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## Assignment - Operating Systems

- ① Write a note on Evolution and generation of an operating system.

→ The evolution of operating System is directly dependant on the development of computer System and how users use them. operating systems have evolved from slow and expensive systems to present-day technology where computing power has reached exponential speeds and relatively inexpensive costs.

There are 4 generation of operating Systems.

- ① The 1st Gen. (1945-55) : Vacuum Tubes & plugboard

These early computers were designed, built and maintained by single group of people. programming languages were unknown and there were no operating systems so all the programming was done in machine language.

By the 1950's punch cards were introduced and this improved the computer System. instead of using plugboard, programs were written on cards and read into the System.

- ② The 2nd Gen. (1955-1965) - Transistors and Batch system.

Transistors led to the development of the computer systems that could be manufactured and sold to paying customers. These machines were known as mainframes and were locked in air conditioned computer rooms with staff to operate them.

③ 3<sup>rd</sup> Gen. - 1965-80 - Integrated circuit Multi programming  
Until the 1960's there were two types of computer system i.e. the scientific and commercial computers. There were combined by IBM in the System 136. This used integrated circuits and provide a major price and performance advantages over the 2<sup>nd</sup> gen. systems.

It also introduced multiprogramming. This meant that the processor was not idle while a job was completing its I/O operation.

④ 4<sup>th</sup> Gen. (1980 - Present day) Personal Comp.

Personal computers were easy to create with the development of large-scale integrated circuit. These were chips containing thousand of transistors on a square centimeter of silicon. Because of these microcomputers were much cheaper than minicomputers and that made it possible for a single individual to own one of them.

PC led to the growth of networks. This created network operating system and distributed operating systems. The user's were aware of a network while using a network operating system & could log into remote machines & copy files from one machine to another.

(2) Describe Operating System in detail.

→ An operating system (OS) is system software that manages computer hardware, software resources and provides common service for comp. programs. Time-sharing operating system schedule tasks for efficient use of the system and may also include accounting software for cost allocation of processor time, mass storage printing and other resources. For hardware fun such as I/O & memory allocation the operating system act as an intermediary betw' programs & the computer hardware.

The dominant general-purpose desktop operating system is Microsoft Windows with a market share of around 76.45%, Mac OS by Apple in 2<sup>nd</sup> place 17.72% & Linux 1.73%. In 3<sup>rd</sup> position. In mobile sector Android share is up to 72% in the year 2020.

There is some type's of OS

- 1) Single-tasking & Multi-tasking.
- 2) Single & Multi-user
- 3) Distributed
- 4) Embedded
- 5) Real time
- 6) Library

⑧ List the different types and functions of an operating System

→ Following are the popular types of OS

- 1) Batch OS
- 2) Multitasking / Time sharing OS
- 3) Multiprocessing OS
- 4) Real time OS
- 5) Distributed
- 6) Mobile OS
- 7) Network OS

#### Function of OS

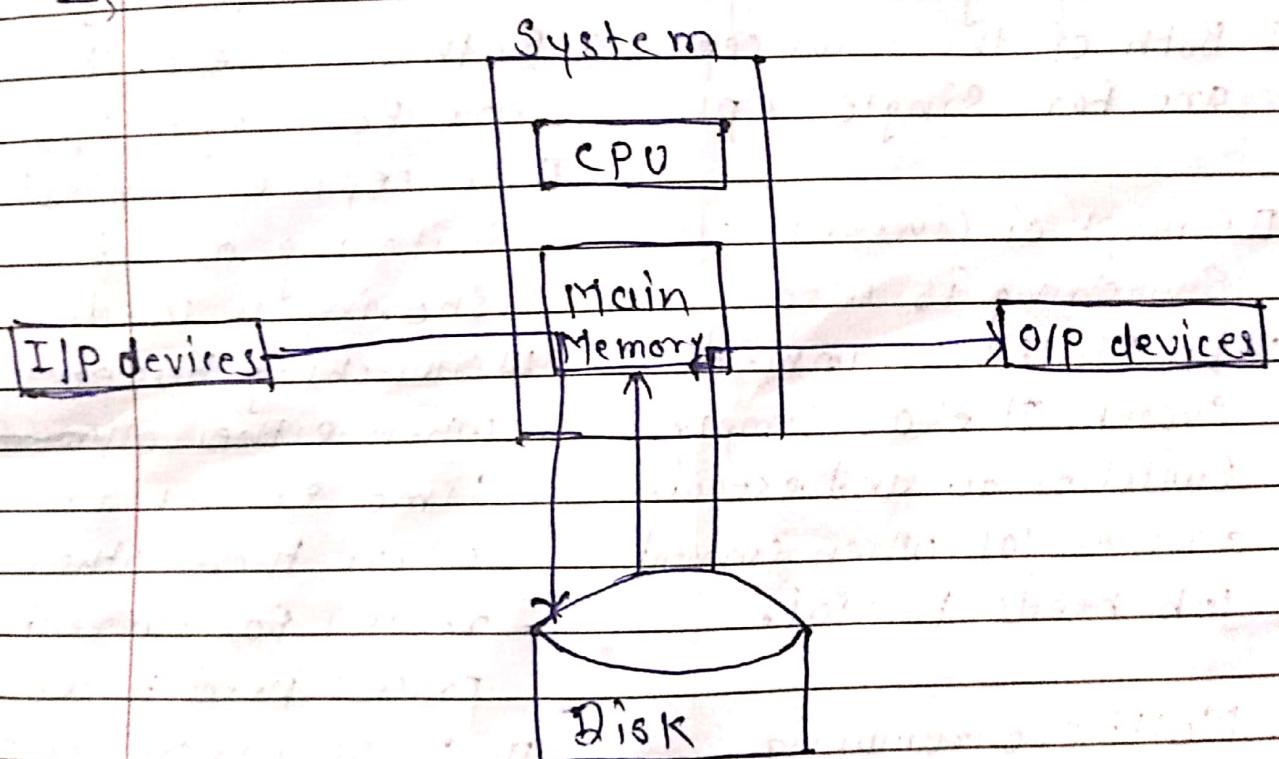
- 1) Memory Management
- 2) Processor Management
- 3) Device - II -
- 4) File - II -
- 5) Security
- 6) Job accounting
- 7) Error detecting aids
- 8) Control over system performance

⑨ What do you mean by Batch Processing System? Explain

→ Batch processing is process by which a computer completes batches of job, often simultaneously in nonstop, sequential order. It's also a command that ensures large jobs are computed in small parts for efficiency during the debugging process.

For large enterprises, batch processing became a normal way of data compilation organization and report generation around the middle of the 20th century with the introduction of the mainframe computer. The early mechanics of processing a batch involved feeding a computer a stack of punched cards that held commands or directions, for the computer to follow.

### Q) Describe Spooling with diagram



Spooling is a process in which data is temporarily held to be used and executed by a device, program or the system.

Spooling works like a typical request queue or spool where data, instructions & processes from multiple sources are accumulated for execution later on.

Generally, the Spool is maintained on the computer's physical memory buffers or the I/O device-specific interrupts. Then on the basis of a FIFO algorithm.

The most common implementation of Spooling can be found in I/O devices such as the keyboard, mouse, printer.

Q) State the difference b/w multiprogramming and Multitasking.

→ Multiprogramming

I Both of these concept are for single CPU

II Concept of context switching is used

III In Multiprogrammed system the OS simply switches to and execute another job when current job needs to wait

IV Multi-programming increase CPU utilization by organising jobs

V The idea is to reduce the CPU idle time for as long as possible

Multitasking

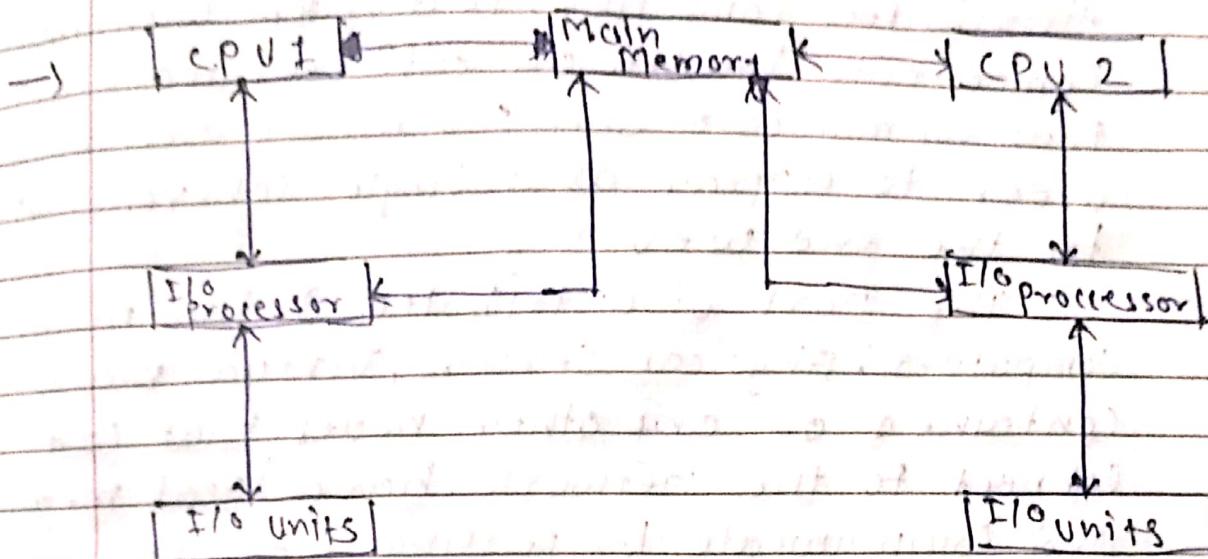
I Both of these concept are for single CPU  
II Concept of Context switching and time sharing is used.

III Switching happens when either allowed time expires or where there other reason for current process need to wait

IV It also increases CPU utilization it also increase responsiveness

V The idea is to further extend the CPU utilization concept by increasing responsiveness time sharing.

Q) With the help of dig explain Multiprocessor Systems (parallel)



Multiprocessor System Supports the processes to run in parallel. Parallel processing is the ability of CPU to simultaneously process incoming jobs. This becomes most important in Computer system as the CPU divides and conquers the jobs.

It refers to the use of two or more central processing units within a single computer system. These multiple CPU's are in close communication sharing the computer bus memory and other peripheral devices. It is based on the symmetric multiprocessing model, in which each processor runs an identical copy of operating system.

① Write a short note on Distributed Systems.

→ A distributed system, also known as distributed computing, is a system with multiple components located on different machines that communicate and coordinate actions in order to appear as a single coherent system to the end user.

The part of distributed system may be computers, physical servers, virtual machines, containers or any other nodes that can connect to the network have local memory and communicate by passing message.

There are two general ways that distributed systems function:

- I) Each machine works toward a common goal and the end-user views results as one cohesive unit.
- II) Each machine has its own end-user and the distributed system facilitate sharing resources or communication service.

Concurrently, there is no global clock and all components fail independently of each other.

② What do you mean by Worst Case Response Time? Explain

→ The non-preemptive nature of subjobs may cause blocking of a task by at most one low priority task under FFDs. The maximum blocking of task  $T_i$  by a lower priority task is equal to the longest computation time of any subjob of a task with a priority lower

than task  $T_i$ , which is given by.

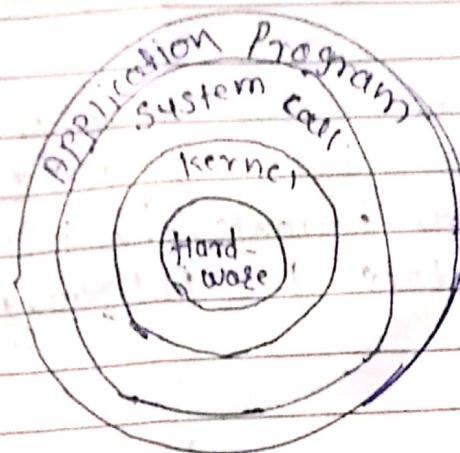
$$B_i = \max_{j > i} \max_{1 \leq k \leq m(j)} c_{j,k}$$

To determine worst case response time under FPPS and arbitrary phasing, we have to revisit critical instants. In this paper, we merely postulate the following conjecture.

10 State the difference between Time sharing System and Real time system

- | → Time sharing  | Real time   |
|---|---|
| I) In time sharing system quick response is emphasized for a request  | II) In Real time computation tasks are emphasized before its nominative point |
| III) Switching Method /Fun" is available                              | IV) Switching Method /fun" is not available                                   |
| V) Modification in the program can be possible                        | VI) Modification does not take place.   |
| VII) Resources are shared to the external                             | VIII) Resources are not shared to the external                                |
| VII) it deal with more than processes or applications simultaneously. | IX) It deal with only one process or appn at a time.                          |

11) With the help of dig describe UNIX layered structure.



The Unix operating system (OS) consist of kernel layer, shell layer and utilities and applications layer

Kernel layer:-

The Kernel layer is the heart of the unix OS. it is a software application that provides the interface between the hardware and the user. It handle the process, memory, file device and network management for the operating system. The kernel is responsible for ensuring that all system and user tasks are performed correctly.

Shell:-

The shell is the program that sits between the user and the kernel. it is the interpreter that translates the commands that are typed into the terminal session.

Users can type commands directly into the terminal or they can create a text file containing a series of commands that can be sent to the shell. The series of commands are called a shell script.

Utilities and application :-

The first layer of the Unix OS is the utilities and application layer. This layer includes the commands, word processor, graphic programs and database management programs. Traditionally, these programs were accessed by typing the commands to start the program on the command line. They can still be accessed in this way, but they can now also be accessed through the GUI.

(12) Explain Ms-dos layer structure and its layered Approach.

→ Ms - Dos operating system is split into various layers and each of the layers have different functionalities.

Application program

These programs perform a particular function directly for the users. In other words, these programs provide an application to the end users, so they are known as application programs.

## System programs:-

The system programs are used to program the operating system software while application programs provide software that is used directly by the user. System programs provide software that is used by other systems.

## MS-DOS device drivers:-

Most of the device driver on MS-DOS are part of the operating system such as keyboard and screen console drivers, floppy and hard-disk drivers, printer port driver, serial port driver etc.

## ROM BIOS device drivers

The BIOS drivers are the programs stored in the EPROM or EEPROM memory chips on the motherboard. These are the basic drivers needed to start the comp. System BIOS stand for Basic I/O System

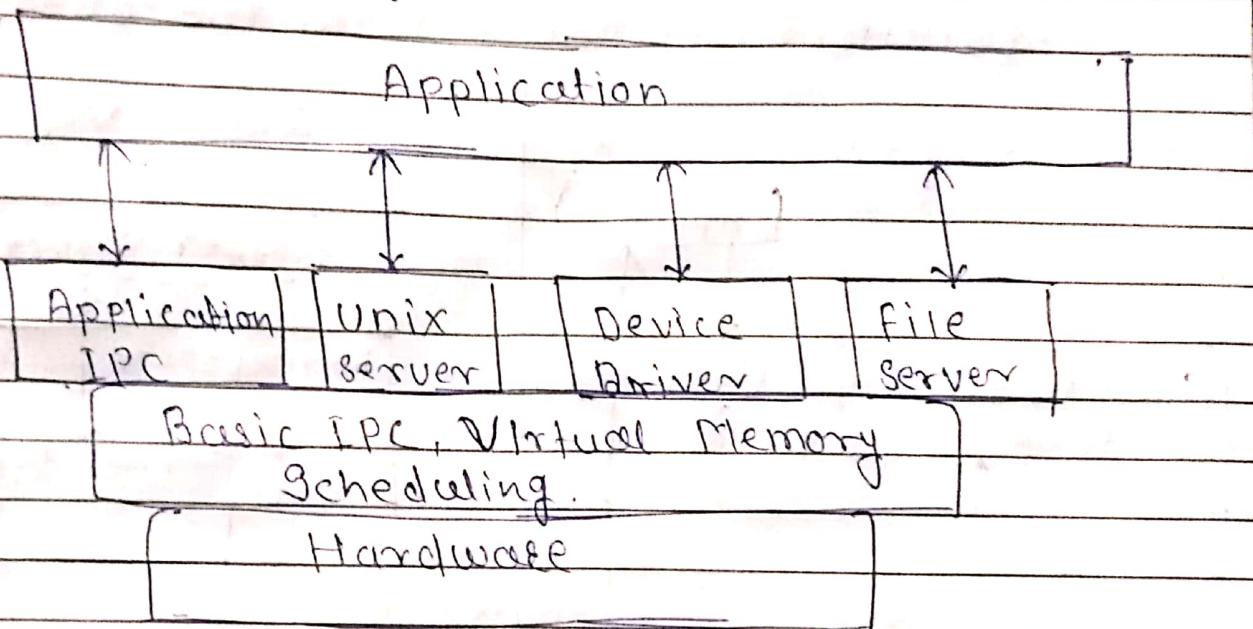
## Layered Approach

This approach breaks up the operating system into different layers

- This allows implementers to change the inner workings & increase modularity
- As long as the external interface of the routines don't change, developer have more freedom to change the inner workings of the routines.

- In with the layered approach the bottom layer is the hardware while layer the highest layer is user interface.

- ③ Discuss Microkernel in detail and draw the diagram for same.

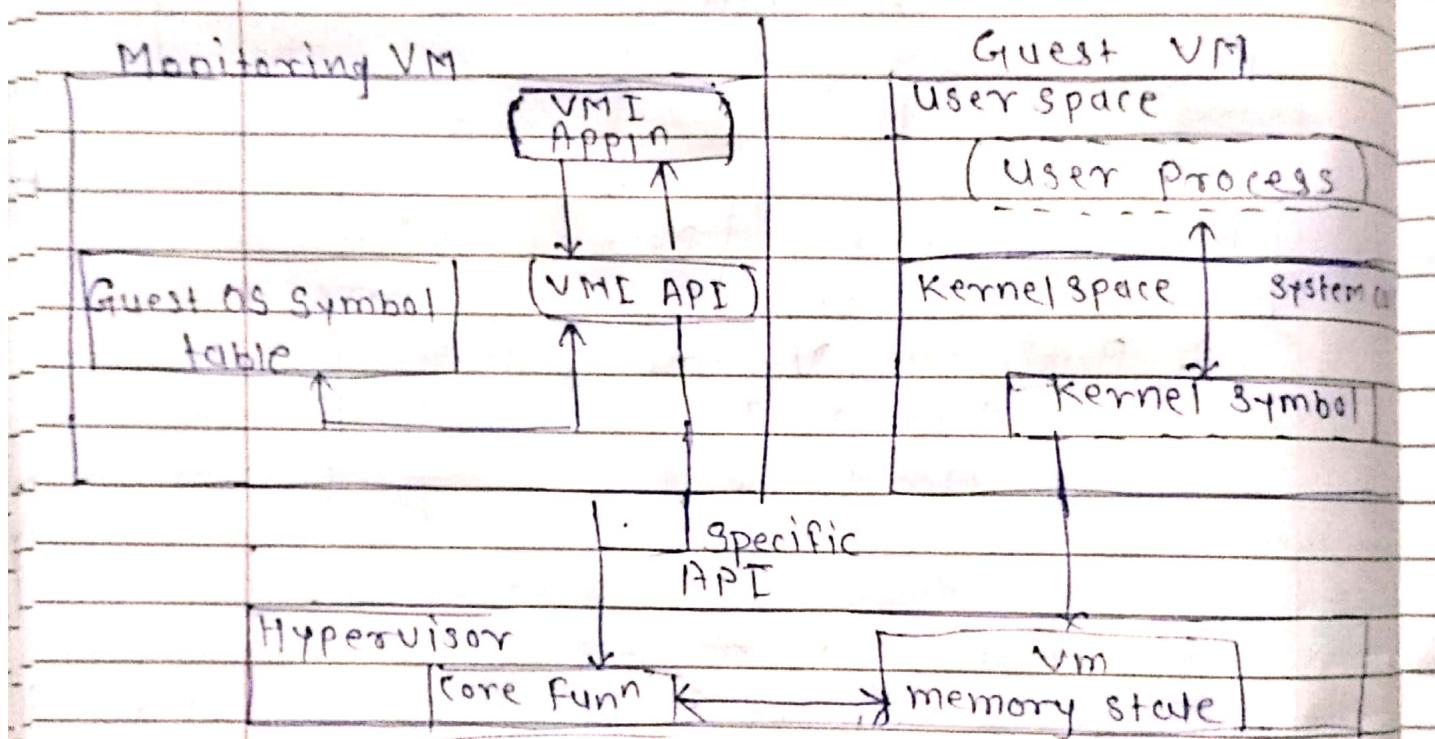


Microkernel is a software or code which contains the required minimum amount of fun<sup>n</sup> data and feature to implement an operating system. It provides

A microkernel is the most important part for correct implementation of an OS. You can see in the dig. that microkernel fulfills basic operations like memory process scheduling mechanism and inter-process communication. The important functionality of the OS are removed from the kernel-mode and run in the user mode. These fun<sup>n</sup> may be device drivers application, file server, interprocess communication etc.

Q14 What do you mean by virtual machine? Explain with the help of diagram.

→ A virtual Machine (VM) is a computer resource that uses software instead of physical computer to run program and deploy apps. It runs its own OS & functions separately from the other VM.



Multiple virtual machines can run simultaneously on the same physical computer for servers. In the multiple operating system run side by side with a piece of software called a hypervisor to manage them, while desktop computers typically employ one operating system to run other OS within its program window. Each virtual machine provides its own virtual hardware including CPU's, memory, hard drives, network interfaces, and other devices.

① Write a note on System Boot

- ) Booting the system is done by loading the Kernel into main memory and starting its execution.

The CPU is given a reset event and instruction register is loaded with predefined memory location where execution starts.

The initial bootstrap program is found in the BIOS read-only memory. This programming can run diagnostics, initialize all components of the system, loads and starts the operating system loader.

When the OS starts, it sets up needed data structures in memory, sets several registers in the CPU and then creates and starts the first user level program. From this point, the OS only runs in response to interrupts. See CPU Response to Interrupts.

⑥ State and explain different services offered by OS

- ) An OS provides services to both the user and to the programs.

Services -

I) Program execution

A process includes the complete execution context (code to execute, data to manipulate, registers, OS resources in use). Following are the major activities of an OS w.r.t. program management.

Adds a program into memory

Executes the program

- Handles program's execution
- provide a mechanism for process synchronization
- provide a mechanism for deadlocks handling.

### III) I/O operation

An I/O Subsystem comprises of I/O devices and their corresponding driver software. Drivers hide the peculiarities of specific hardware devices from the users.

An OS manages the communication between user & device driver

- op. os provides the access to the required I/O device when required

### III) File System manipulation

A file represents a collection of related information. Computers can store files on the disk for long term storage purpose.

A file system is normally organized into directories for easy navigation and usage. These directories may contain files and other directories.

major activity of os w.r.t. to file management

- program needs to read a file or write file
- The OS gives the permission to the program for operation on file
- permission varies from read-only read-write denied and so on.

#### IV) Error Handling.

Errors can occur anytime and anywhere. An error may occur in CPU, in I/O devices or in the memory hardware. Following are the major activities of an OS w.r.t. to error handling.

- The OS constantly checks for possible errors.
- The OS takes an appropriate action to ensure correct and consistent computing.

#### V Resource Management.

In case of multi-user or multi-tasking environment, resources such as main memory, CPU cycles and file storage are to be allocated to each other user or job.

Major activities w.r.t. to resource management.

- The OS manages all kinds of resources using Schedulers.
- CPU Scheduling algorithms are used for better utilization of CPU.

#### VI Protection

It is way to control access of programs, processes or users to the resources defined by a computer system.

Major Activities w.r.t. to protection.

- The OS ensures that all access to System resources is controlled.
- The OS ensures that external I/O devices are protected from invalid access attempts.

(P7) What do you mean by System call?

→ System call is a mechanism that provides the interface between a process and the OS. It is a programmatic method in which a computer program requests a service from the kernel of the OS. System call offers the services of the OS to the user programs via API (Application programming interface). Calls are the only entry points for the kernel system.

There are some types of system calls:

- 1) Process control
- 2) File Management
- 3) Device Management
- 4) Information Maintenance
- 5) Communications.

(P8) List the adv. of distributed OS

- 
- 1) Failure of one will not affect the other network communication as well. Systems are independent from each other.
  - 2) Electronic mail increases the data exchange speed.
  - 3) Since resources are being shared, computation is highly fast & durable.
  - 4) Local on host computer reduces delay in data processing.
  - 5) Delay in data processing reduced.

(19)

Give any two benefits of Linux OS.

- I) Open Source - As it is open source, its source code is easily available
- II) Security - The Linux security feature is the main reason that is the most favorable option for developers.

(20)

Explain Multiprocessor System with advantages.

→ The multiprocessor is a computer system with two or more (CPUs) shares full access to a common RAM.

At the OS level multiprocessing is sometimes used to refer to the execution of multiple concurrent processes in a system with each process running on a separate CPU or core, as opposed to a single process at any one instant.

Advantages:

- I) Increased Throughput - By increasing the number of processors, more work can be completed in a unit time.
- II) Cost Saving - parallel system share the memory buses, peripherals etc. Multiprocessor system thus saves money as compared to multiple single systems.
- III) Increase Reliability - in this system, as the workload is distributed among several processors which results in increased reliability, if one processor fails then its failure may slightly slow down the speed of the system but system will work smoothly.

(21) What is Virtual Machine? Give two ex of virtual machine. List any three.

→ A virtual machine is a computer resource that uses software instead of a physical computer to run programs and deploy apps...

### Types of Virtual Machines

- I) Windows VM
- II) Android VM
- III) Mac VM
- IV) iOS VM

### Ex. of Virtual Machines

I) VMware : It's run both on the windows os & linux os

II) virtual Box : It's run on windows Mac and linux os

(22) Benefits of Virtual Machine

→ They allow multiple OS environments to exist simultaneously on the same machine

They empower users to go beyond the limitations of hardware to achieve their end goals

Using VMs ensures application provisioning, better availability, easy maintenance and recovery.

(23) What is OS? Explain 4 OS Services

→ An operating system is system software that manages computer hardware, software resources and provide common services for computer program.

### OS Services

I) Error handling

Error can occur any time and anywhere. An error may occur in CPU, in I/O devices or in the memory hardware.

II) protection

It is a way to control the access of program processes, or user to the resources defined by a computer system.

III) communication

The OS handles routing and connection strategies and the problems of contention and security.

IV) file system manipulation

A file system is normally organized into directories for easy navigation and usage. These directories may contain file and other directories.

(24) Write short note on buffering

→ A buffer contains data that is stored for a short amount of time typically in the computer's memory (RAM). The purpose of a buffer is to hold data right before it is used. ex. when you download an audio or video file from the internet, it may load the 1st 20% of it into a buffer.

and then begin to play. While the clip plays back, the computer continually downloads the rest of the clip and stores it in the buffer.

Buffering is used to improve system performance in other areas of computer performance as well most hard disks use a buffer to enable more efficient access to the data on the disk.