[L:-4]

* Components of Operating System.

• There are two types of components :-
① Kernel , ② User Space.

① User Space :- Where application software runs & no hardware access.

② Kernel :- Heart of OS, very first part of OS to load on start-up. It directly interacts with the hardware and performs the most crucial tasks.

• There are two types of user space :-
ⓐ GUI (Graphical user Interface) :- Clicking of mouse on the screen.

ⓑ CLI (Command line Interface) :- Writing commands on command line or Shell.

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* Function of Kernel

① **Process management:-**
- Scheduling processes & threads.
- Creating and deleting both user & system process.

② **Memory management:-**
- Allocating & deallocating memory space.
- Keeping track of which part of memory is being currently used and by which process.

③ **File management:-**
- creating and deleting files.
- Creating & deleting directories.
- Mapping files into secondary storage.

④ **I/O management:-**
Manage I/O operations and I/O devices.

ⓐ **Spooling:-** Print spooling & mail spooling.

ⓑ **Buffering:-** Youtube buffering.

ⓒ Caching :- Memory cache.

* **Note:-**

Print spooling:- like we have give 10 pages to print but printer prints one pages per minute, so it will store the data of 10 pages it in.

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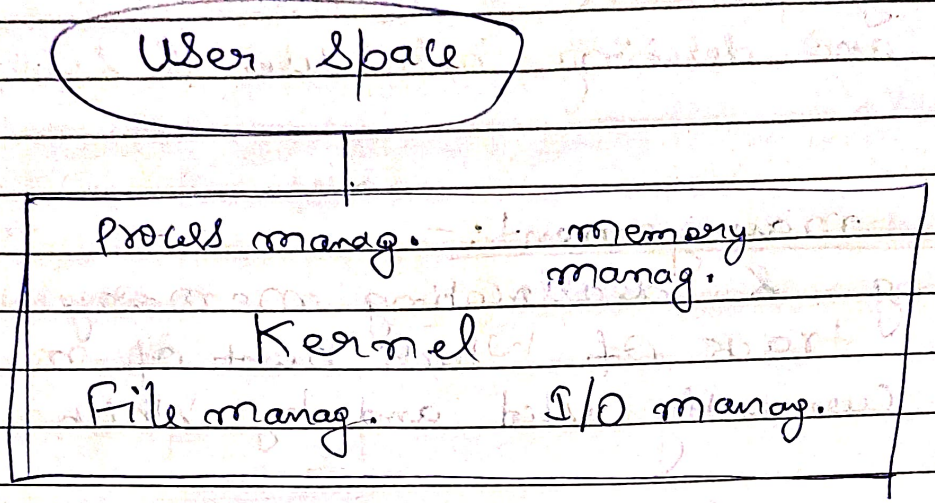
* Types of kernel

(1) Monolithic kernel

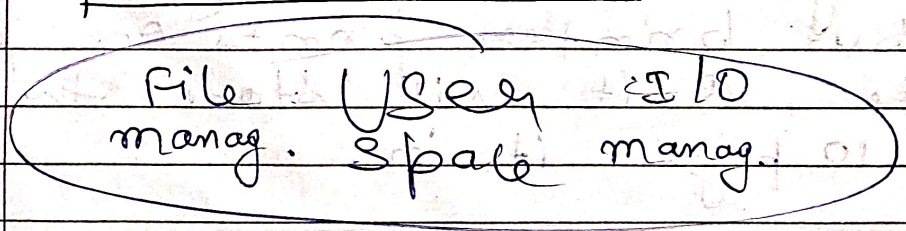


- All functions are done by Kernel.

Advantages	Disadvantages
(1) High performance as communication is fast (less user mode)	Bulky in size.
	less reliable, one module crashes – whole kernel is down.
	Memory requirement is high.

E.g.⇒ Linux, Unix, MS-DOS

(2) Micro Kernel



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Process manag. | Kernel | Memory manag.

- only major functions are in Kernel.

Advantages	Disadvantages
• Smaller in size.	Performance is slow.
• More reliable.	overhead switching b/w user mode and kernel mode. High IPC.
• More stable.	

E.g. => L4 Linux, symbian OS etc.

③ **Hybrid Kernel**

- only file management is in user space, rest are in kernel.
- Combined approach, stable is more and more speed.
- E.g. => Mac OS, Window 7/8/10.

④ **Nano and Exo Kernel**

- **Nano**:- A very small core that handles only basic functions like CPU scheduling. used in embedd systems.
- **Exo**:- A kernel gives direct access to hardware.

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* How user space and kernel communicate?

Ans We use an way called IPC (Inter Process Communication). They are two ways to do so:-

1. **Shared memory** :- A memory is being shared where both user space & Kernel can read & write.

2. **Message passing** :- Sending message to each other using an channel.