Operating Systems Z02-54c

Task 1 Processor scheduling algorithms

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OVERVIEW

A. Processor scheduling algorithms

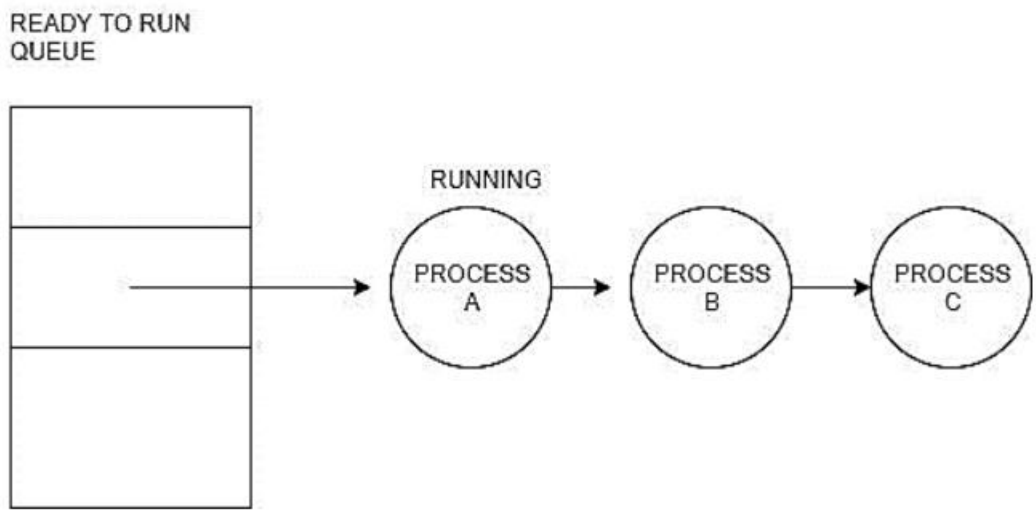
Processor scheduling is the allocation of the Processor to a process for use while the execution of another process is on hold i.e., in waiting for state due to unavailability of any resource like I/O, etc. Thereby making full use of Processor. The main goal of Processor scheduling is to make the system efficient, fast and fair (Singh Updated).Processor scheduling is done following some algorithms which are known as Processor scheduling algorithms. Processor scheduling algorithms offer proper and efficient use of the Processor. Different types of criteria are measured to check which scheduling algorithm performs better than others such as Processor utilization, throughput, turnaround time, waiting time, load average, and response time etc. The mostly used Processor scheduling algorithms are First Come First Served (FCFS), Shortest Job First (SJF), Shortest Remaining Time First (SRTF), Round Robin (RR).

1. First Come First Serve (FCFS)

First Come First Serve is the easiest and most simple CPU scheduling algorithm. In this type of algorithm, the process which requests the CPU gets the CPU allocation first. This scheduling method can be managed with a FIFO queue. . This scheduling method is non-preemptive.

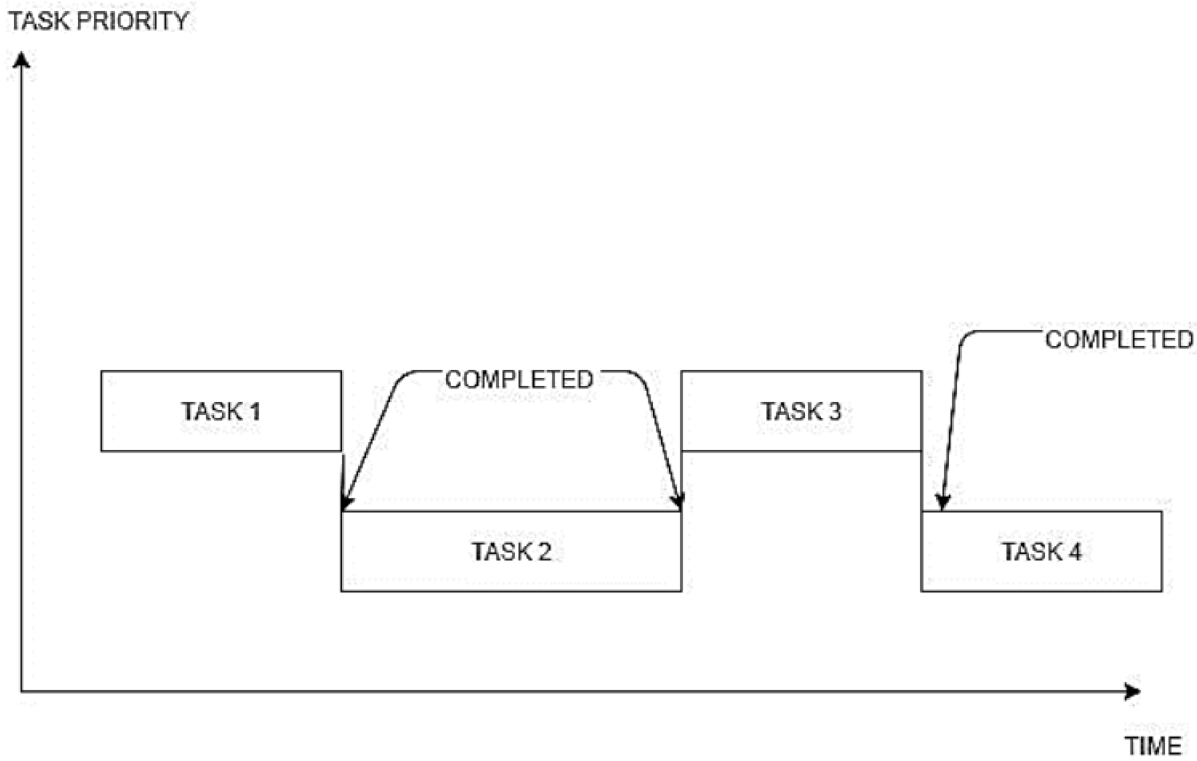
As the process enters the ready queue, its PCB (Process Control Block) is linked with the tail of the queue. So, when CPU becomes free, it should be assigned to the process at the beginning of the queue.

Fig. shows the movement of the task in the ready to run and running state.



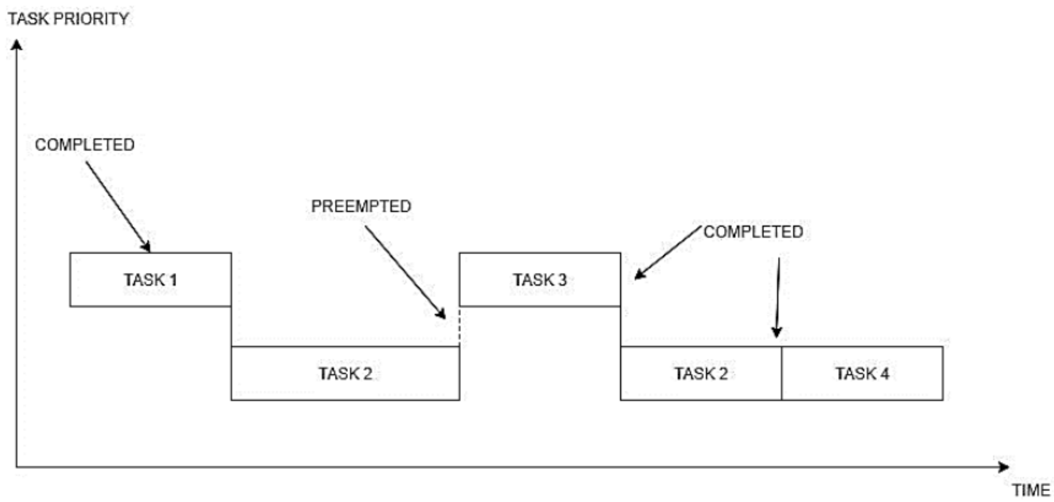
2. Shortest Job First (SJF)

Shortest job first is a scheduling algorithm in which the process with the shortest execution time should be selected for execution next. This scheduling method is non-preemptive. It significantly reduces the average waiting time for other processes awaiting execution. The main limitation is that it is very difficult to know the burst time of the next CPU request. Although SJF is optimal, it cannot be implemented at the level of short-term CPU scheduling.



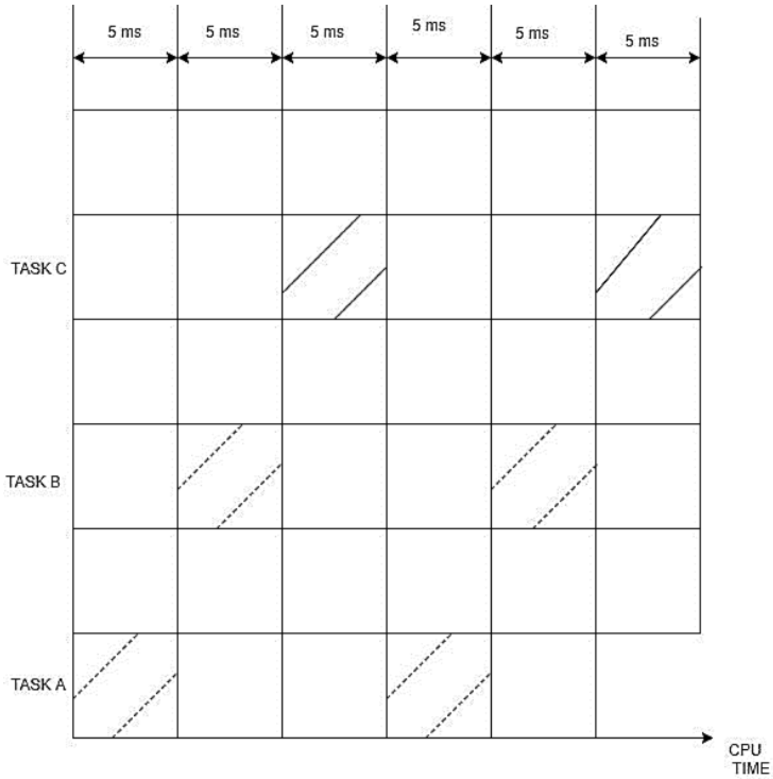
3. Shortest Remaining Time First (SRTF)

It is the preemptive version of Shortest Job Next (SJN) algorithm, where the processor is allocated to the job closest to completion. This algorithm requires advanced concept and knowledge of CPU time required to process the job in an interactive system, and hence cannot be implemented there. But, in a batch system where it is desirable to give preference to short jobs, SRT algorithm is used.



4. Round-Robin (RR)

It is the oldest, simplest scheduling algorithm, which is mostly used for multitasking. In Round-robin scheduling, each process gets a small unit of CPU time, known as time quantum q, usually 10-100milliseconds. After this time has elapsed, the process is preempted and added to the end of the ready queue. If there are n processes in the ready queue and the time quantum is q, then each process gets 1/n of the CPU time. in chunks of at most q time units at once. No process waits more than (n-1)q time units. Timer interrupts every quantum to schedule next process. This algorithm also offers starvation free execution of processes. It is the preemptive scheduling algorithm. The CPU time utilization for three tasks according to round robin is shown in fig. In this example, It's assumed that the time slots are 5ms each.



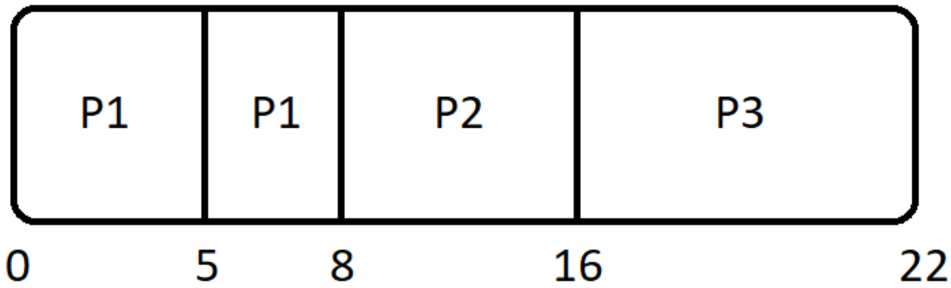
Let's consider a scheduling task consisting of four processes in the ready queue to be processed as given in the following table:

Process	**Burst Time (ms)**	**Arrival Time (ms)**
P1	5	0
P2	3	1
P3	8	2
P4	6	3

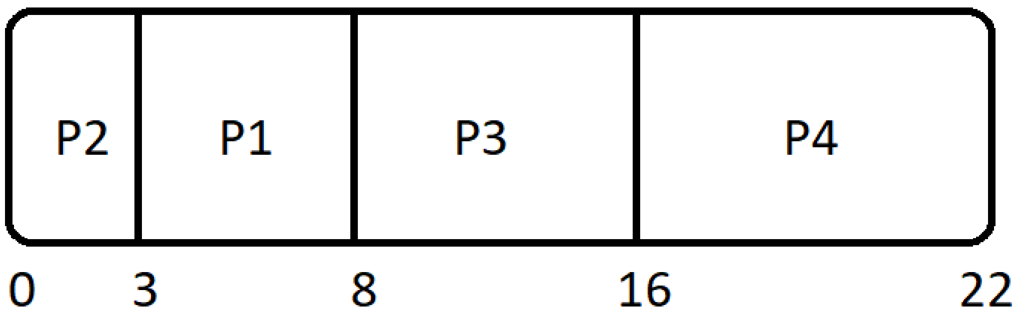
Turn Around Time = Completion Time – Arrival Time

Waiting Time = Turn Around Time – Burst Time

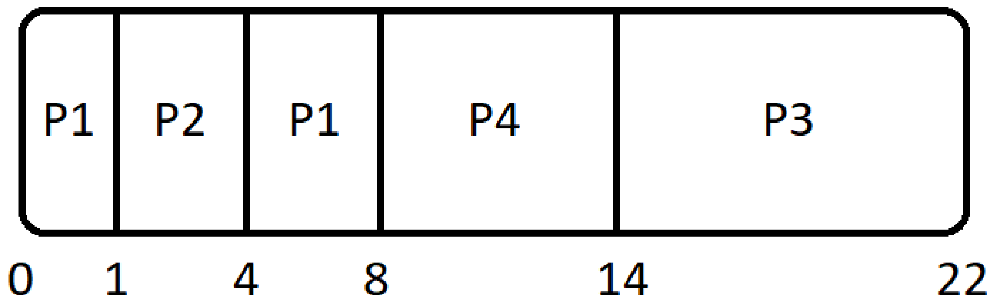
When FCFS is used, then the average waiting time of a process will be (0 + 4 + 6 + 13)/4 = 5.75ms.



When SJF is used, then the average waiting time of a process will be (0 + 4 + 12 + 5)/4 = 5.25ms



When SRTF is used, then the average waiting time of a process will be [(4 -1) + (1-1) + (14-2) + (8-3) = 20/4 = 5ms



When RR algorithm with quantum = 3ms is used, then the average waiting time of a process will be (9 + 2 + 12 +11)/4 = 8.5