# OS Viva

### Kernel

The kernel is a computer program at the core of a computer's operating system and has complete control over everything in the system.

The Instructions that can run only in Kernel Mode are called Privileged Instructions .

### User Mode

The User mode is normal mode where the process has limited access. While the Kernel mode is the privileged mode where the process has unrestricted access to system resources like hardware, memory, etc.

### Zombie Process

A process in Unix or Unix-like operating systems becomes a zombie process when it has completed execution but one or some of its entries are still in the process table

### Asymmetric Multiprocessing

An asymmetric multiprocessing system is a multiprocessor computer system where not all of the multiple interconnected central processing units are treated equally.

### Symmetric Multiprocessing

In symmetric multiprocessing, all the processors are treated equally.

### CPU Scheduling

CPU Scheduling is a process of determining which process will own CPU for execution while another process is on hold.

### Process Control Block

A process control block (PCB) is a data structure used by computer operating systems to store all the information about a process.

**Preemptive Scheduling**

In preemptive scheduling, the CPU is allocated to the processes for a limited time whereas, in Non-preemptive scheduling, the CPU is allocated to the process till it terminates or switches to the waiting state.

**Note:**

- The only way an user space application can explicitly initiate a switch to kernel mode during normal operation is by making an system call such as open, read, write etc.
- All processors communicate with another processor by a shared memory.
- The ready queue is a queue of all processes that are waiting to be scheduled on a core/CPU.
- Heap is used for dynamic memory allocation
- Multiprogramming OS – the CPU is never kept idle
- Multiprogramming OS and CPU scheduling to perform quick switches between jobs.
- Real-Time OS are usually built for dedicated systems to accomplish a specific set of tasks within deadlines.
- An Operating System can be defined as an interface between user and hardware.
- In computing, a system call is a programmatic way in which a computer program requests a service from the kernel of the operating system on which it is executed

**Types of OS**

- Batch OS
- Multiprogramming OS
- Multitasking OS
- Time Sharing OS
- Real Time OS

### Sleep vs Wait

The major difference is to wait to release the lock or monitor while sleep doesn't release any lock or monitor while waiting. Wait is used for inter-thread communication while sleep is used to introduce pause on execution.

### Paging

The physical memory is divided into equal sized frames. The main memory is divided into fixed size pages. The size of a physical memory frame is equal to the size of a virtual memory frame.

### Advantages of Paging

- Paging mainly allows to storage of parts of a single process in a **non-contiguous fashion**.
- With the help of **Paging, the problem** of external fragmentation is solved.
- Paging is one of the simplest algorithms for memory management.

## Disadvantages of Paging

- In Paging, sometimes the page table consumes more memory.
- Internal fragmentation is caused by this technique.
- There is an increase in time taken to fetch the instruction since now two memory accesses are required.

### Fragmentation

Fragmentation is a phenomenon of memory wastage. It reduces the capacity and performance because space is used inefficiently.

1. **Internal fragmentation**: It occurs when we deal with the systems that have fixed size allocation units.
2. **External fragmentation**: It occurs when we deal with systems that have variable-size allocation units

## Semaphore

Semaphore is a protected variable or abstract data type that is used to lock the resource being used. The value of the semaphore indicates the status of a common resource.
There are two types of semaphores:
**Binary semaphores** (Binary semaphores take only 0 and 1 as value and are used to implement mutual exclusion and synchronize concurrent processes.)
**Counting semaphores** (A counting semaphore is an integer variable whose value can range over an unrestricted domain. )

## Memory Management

In a multiprogramming computer, the operating system resides in a part of memory and the rest is used by multiple processes. The task of subdividing the memory among different processes is called memory management.

## Process Synchronization

Process synchronization problem arises in the case of Cooperative process also because resources are shared in Cooperative processes.

## Convoy Effect

Convoy Effect is **phenomenon associated with the First Come First Serve (FCFS) algorithm**, in which the whole Operating System slows down due to few slow processes. ... This property of FCFS scheduling leads to the situation called Convoy Effect.