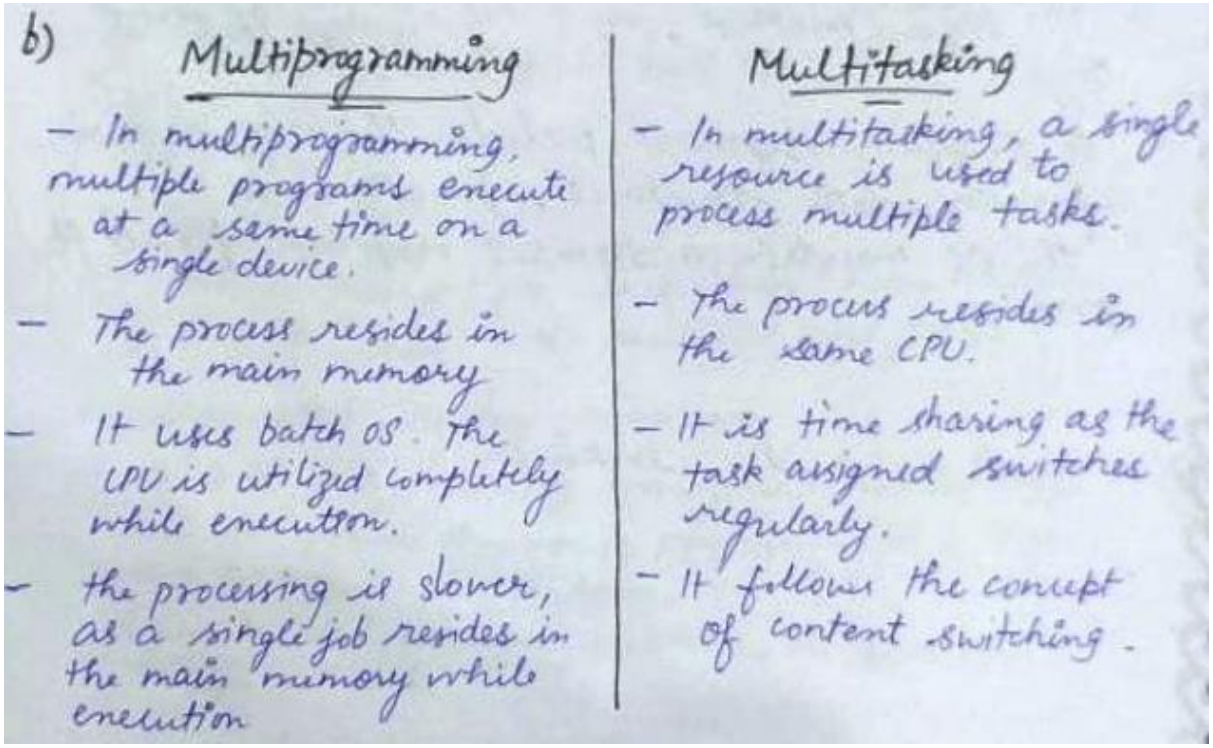
- OS- an operating system is a collection of software that manages computer hardware resource and provide common service for computer program.
- Time sharing OS- is one of the important type of system.it enable many people located at various terminals , to use a particular computer system at the same time. processors time is shared among multiple users Simultaneously Is termed as timesharing.
- Multiprogramming and multitasking



b)

Multiprogramming	Multitasking
– In multiprogramming, multiple programs execute at a same time on a single device.	– In multitasking, a single resource is used to process multiple tasks.
– The process resides in the main memory	– The procus resides in the same CPU.
– It uses batch os. The CPU is utilizid completely while execution.	– It is time sharing as the task assigned switches regularly.
– the processing is slower, as a single job resides in the main memory while execution	– It follows the concept of content switching.

- Function of OS

1. Security
2. Error detecting
3. Control over system performance
4. Memory management
5. Processor management
6. File management
7. Device management
8. Coordination of software and users.

- Real time OS- Are using environments where A large number of events Mostly eternal to the computer, Must be accepted and processed in a short time or within deadlines.
- With RTOS The processing time is measured in length of second this system is time bound and has a finite deadline.

- Thread is a part of execution within a process a process can be contained multiple threats it also known as lightweight process.

- Fragmentation

1. Fragmentation is unwanted problem in an operating system in which the processes are loaded and unloaded from memory space and tree memory space is fragmented.
2. Processes can't be assigned to memory blocks due to their small size and the memory blocks stay unused.
3. it is also necessary to understand that as program All loaded and deleted from memory.

   Types of fragmentation

   1) Internal fragmentation
   2) External fragmentation

=>Internal fragmentation- When a process is allocated to a memory block and if the process is smaller than the amount of memory requests a free space is credited in the given memory block. due to this the free space of the memory block is unused which causes internal fragmentation.

=> External fragmentation- It happens when a dynamic memory allocation method allocated some memory but leaves a small amount of memory unusable. The quantity of available memory is sustainability reduce If there is too much external fragmentation.

- Memory management

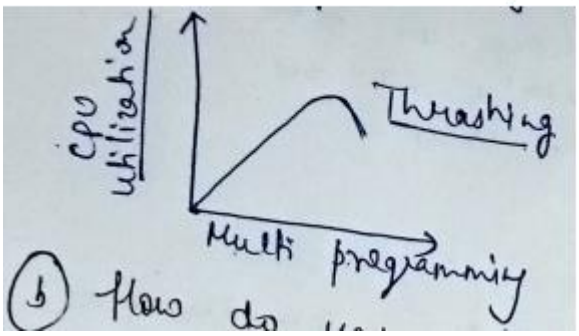
1. Memory is the important part of a computer system that is used to store the data. Its management is Critical To the computer system because the amount of main memory available in computer system is very limited.

2. Memory management is used to keep track of the status of a memory location whether it is free or allocated.
3. It permits computer with a small amount of main memory is execute Programs larger than the size of available memory.
4. It is responsible for protecting the main memory allocated to each process from being corrupted.
5. It enables sharing of memory space between processes.

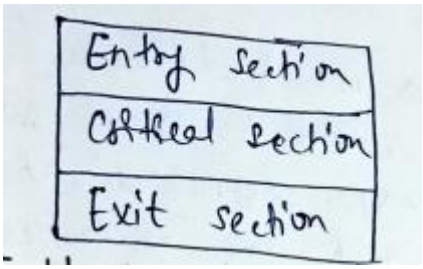
TYPES

1. Single contiguous allocation- It is easiest memory management. In this all type of computers memory except a small portion is which reserve for the OS is available for one application.
2. Paged memory management- This method divides the computers main memory into fined seized page frames.
3. Segmented memory management- this method does not provide the user program with a liner and contiguous address space.
4. Partitioned allocation- It divides primary memory into various memory partition, Which is mostly contiguous area of memory.

- Thrashing- Is a condition In which excessive paging operation are taking place. Thrashing occurs when a computer's virtual memory is overused.



- Critical section problem- Critical section is a problem is make sure that only one process should be in a critical section problem. When the process is in the critical section no other problem are allowed to enter the critical section problem.

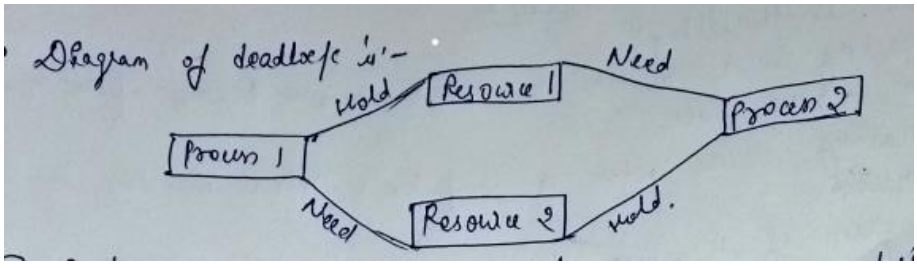


- **Starvation**-
    1. starvation if a process is indefinitely postponed.
    2. Start vessel is also called indefinitely blocking.
    3. Salvation occured due to poor scheduling algorithm.

- **Deadlock**- A deadlock is a situation where a set of processes are blocked because each process is holding a resource and waiting for another resource acquired by some other process.

  There are four major condition of deadlock

    1. Mutual Exclusion: Two or more resources are non-shareable (Only one process can use at a time)
    2. Hold and Wait: A process is holding at least one resource and waiting for resources.
    3. No Preemption: A resource cannot be taken from a process unless the process releases the resource.
    4. Circular Wait: A set of processes waiting for each other in circular form.



Handling the deadlock

Prevention: - Design such protocols that there is no possibility of deadlock.

• **Avoidance:** - Try to avoid deadlock in run time so ensuring that the system will never

enter a deadlocked state.

• **Detection**: - We can allow the system to enter a deadlocked state, then detect it, and

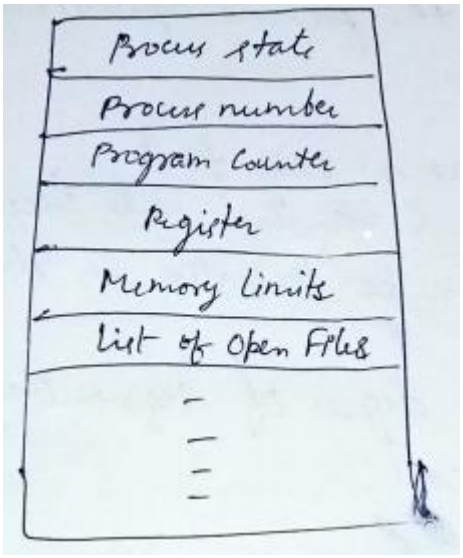
recover.

• **Ignorance**: - We can ignore the problem altogether and pretend that deadlocks never occur in the system.

- Scheduling- Scheduling is the process of Removing an active task from the processor of replacing it with a new one.
  Scheduling decide a procedure into states.
  1. Ready
  2. Writing
  3. Running

- PCB

1. Process control block Is a date Structure that contains Information of the process related to it.
2. The process control Block is also known as the task control block. Entry of the process table etc.
3. It is very important for process management as the data structuring for process is done in terms of PCB.
4. It also defines the current state of the operating system.



- Process and its states

1. Process is a program in execution And it is more than a program code called as tent section and this concept works under all the operating system because all the tasks performed by the operating system need a process to perform a task.

Each process have following state

- New- The process is being created.
- Running- The instruction are being executed.
- Waiting- Waiting until an event like I/O operation.
- Ready- The process is assigned to a processor.
- Terminated- The process has finished execution.

- Paging-

1. Paging is storage mechanism that allows OS to retire processes from the secondary storage into the main memory in the form of pages.
2. The main memory is divided into small fix size blocks of physical memory which is called frame.
3. Paging is used for faster access to data, And it is a local concept.
4. Paging allows the physical address space of a process to be non-contigunous

- Segmentation-

1. Segmentation method works call more similar to paging. The only difference between the two is that Segments are of variable length, where's the paging method pages are always for fix sized.
2. A program segment includes the program main function, data structure, function etc.
3. The OS Maintain a segment map table for all the process.

- **Buffering**- A buffer is a memory area that stores data being transferred between two devices or between a device and an application.

- **Types of devices-** The OS peripheral devices can be categorized into 3: Dedicated, Shared, and Virtual. The differences among them are the functions of the characteristics of the devices as well as how they are managed by the Device Manager.

- **Dedicated devices:-**
- Such type of devices in the **device management in operating system** are dedicated or assigned to only one job at a time until that job releases them. Devices like printers, tape drivers, plotters etc.
- **Shared devices:-**
- These devices can be allocated for several processes. Disk-DASD can be shared among several processes at the same time by interleaving their requests.
- **Virtual Devices:-**
- These devices are the combination of the first two types and they are dedicated devices which are transformed into shared devices. For example, a printer converted into a shareable device via spooling program which re-routes all the print requests to a disk.

Storage Devices

There are two types of storage devices:-

- **Volatile Storage Device –**
  It losses its contents when the power of the device is removed.

- **Non-Volatile Storage device –**
  It does not losses its contents when the power is removed. It holds all the data when the power is removed.

- **Volatile device**-

  1. Is type of memory data lost when powered off
  2. Memory stores temporarily
  3. It is faster than non-volatile
  4. Ram is example of vola
  5. Can read or write
  6. Has less storage capacity

  Non-Volatile device-

  1. Is type of memory data stored when powered off
  2. Memory stores permanently
  3. It is slower than volatile
  4. Rom is example of vola
  5. Only read
  6. Has high storage capacity

Disk Scheduling Algorithms

On a typical multiprogramming system, there will usually be multiple disk access requests at any point of time. So those requests must be scheduled to achieve good efficiency. Disk scheduling is similar to process scheduling. Some of the disk scheduling algorithms are described below----

- process scheduling

Process Scheduling is the process of the process manager handling the removal of an active process from the CPU and selecting another process based on a specific strategy.

Process Scheduling is an integral part of Multi-programming applications. Such operating systems allow more than one process to be loaded into usable memory at a time and the loaded shared CPU process uses repetition time.

- CPU scheduling

1. Scheduling of processes/work is done to finish the work on time. CPU Scheduling is a process that allows one process to use the CPU while another process is delayed (in standby) due to unavailability of any resources such as I / O etc, thus making full use of the CPU.
2. The purpose of CPU Scheduling is to make the system more efficient, faster, and fairer.
3. Whenever the CPU becomes idle, the operating system must select one of the processes in the line ready for launch.
4. The selection process is done by a temporary (CPU) scheduler.
5. The Scheduler selects between memory processes ready to launch and assigns the CPU to one of them.
6. # Virtual Memory
7.
8. It is a virtual resource of a computer. It is an illusion that a computer system possesses more memory that is actually having. This illusion makes a process independent of the size of real memory (main memory). It also permits a large number of processes to share a computer system without constraining each other.

Demand Paging

In Demand paging, a page is brought into the memory for its execution only when it is demanded, otherwise it is remained in backing storage disk The name seems to have been derived from demand feeding- a policy used for feeding the baby by mothers in which the food is given to the baby only when he cries for it

Advantages:

1. Reduced memory requirement.
2. Swap time is also reduced.
3. Increase degree of multiprogramming.