

Q1. Processes P1, P2, P3 and P4 arrive in that order at times 0, 1, 2, and 8 milliseconds respectively, and have execution times of 10, 13, 6, and 9 milliseconds respectively. Shortest Remaining Time First (SRTF) algorithm is used as the CPU scheduling policy. Ignore context switching times. Calculate the average turnaround time, Average Waiting time and Average Response time for four processes in milliseconds?

Q2. A computer has two processors, M1 and M2. Four processes P1, P2, P3, P4 with CPU bursts of 20, 16, 25, and 10 milliseconds, respectively, arrive at the same time and these are the only processes in the system. The scheduler uses non-pre-emptive priority scheduling, with priorities decided as follows:

- M1 uses priority of execution for the processes as, $P1 > P3 > P2 > P4$, i.e., P1 and P4 have highest and lowest priorities, respectively.
- M2 uses priority of execution for the processes as, $P2 > P3 > P4 > P1$, i.e., P2 and P1 have highest and lowest priorities, respectively.

A process P_i is scheduled to a processor M_k , if the processor is free and no other process P_j is waiting with higher priority. At any given point of time, a process can be allocated to any one of the free processors without violating the execution priority rules. Ignore the context switch time. What will be the average waiting time of the processes in milliseconds?

Q3. You are an operating systems designer tasked with analyzing the performance of two different CPU scheduling algorithms for a new system. You have been given a set of five processes with their arrival times and required CPU burst times.

Process Details:

Process	Arrival Time (ms)	CPU Burst Time (ms)	Priority
P1	0	12	3
P2	2	7	1
P3	3	5	2
P4	6	8	4
P5	8	4	1

Task:

Analyse the performance of the following two scheduling algorithms for the set of processes described above.

Q4. Four processes (P1, P2, P3, P4) arrive at time $t=0$ with the characteristics shown below. Their total CPU burst time is the sum of their Data Processing Time and Computational Time

Process	Data Size (KB)	Processing Rate (KB/ms)	Computational Ops (millions)	Ops per ms (millions/ms)	Priority
P1	120	10	30	5	2
P2	90	15	24	8	1
P3	100	10	25	5	3
P4	80	20	12	6	1

Scheduling Rule:

The system uses a **non-preemptive Shortest Job First (SJF)** algorithm. If a tie occurs for the shortest burst time, the tie is resolved by using **pre-emptive Priority scheduling** (a lower number means higher priority) only among the tied processes. Calculate the **average turnaround time** and **average waiting time** for these processes. Assume context switching time is negligible.