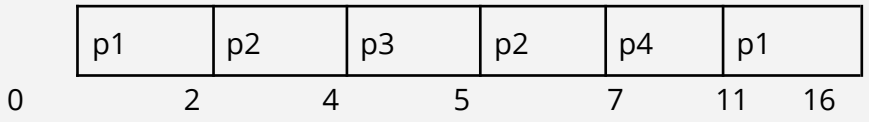
Shortest-Job-First Scheduling

This algorithm is associated with each process length of the next CPU storage. When the CPU is available, it is given a process with the next minimum CPU bust. If the two processes are the similar length for the next CPU explosion, the FCFS configuration is used to break the tire.
If a new process arrives with CPU burst length less than remaining time of the current executing process, preempt,his scheme is known as the Shortest-Remaining-Time-First (SRTF).
SJF is optimal – gives a minimum average waiting time for a given set of processes.

Example of Preemptive SJF

Process	Arrival Time	Burst Time
P1	0.0	7
P2	2.0	4
P3	4.0	1
P4	5.0	4

Gantt Chart:



SJF (preemptive)
Average waiting time = (9 + 1 + 0 +2)/4 = 3 ms

User Problems:

1. Consider a set of n tasks with known runtimes r1, r2, ... rn to be run on a uniprocessor machine. Which of the following processor scheduling algorithms will result in the maximum throughput? (Gate 2001)

(a) Round-Robin

b) Shortest-Job-First

(c) Highest-Response-Ratio-Next

(d) First-Come-First-Served

Ans: option (b)

Explanation:

Throughput means total number of tasks executed per unit time. Shortest Job First has maximum throughput because in this scheduling technique shortest jobs are executed first hence maximum number of tasks are completed.

Note: Highest-Response-Ratio-Next policy favors shorter jobs, but it also limits the waiting time of longer jobs.

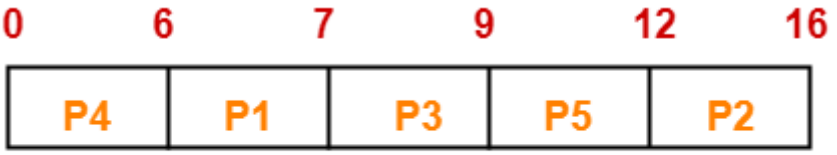
2. Consider the set of 5 processes whose arrival time and burst time are given below-

Process Id	Arrival time	Burst time
P1	3	1
P2	1	4
P3	4	2
P4	0	6
P5	2	3

If the CPU scheduling policy is SJF non-preemptive, calculate the average waiting time and average turnaround time.

Solution

Gantt Chart-



Gantt Chart

Now, we know-

- Turn Around time = Exit time – Arrival time
- Waiting time = Turnaround time – Burst time

Process Id	Exit time	Turn Around time	Waiting time
P1	7	7 – 3 = 4	4 – 1 = 3
P2	16	16 – 1 = 15	15 – 4 = 11
P3	9	9 – 4 = 5	5 – 2 = 3
P4	6	6 – 0 = 6	6 – 6 = 0
P5	12	12 – 2 = 10	10 – 3 = 7

Now,

- Average Turnaround time = (4 + 15 + 5 + 6 + 10) / 5 = 40 / 5 = 8 unit
- Average waiting time = (3 + 11 + 3 + 0 + 7) / 5 = 24 / 5 = 4.8 unit

Problem 3:

Consider the set of 4 processes whose arrival time and burst time are given below-

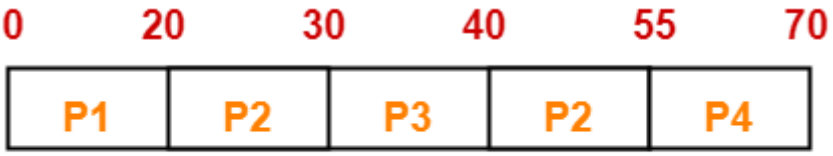
Process Id	**Arrival time**	**Burst time**
P1	**0**	**20**
P2	**15**	**25**

P3	**30**	**10**
P4	**45**	**15**

If the CPU scheduling policy is SRTF, calculate the waiting time of process P2.

Solution:

Gantt Chart-



Gantt Chart

Now, we know-

Turn Around time = Exit time – Arrival time

Waiting time = Turnaround time – Burst time

Thus,

- Turn Around Time of process P2 = 55 – 15 = 40 unit
- Waiting time of process P2 = 40 – 25 = 15 unit

Interview Questions

1.How does the SJF algorithm work? (Flipkart)

Shortest Job First (SJF) is an algorithm in which the process having the smallest execution time is chosen for the next execution. This scheduling method can be preemptive or non-preemptive. It significantly reduces the average waiting time for other processes awaiting execution.

2.What is the preemptive shortest job first? (Amazon)

In Preemptive Shortest Job First Scheduling, jobs are put into a ready queue as they arrive, but as a process with short burst time arrives, the existing process is preempted or removed from execution, and the shorter job is executed first.

3.What is the real difficulty with the SJF CPU scheduling algorithm? (TCS)

The real difficulty with SJF is knowing the length of the next CPU burst. For long-term (job) scheduling in a batch system, the length of process time could be specified by a user. However, at the level of short-term CPU scheduling, there is no way to know the length of the next CPU burst.

4.What is the main problem with the shortest job scheduling and what is its solution? (Barclays)

The main problem with the shortest job first algorithm is starvation [1], [2]. If there is a steady supply of short processes, the long process may never get the chance to be executed by the processor. There are a variety of scheduling algorithms proposed in the past to solve the issue of starvation of SJF.