Assignment - 4

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1) Explain CPU - Input/output burst cycle

→ Process execution consists of a cycle of CPU execution & I/o wait. The state of process under execution is called CPU burst & the state of process under I/O request & its handling is called I/o burst.

Processes alternate between these two states. Process execution begins with a CPU burst. That is followed by an I/o burst, which is followed by another CPU burst, then another I/o burst and so on. Eventually, the final CPU burst ends with a system request to terminate execution.

Load store Add store Read from file	CPU Burst
Wait for I/o	I/o Burst
store increment index	CPU Burst
Write to file ~~Write~~ Wait for I/o	I/o Burst
Load store Add store Read From file	CPU Burst
Wait for I/o	I/o Burst

1) The process during execution undergoes two phases CPU Burst & I/o Burst.

2) When a process is allocated CPU & other resources & is executing, this is the CPU burst phase of the process

3) When a process waits for some I/o operation or some other task to be completed, this is the I/o burst phase of the process

4) The execution of a process consists of an alternation of CPU bursts & I/o bursts.

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5) A process begins & ends with a CPU bursts. In bet^n CPU activity is suspended whenever an I/o operation is needed
6) load store data, add store data, read from file, store increment, write to file, delete data from a file, add increment & other operations like these are known as CPU burst.
7) I/o burst contains any input & output. The whole process as from the beginning of a CPU burst & ending with the system request to close execution is known as CPU-I/o burst cycle

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2) Explain various types of process scheduling algorithms

→ A process scheduler schedules different processes to be assigned to the CPU based on particular scheduling algorithms. There are six popular process scheduling algorithms

1) First-come, First-served (FCFS) scheduling
2) Shortest-Job-Next (SJN) scheduling
3) Priority Scheduling
4) Shortest Remaining Time
5) Round Robin (RR) scheduling
6) Multiple-Level Queues Scheduling

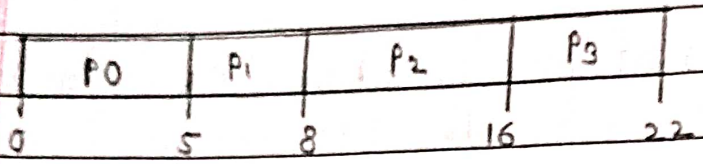
These algorithms are either non-preemptive or preemtive. Non-preemptive algorithms are designed so that once a process enters the running state, it cannot be preempted until it completes its allotted time & preemptive scheduling is based on priopriy where a scheduler may preempt a low priority running process anytime when a high priority process enters into a ready state.

1) First-Come, First-Served (FCFS)

1) Jobs are executed on first come, first serve basis
2) It is a non-preemptive, pre-emptive scheduling algorithms.

3) Easy to understand & implement
4) Its implementation is based on FIFO queue
5) Poor in performance as average wait time is high

Process	Arrival Time	Execute Time	Service Time
P0	0	5	0
P1	1	3	5
P2	2	8	8
P3	3	6	16



Process	Wait Time = service Time - Arrival Time	
P0	0-0=0	Average:
P1	5-1=4	=0+4+6+13/
P2	8-2=6	=5.75
P3	16-3=13	

2) Shortest Job Next (SJN)
1) This is also known as shortest job first (SJF)
2) This is a non-preemptive, pre-emptive scheduling algorithm
3) Best approach to minimize waiting time
4) Easy to implement in Batch systems where required CPU time is known in advance
5) Impossible to implement in interactive systems where required CPU time is not known
6) The processer should know in advance how much time process will take

Process	Arrival Time	Execute Time	service Time
P0	0	5	0
P1	1	3	5
P2	2	8	14
P3	3	6	8

Process	Arrival Time	Execute Time	service Time	(0,3,8,16,22)
P_0	0	5	3	
P_1	1	3	0	
P_2	2	8	16	
P_3	3	6	8	

3) Priority Based scheduling

1) Priority scheduling is a non-preemptive algorithm & one o
the most common scheduling algorithms in batch systems
2) Each process is assigned a priority. Process with highest priori
is to be executed first & so on.
3) Processes with same priority are executed on first come
first served basis.
4) Priority can be decided based on memory requirements,
time requirements or any other resource requirements.

Process	Arrival Time	Execution Time	Priority	Service Tim
P_0	0	5	1	0
P_1	1	3	2	11
P_2	2	8	1	14
P_3	3	6	3	5

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Process	Arrival Time	Execute Time	Priority	service Time
P_0	0	5	1	9
P_1	1	3	2	6
P_2	2	8	1	14
P_3	3	6	3	0

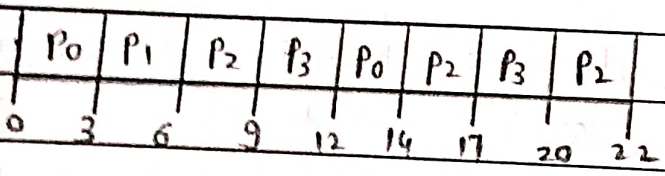
4) Shortest Remaining Time

1) Shortest remaining Time (SRT) is the preemptive version
the SJN algorithm.
2) The processor is allocated to the job closet to complet

but it can be preempted by a newer ready job with shorter time to completion.
3) Impossible to implement in interactive systems where required CPU time is not known
4) It is often used in batch environments where short need to give preference.

5) Round Robin scheduling
1) Round Robin is the preemptive process scheduling algo
2) Each process is provided a fix time to execute, it is c a quantum
3) Once a process is executed for a given time period preempted & other process executes for a given time per
4) Context switching is used to save states of preempted processes

Process	Wait Time = Service Time - Arrival Time	
P_0	(0-0) + (12-3) = 9	Average = 9+2
P_1	(3-1) = 2	= 8.5
P_2	(6-2) + (14-9) + (20-17) = 12	
P_3	(9-3) + (17-12) = 11	



6) Multiple-Level Queues Scheduling
Multiple-level queues are not an independent scheduli algorithm. They make use of other existing algorithm to gr & schedule jobs with common characteristics
1) Multiple queues are maintained for processes with common characteristics
2) Each queue can have its own scheduling algorithms

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3) Priorities are assigned to each queue.
e.g - CPU-bound jobs can be scheduled in one queue & all I/o bound jobs in another queue. The process scheduler then alternately selects jobs from each queue & assigns them to the CPU based on the algorithm assigned to the queue.

3) Difference between preemptive & non-preemptive schedule

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	Preemptive Scheduling	Non-preemptive scheduling
1)	The resources are assigned to a process for a long time period	once resources are assigned to a process, they are held until it completes its burst period or changes to the waiting state
2)	Its process may be paused in the middle of the execution	When the procession starts the process exicution, it must complete it before executing the other process & it may not be interrupted in the middle
3)	When a high-priority process continuously comes in the ready queue, a low-priority process can starve.	When a high burst time process uses a CPU, another process with a shorter burst time can steave
4)	It is flexible	It is rigid
5)	It is cost associated	It does not cost associated
6)	It has overheads associated with process scheduling	It doesn't have overhead

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7)	It affects the design of the operating system kernel	It doesn't affect the de of the os kernel.
8)	Its CPU utilization is very high.	Its CPU utilization is v
9)	e.g- Round Robin & shortest Remaining Time First	e.g- FCFS & SJF are e.g preemptive scheduling
10)	It is expensive in nature	It is not expensive in