Computer Engg

OS-Assignment-1

Prepared by:

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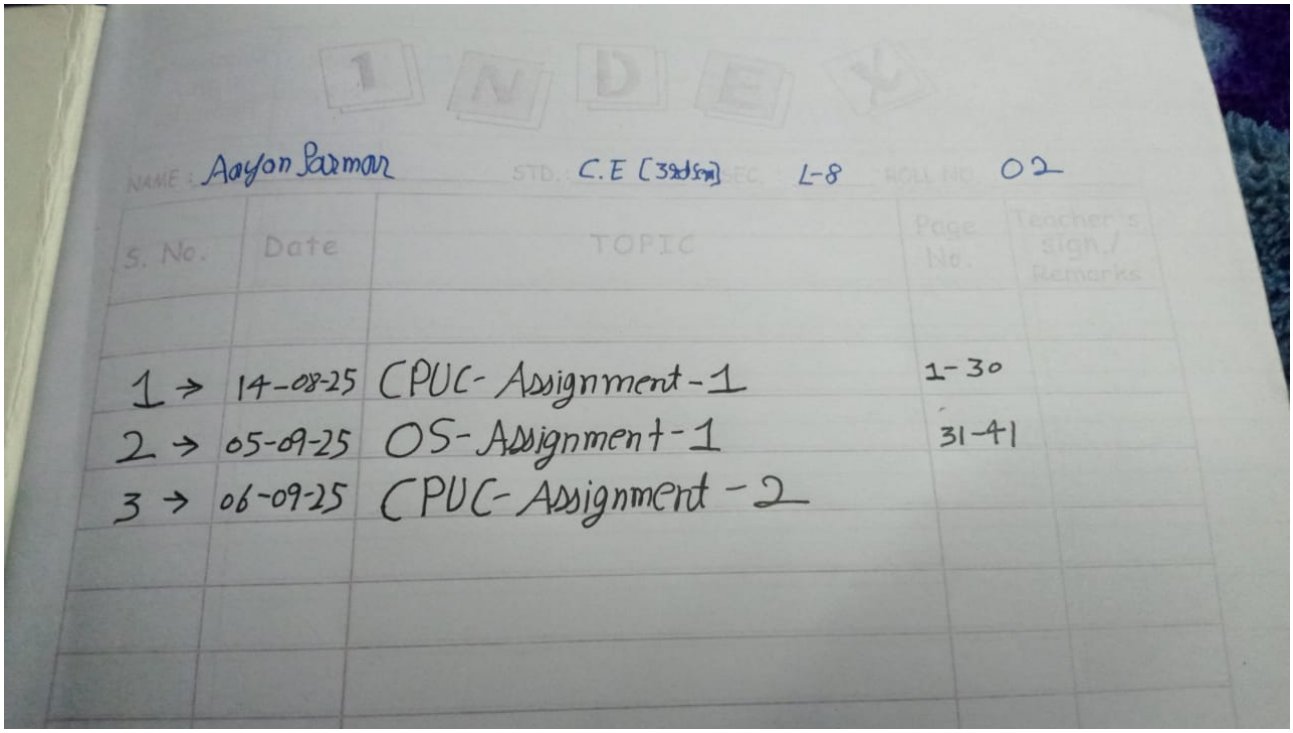
Roll No: 02



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O.S

Assignment - 1

Q1:- Explain the following terms:-

1→ Process :- A process is simply a running program that uses the computer's memory and resources to do a task, like opening a browser or playing music.

2→ Control Block :- In OS, it is a data structure the system uses to keep all the important information about a process, such as its ID, state, CPU registers, memory, and resources.

3→ Race Condition :- It is a problem that happens when two or more processes try to access and change the same shared data at the same time, and the final result depends on the order in which they run.

4→ Critical Section :- It is a part of a program where a shared resource is accessed, and only one process or thread should enter at a time to avoid errors or conflicts.

5→ Deadlock:- A deadlock is a situation in which 2 or more processes are stuck forever because each is waiting for a resource that the other process is holding.

6→ Thread:- It is the smallest unit of a process that can be executed independently, sharing the same resources of the process but running tasks seperately.

Q2: What do you mean by process life cycle & also explain the states of process.

Ans:- Process life cycle means the journey of a process from the time it is created until it finishes execution. During this journey, a process passes through different states managed by the OS.

States of a process:-

1→ New:- The process is being created.

2→ Ready:- The process is loaded into memory and waiting for CPU to run.

3→ Running:- The process is being executed by the CPU.

4→ Waiting / Blocked:- The process is paused, waiting for some event to finish.

5→ Terminated / Exit:- The process has finished its execution & is removed from memory.

Q3:- Write short note on process synchonnization?

Ans It is a technique used in OS to ensure that multiple processes can work together safely when they share resources like memory, files, or data.

- Without synchonization, processes may interfere with each other, causing problems such as race conditions or inconsistent results.
- To handle, the critical section problem is solved using synchronization tools like semaphores, mutex locks, and monitors, which make sure only one process uses a shared resource at a time.

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Q4→ Explain PCB in detail.

Ans:- Process Control Block [PCB] :-

It is a special data structure in the OS that stores all the information about a process. It is like an identity card or record file for each process, so the OS can keep track of it while scheduling and executing.

- Contents of PCB :-

1→ Process ID [PID] :- Unique no to identify each process.

2→ Process state :- Current state of the process

3→ CPU Registers :- Values of CPU registers when the process is paused.

4→ Program Counter :- Addresses of the next instruction to execute.

5→ Memory Information :- Base and limit registers, page tables, etc.

6→ CPU Scheduling Information :- Priority, scheduling queue pointers, etc.

7→

8→

Ans:

7→ I/O Info:- List of I/O devices allocated and files opened.

8→ Accounting Information :- CPU usage, execution time, process number, etc.

- Importance of PCB:

- The OS uses the PCB to switch between processes.

- It ensures that when a process resumes, it starts from where it left off.

- Without PCB, the OS wouldn't be able to manage multiple processes at once.

Q5:- What is deadlock? What are the necessary conditions for deadlock. Explain how deadlock is avoided.

Ans:- A deadlock is a situation in an OS where 2 or more processes are waiting for resources in such a way that none of them can continue, and they remain stuck forever.

- Necessary Conditions for deadlock :-

Deadlock occurs only if all four of these conditions hold at the same time :-

1→ Mutual Exclusion :- At least one resource must be held in a non-shareable mode.

2→ Hold and Wait :- A process is holding at least one resource and waiting for more.

3→ No Preemption :- A resource cannot be forcibly taken away from a process; it must be released voluntarily.

4→ Circular Wait :- A set of processes are waiting for each other in a circular chain.

★→ How deadlock is avoided :-

1→ Avoid Circular Wait :- Impose a fixed order of resource allocation so circular waiting cannot occur.

2→ Avoid Hold and Wait :→ Require processes to request all resources at once, or release what they hold before requesting new ones.

3→ Preemption :- Allow resources to be taken away from a process and given to another if needed.

4→ Banker's Algorithm :- A resource allocation algorithm that checks if granting a resource request will leave the system in a safe state; if yes, grant, else wait.

Q6:- Differentiate b/w monolithic & Microkernel OS Architecture.

Ans:-

	Monolithic Kernel.	Microkernel
1→	A single large kernel where all OS services run in kernel mode.	1→ A minimal kernel where only essential services communication and basic run in kernel mode, while other services run in user space.
2→	Large and complex	2→ Small and light-weight.
3→	Faster	3→ Slower.
4→	Difficult to extend or modify	4→ Easier to extend and add new features.
5→	ex:- Linux, UNIX, MS-DOS	5→ ex:- Minix, Mac OS X, QNX.

Q7 What do you mean by interprocess communication ? Explain its types.

Ans:- **Interprocess Communication [IPC]**

It is a mechanism that allows processes in an OS to exchange data, share information, and co-ordinate their activities.

- Since processes run independently, IPC provides a way for them to communicate and stay synchronized.

- **Types of IPC :-**

1→ **Shared Memory :-**

- A block of memory is shared between processes.
- Processes read / write data directly in this shared space.
- Very fast but requires synchronization to avoid conflicts.

2 → Message Passing:-

- No shared memory is required.
- Slower than shared memory but simple and safe.
- Processes exchange information by sending and receiving messages through the OS.
- ex:- Client Server Communication.

Q8 Explain the following using Round robin scheduling

Process	AT	BT
P1	2	8
P2	0	7
P3	1	9

TQ = 4

Calculate its TAT, WT & RT

Ans:- Definitions:-

- CT [Completion Time]: Time when a process finishes.
- TAT [Turn-around Time]: CT - AT
- WT [Waiting time]:- TAT - BT
- RT [Response time]: first CPU start time - AT

★→ Time quantum = 4

1→ t = 0-4 → P2 [arrived at 0].
- P2: 7 → 3 left

2→ t = 4-8 → P3
- P3: 9 → 5 left

3→ t = 8-12 → P1
- P1: 8 → 4 left

4→ t = 12-15 → P2 [only 3 left, it finishes]
- CT[P2] = 15
- ~~Queue~~

5→ t = 15-19 → P3
- P3: 5 → 1 left

6→ t = 19-23 → P1 [finishes]
- CT[P1] = 23

7 t = 23-24 → P3 [finishes]
- CT[P3] = 24

★→ Chart

0 4 8 12 15 19 23 24
| P2 | P3 | P1 | P2 | P3 | P1 | P3 |

Now, RT [P2] = 0-0 = 0
RT [P3] = 4-1 = 3
RT [P1] = 8-2 = 6

→ Completion TAT & WT

Process	AT	BT	CT	TAT = CT-AT	WT = TAT-BT
P1	2	8	23	21	13
P2	0	7	15	15	8
P3	1	9	24	23	14

Avg :-

TAT = [21 + 15 + 23] / 3 = 19.67
WT = [13 + 8 + 14] / 3 = 11.67
RT = [6 + 0 + 3] / 3 = 3.00

Ans