Operating System is responsible for:

1. Creation / Deletion of files.
2. Creation deletion of directories.
3. File and directory manipulation.
4. Backing or storing files onto media like tapes.

**Types of Operating System**

Following are the Types of Operating System:

1) Simple batch system.

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2) Multiprogramming
    a. Multitasking
    b. Multiuser
    c. Multiprocessing system
3) Time Sharing system
4) Parallel system
5) Distributed systems
6) Real time system
7) On-line and off-line processing

**1) Simple Batch System :**

A batch processing environment requires the grouping up of similar jobs which consist of programs, data and system commands. The programs with large computation time and no user interaction were well served by Batch processing.

1. Batch processing is a method in which data are gathered for a time and collected into a group (or batch)
2. In a batch processing system a group of programs have been collected by the user and then loads into the computer at one time.
3. The programs stored in batch processing system are executed one after another.
4. It is based on automatic job-to-job transition i.e. in a batch mode, each user develops his programs off-line and submit it to computer center.
5. It is also known as serial, sequential, offline or stacked job processing.

**Advantages:**

1. It reduces the idle time of computer system
2. The transition from one job to another does not require operator intervention.

**Disadvantages:**

1. The time required to accumulate data into batches is more which causes delay in jobs.
2. Batch processing makes each job wait in line at each step.
3. It is difficult to provide the desired priority scheduling.
4. It is not efficient because timing is not maintained properly.

**Applications:**

The applications where it is not necessary to update information (Records) on daily basis are best suited for the use of batch processing system, such a application are,

1. Payroll system
2. Preparation of customer information.

**2) Multiprogramming:**

Multiprogramming operating system are more complex than batch operating system. Multiprogramming has a significant potential for improving system throughput and resource utilization with very minor differences. There are three different forms of multiprogramming operating system

a) Multitasking Operating system.
b) Multiuser Operating system.
c) Multiprocessing Operating system.

**a) Multitasking Operating System:**

A running state of a program is called a process or a task. A multitasking operating system supports two or more active processes simultaneously. The concept of managing a multitude of simultaneously active programs, competing with each other for accessing the system resources is known as multitasking. Multiprogramming operating system is an operating system which in addition to supporting multiple concurrent process allows the instructions and data from two or more separate processes to reside in primary memory simultaneously. Therefore, multitasking operation is one of the mechanism that multiprogramming Operating System employs in managing the totality of computer related resources like CPU, memory and I/O devices.

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**b) Multi-User Operating System:**

It is defined as a multiprogramming Operating System that support simultaneous interaction with multiple users. The multiuser support is necessary for the large company where the data remains same among various user.

The data is stored centrally in one computer called as server and all the users can access this data through the terminals called as client machines.

For example, A dedicated transaction processing system such as a railway reservation system is an example of a multiuser operating system.

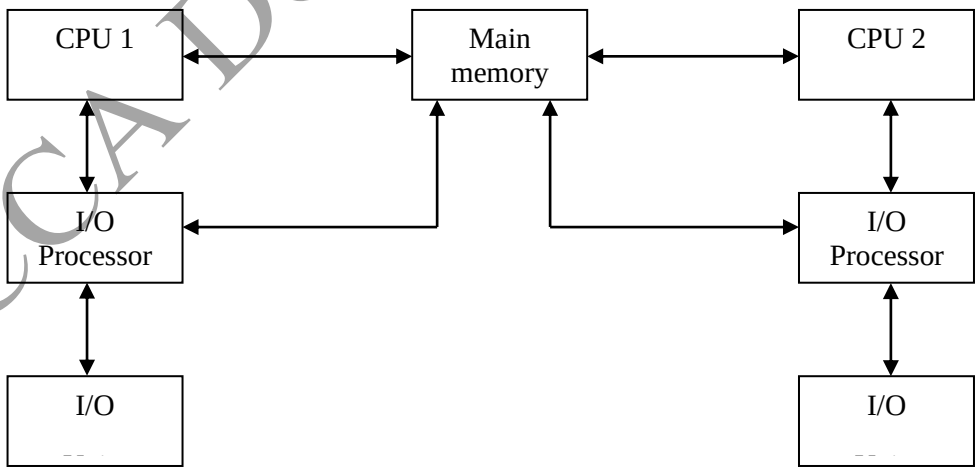
Some points to remember:

1) Dedicated means specific for one work.
2) Server is a must for multiuser environment.
3) The clients communicate only via server.
4) User authentication by user-id and password is must.
5) Protection of user's environment is must.

**c) Multiprocessing System:**

When an Operating System controls multiple processes at a time, different tasks may be performed on different processors. But all processors are controlled by one CPU only. The OS allows the multiple concurrent processes in execution states simultaneously.

1. Multiprocessing computer system means ability of a computer to utilize two or more processors for computer operations.
2. Multiprocessing is the use of two or more CPUs (microprocessor) linked together to optimize data processing.
3. In multiprocessing system
    a. More than one instruction can be executed by the CPUs at the same time.
    b. Instructions from different and independent programs can be processed at the same instant of time by different processors.
4. In multiprocessing system, each CPU performs only specific types of applications. For example, a multiprocessor be utilize for processing on-line jobs and another CPU (microprocessor) is utilize for processing only batch applications.
5. Different multiprocessing use different types of memory configuration.
6. The basic organization of a multiprocessing system is illustrated in following diagram.




**BASIC ORGANIZATION OF MICROPROCESSING SYSTEM**

**Advantages**

1. It improves the performance of computer system.
2. It provides more efficient utilization of CPU and all the other devices of computer system.
3. It provides a built in backup.
4. The complete breakdown of the system is occurred rarely due to backup facility.
5. It increases the data processing speed due to simultaneous processing of multiple CPUs

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**Disadvantages**

1. A high profile operating system is required to schedule, balance and co-ordinate the input, output and processing of multiple CPU.
2. A large main memory is required.
3. It is very expensive.

**3) Time Sharing System**

Time Sharing system is a form of multi programmed operating system which operates in an interactive mode with a quick response time. A time sharing system allows many users to simultaneously share the computer resources. Since each program takes a very small fraction of time so only small amount of CPU time is needed for each user.

1. In time sharing system, the CPU time is shares among several user programs. Each user program is allocated a very short period of time for CPU usages.
2. The short period of time during which a user program utilize the CPU is known as 'Time Slice' or 'Time Slot' or 'Quantum'. The duration of time slot is in the order of 10 to 20 miliseconds.
3. The main objective of this system is to provide a large number of users direct access to the computer for problem solving. It allows multiple users to access the single computer system. This system controls the switching of attention of the CPU among users on a time basis.
4. In time sharing , the computer switches from one job to another at a rapid rate. After processing the first user's job, it proceeds to the second and then the third and then return to first user job. This cycle continues indefinitely. The switching of jobs is so fast that the processing at any given terminal appears to be continuous.
5. In time sharing system, only one programme can be in control of the CPU at any given time.
6. The user who are using a time sharing system fall in one of the following status group,
    a. **Active :** The user's program currently has the control of the CPU.
    b. **Ready :** The user's program is ready to continue but is waiting for its turn to get the attention of the CPU, more than one user can be in ready state at a time.
    c. **Wait :** User's program is waiting for some I / O operation. In this case, more than one user can be in WAIT State.
7. The time sharing, operating system keeps only a few programs in the main memory and the rest are stored on the Disk storage the operation of transferring programs from the main memory to the disk storage and vice-versa is known as 'Swapping' or 'Roll-in Roll-Out'

**Advantages:**

1. Reduces CPU idle time.
2. Provides advantages of quick response
3. Reduce the output of paper
4. Avoids duplication of software
5. Offers computing facility to small users.
6. It increases CPU utilization by switching from one program to another in rapid sucession.

**Disadvantages:**

1. In time sharing system, there is problem of security related to user program and data.
2. Problem of reliability.
3. Problem of data communication.

**4) Parallel System:**

1. The system which uses more than one processor that shares the processing work for faster computation is called parallel processing system. In parallel processing system more than one processor can process on data and therefore, it is also termed as multiprocessing system.
2. Multiprocessing is the use of two or more microprocessor linked to optimizing data processing.

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3. In parallel processing system the use of multiprocessor increases the performance of computer system.
4. Many powerful computers such as mini, mainframe and super computer supports multiple processor and therefore they utilize parallel processing system.
5. The recent generation of PC microprocessor incorporate a measure of parallel processing by using pipelining techniques to execute more than one instruction at a time.
6. The process of executing two or more process together is called parallel execution and the system by which it performs is called 'Parallel processing system.'

**Advantages :**

a) It optimizes data processing speed because multiple processor process on data simultaneously.
b) Multiple task can be completed in short duration.
c) Deals with the demands of many input and output devices.

**5) Distributed System:**

A distributed Operating System refers to a collection of autonomous system, capable of communicating and cooperating with each other through the network are connected to each other through LAN / WAN. A distributed operating system governs such a distributed system and provides a virtual machine abstraction to its users. A distributed OS is one that looks to its users like an ordinary centralized OS but runs on multiple independent CPU. It means that the user of multiple CPUs should be invisible to the user, the resource distribution must be hidden from the users and the application programs unless required by the user.

Distributed OS often allow programs to run on several processors at the same time, thus requiring more complex CPU scheduling algorithms in order to achieve maximum CPU utilization.

**Advantages:**

1. It is mostly useful in centralized and decentralized system.
2. Computer resources are easily available to the end user.
3. It provides quick and better access to data and information which distance is the main factor.
4. It provides backup facility.
5. It allows greater flexibility in placing true computer power at the location where it is needed.

**Disadvantages:**

1. There is lack of proper security controls for protecting the confidentiality and integrity of the user programs and data.
2. There is lack of communication standard for linking different equipment in a network.
3. System reliability, response time, vendor support are the factor termed as drawback.

**6) Real Time System:**

There are many definitions of Real Time Operating System. Some of then are

"It is characterized by processing activity triggered by randomly accepted external events."

"A real time OS has a will defined, fixed time constraints. Processing must be done within the defined constraints or the system will fall. A real time system is considered to function correctly only if it returns the correct result within any time constraints."

1. Real time means immediate response from the computer.
2. A real time processing system is a transaction processing in which data are processed immediately and files get updated as soon as a transaction take place. It is also known as transaction processing.
3. A real time processing system may be described as an online processing system with secure time limitation.
4. This system requires immediate transaction input from all input terminals.
5. Real time processing usually uses terminal linked to a CPU via telecommunication lines.

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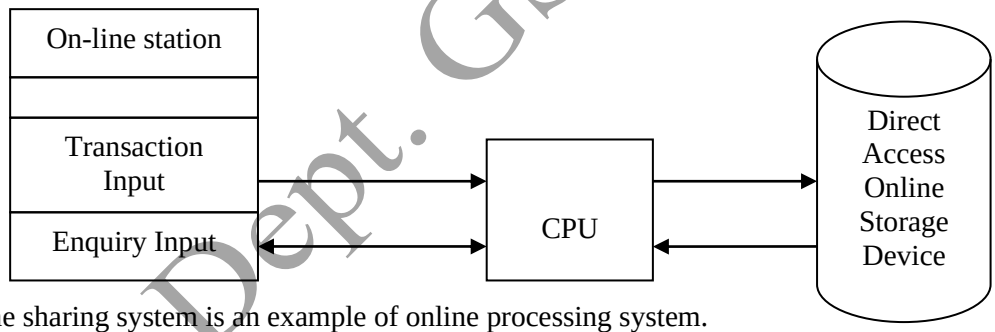
6. There are various features of real time processing system such as quick response, fast transaction, immediate updates of records.
7. The following are the applications where real time processing system is used.
    a. Airline reservation system.
    b. Air-traffic control system
    c. Reservation systems used by Hotel and Car rental agencies.
    d. Banking system
    e. Process control system as in Nuclear Reactor plants and steel mills.

   There are increase in the applications of the real time processing system because most business required a quick response system.

**7) On-line and off-line processing**

**On line processing system**

1. It is also known as 'Direct Access' or 'Random Access' processing system.
2. In online processing system, use the terminals at the points where the data are generated and these terminals are directly connected to the CPU. When the transactions are made, the data are recorded using the terminal and then directly transmitted to the CPU by telephone lines or by cables.
3. An online processing system is one where devices directly connected to CPU either for data entry or for enquiry purposes.
4. Online processing permits transaction data to be fed under CPU control directly into secondary online storage devices from the point where data created.
5. Online processing and direct access to records requires unique hardware and software.
6. Online processing system makes random and rapid input of transactions and immediate, direct access to record contents as and when needed.
7. A simplified concept of online processing is illustrated in following diagram.




8. A time sharing system is an example of online processing system.
9. Online processing facilitates the use of interactive programs, by which user can communicate with the computer during processing, so that they can be used when required to control an operation or answer a customer's enquiry.

**Off-line Processing System**

1. Off-line processing is the processing of data that is not directly under the control of the main CPU.
2. In offline processing, a terminal is used for keying in the data not directly into the CPU but onto a small cassette tape of magnetic disk. The data recorded on tape or disk then transferred at high speed in batch mode to the CPU for processing.
3. This 'Key-to-Tape' or 'Key-to-Disk' operation is known as off-line processing.
4. In off-line processing data is gathered on to the tape or disk and then transferred in batch mode to the CPU for further processing and therefore, it is more time consuming.
5. Off-line processing is used for data entry by the terminal and data (recorded) is then batched for reading CPU for further processing.
6. Minicomputers used an off-line processing where number of terminal devices are connected to a minicomputer and the data can be keyed onto tape or disk. This tape or disk can be entered into the main computer system in a batch mode and transfer to the CPU for processing.
7. In off-line processing system following off-line data entry devices are used to enter the data.

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a. KEY-TO-CARD
b. KEY-TO-TAPE
c. KEY-TO-FLOPPY
d. KEY-TO-DISK

**Popular Operating system**

**1. Unix**

Unix was develop in the early 1970s at Bell Laboratories by Ken Thompson and Dennis Ritchie for a small PDP-11 computer. It ws the first operating system to be written in a high level language, C. the normal practice until then was to use assembly language for writing operating system due to which operating systems were system dependent. That is, they were usable only on the system for which they were developed.

UNIX is an increasingly popular operating system. Traditionally used on minicomputers and workstations in the academic community, UNIX is now available on personal computers, and the business community has started to choose UNIX for its openness. Previous PC and mainframe users are now looking to UNIX as their operating system solution. This section looks at how UNIX fits into the operating system model.

The part of UNIX that manages the hardware and the executing processes is called the kernel. In managing all hardware devices, the UNIX system views each device as a file (called a device file). This allows the same simple method of reading and writing files to be used to access each hardware device.

**UNIX fundamentals**

As UNIX is designed a multiuser, shared, network operating environment UNIX has consist such as users, groups, permission an network shared resources such as files, printer other computer system. This makes UNIX a uniquely powerful and flexible operating system.

| | |
|---|---|
| **1) USERS** | : In order to make use of UNIX system you must first log in this require a user account which consist of username and password. |
| | a) **User Name**: This is your log in name and is how you are identify to system itself and other user of the system.<br>b) **Password :** Along with your user name your password grants you access to system<br>c) **Default group :** The default group that you user name belongs to.<br>d) **Contact info:** So that system administrator and other user contact you is necessary.<br>e) **Home dir:** A directory or folder assign to your user name this grants you access to disk storage this is were you will keep your files and data<br>f) **Default shell:** The programme which manages your log in and command line session. |
| **2) Groups** | : A UNIX group is a collection of user i.e. list of user name groups provide a mechanism to assign permission to a list of users all at once. For our purpose group association are typically based on which research group or area of study a user is affiliated with each user can belong to more than 1 group. |
| **3) Permission** | : Everything in UNIX is owned by both user and a group. For example, this would be files by manipulating permission the user who owns a file can define which other users and groups can read or modify that file. In this way users can secure sensitive file from praying eyes and keep themselves or others from accidently deleting important data. |
| **4) Shared resource** | : UNIX is a network operating environment as its score as such nearly everything that one can access on the local system can also be access wire. The network form remote system this includes among there possibility editing and sharing files running software or using printer or scanner even the contents of a UNIX system display can be manipulated remotely. |

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**2. MS-DOS**

MS-DOS stands for Microsoft Disk Operating System. It is a single user operating system for IBM and IBM compatible personal computer. It was introduced in 1981 Jointly by Microsoft and IBM and was the most popular operating system for personal computer in the 1980s. its popularity started in the 1990s with the launch of Microsoft Windows system.

**Essential Components of DOS**

DOS is composed of number of files you can choose to keep all of its component available on disk so that you can use all the facility it offers. Alternatively you may choose to have a minimum set up in which case not all of its feature if is available at a minimum.

There are 3 system files which you must have

1. IO.system
2. MSDOS.system
3. COMMAND.com

**DOS Version**

1. There are total six major version of DOS have been released. These version are DOS 1.0, DOS 2.0, DOS 3.0, DOS 4.0, DOS 5.0 and DOS 6.0
2. The DOS 6.22 is the latest version of DOS
3. A New version of DOS comes with every new version of Windows for eg. Window 95 have build in DOS 7.0 Version
4. The command introduced in new version are not used in previous versions.

**3. Microsoft Windows**

Windows operating system is a computer operating system developed by Microsoft corporation to run [PC] personal computer. It feature in the first graphical user interface (GUI) for IBM compatible personal computers. The windows operating system very soon dominated the PC market approximately 90% of PC's run some version of windows.

The first version of windows release in 1985 was simply a graphical user interface (GUI) offered as an extension or Microsoft existing disk operating system or window MS-DOS based in part on license concepts that apple INC had used for its machine system soft.

Windows for the first time allows DOS users to usually navigate a virtual desktop opening graphical windows displaying the contents or electronic folders and files with the click of mouse button rather than typing commands and dir path at the txt prompt (command prompt)

The highly successful XP standard was succeeded in late of 2006 by windows Vista, which experience a trouble roll out and make with considerable market place resistance quickly query a reputation for being a large, slow and resource consuming system. Responding to Vista disappointing adoption rate, Microsoft develop windows 7 and Operating system whose interface was similar to that of Vista but was made with enthusiasm for its noticeable speed improvement and its modest system requirements.

**Features of windows 95 /98 /2000 and above**

1. Windows let you view and use more than one program at a time. This is called multitasking.
2. It provides an OLE (Object Linking Embedding) facility i.e. combining various features of application into single documents.
3. Supports graphical user interface (GUI) where user doesn't require remembering commands.
4. One can perform any action in more than one way.
5. Interface all major tasks of user like e-mail, faxing, multimedia features, printing facility.
6. One can set up different users, each with his own desktop, password and other settings.
7. It gives power of Plug and Play.
8. It allows drag and drop operation.
9. User neither needs to know anything about the working of a computer, nor remember the syntax,
10. All the major operations can be performed by just a click of mouse.

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11. All windows application have similar appearance with menus, help facility and thus user finds it easy to work.
12. Windows is customizable. It is possible to change the look and feel of windows.
13. Deleted files are not actually removed from disk but are placed in a recycle bin, from which they can be recovered if necessary.
14. Windows provide various tools, utility software and entertainment programs. It provides a better multi-media support with video as well as sound being available.
15. All latest version windows retain the features of previous versions for example, windows 98 retains all the features of 95 and provides many new features.

**Differentiate between DOS and Windows**

| **DOS** | **Windows** |
|---|---|
| DOS is a single user operating system | Windows is multi user operating system |
| DOS is a character based user interface (CBI) | Windows is a Graphical User Interface (GUI) |
| In DOS mostly command are used for various types of operations | In Windows mostly graphical elements called ICON is used |
| In DOS user communicated with the operating system through written commands by use of keyboard | In Windows user communicated with the operating system through graphical element Icon and windows by use of mouse |
| DOS does not support multi tasking and multi processing | Windows support multi tasking and multiprocessing. |
| DOS does not have plug and play facility | Windows support multimedia and plug and play facility |
| In DOS, keyboard plays an important role for typing various command at the DOS prompt. | In Windows mouse plays an important role for various operation like selection, dragging and dropping. |
| To operate DOS, a command are to be remembered and therefore it is not easy to operate and learn. | Windows operating system is easy to learn and use because user does not require to memorize the commands. |
| DOS provides a command prompt from where all the operations are controlled by writing the commands. | Windows provides a Desktop from where all the operations are controlled by selecting the icons. |
| Example of DOS operating system is MS-DOS | Examples of windows operating system are Win 98, win 2000, win XP, win Vista, Window 2007 etc. |

**Mobile Operating System**

The operating system which operates a mobile device is called mobile operating system.

A mobile operating system is software that allows smart phones, tablet PCs and other devices to run applications and program.

A mobile operating is an operating system for smart-phones tables, PDAs or other mobile devices. The mobile operating system are categories as under.

**1)** Symbian OS
**2)** Android OS
**3)** iphone OS (IOS)
**4)** BlackBerry OS
**5)** Windows

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