Scheduling Algorithms

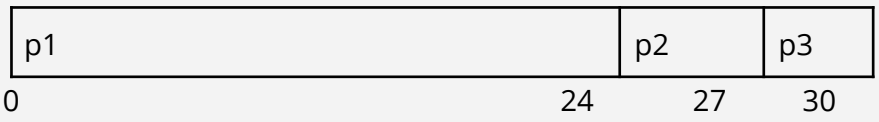
First-come first-served (FCFS) scheduling

The process that asks for the CPU first is given to the CPU first. The implementation of FCFS policy is easily handled with FIFO queue. The average waiting time under the FCFS policy, however, is often quite long.
It is non-preemptive.
It has a high average waiting time.

Example:

Process	Burst Time
P1	24
P2	3
P3	3

If the processes arrive in the order PI, P2, P3, and are served in FCFS order, we get the result shown in the following Gantt chart:



Average waiting time = (0+24+27) / 3 = 17 ms
Average Turnaround time = (24+27+30) / 3 = 27 ms

The FCFS algorithm is particularly troublesome for time – sharing systems, where it is important that each user get a share of the cpu at regular intervals.

User Problems:

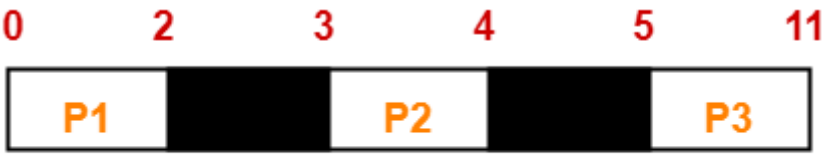
Problem 1:

Consider the set of 3 processes whose arrival time and burst time are given below-

Process Id	Arrival Time	Burst Time
P1	**0**	**2**
P2	**3**	**1**
P3	**5**	**6**

If the CPU scheduling policy is FCFS, calculate the average waiting time and average turnaround time.

Solution:



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	2	2 – 0 = 2	2 – 2 = 0
P2	4	4 – 3 = 1	1 – 1 = 0
P3	11	11- 5 = 6	6 – 6 = 0

Now,

- Average Turnaround time = (2 + 1 + 6) / 3 = 9 / 3 = 3 unit
- Average waiting time = (0 + 0 + 0) / 3 = 0 / 3 = 0 unit

Problem 2:

Consider three CPU-intensive processes, which require 10, 20 and 30 time units and arrive at times 0, 2 and 6, respectively. How many context switches are needed if the operating system implements a shortest remaining time first scheduling algorithm? Do not count the context switches at time zero and at the end.

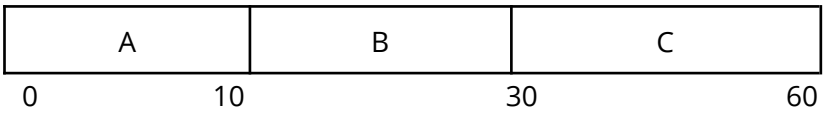
(a) 1 (b) 2 (c) 3 (d) 4

Ans: option(b)

Explanation:

Process	Arrival Time	Burst Time
A	0	10
B	2	20
C	6	30

Gantt Chart:



Time 0: Process A arrives and it's the only available process so it runs.

Time 2: Process B arrives, but A has the shortest remaining time (8), so it continues.

Time 6: Process C arrives, but A has the shortest remaining time (2), so it continues.

Time 10: Process A is completed and context switching takes place. B is scheduled as it is the shortest remaining time process.

Time 30: Process B is completed and context switching takes place. Now C is scheduled.

Interview Questions

1.What is the Convoy Effect? (Vmware)
Convoy Effect is a situation where many processes, who need to use a resource for a short time, are blocked by one process holding that resource for a long time.
This essentially leads to poor utilization of resources and hence poor performance.

2. Why is fcfs non preemptive ? (Amazon)
It is Non Preemptive algorithm, which means the process priority doesn't matter

3.Briefly explain FCFS. (TCS)
FCFS stands for First-come, first-served. It is one type of scheduling algorithm. In this scheme, the process that requests the CPU first is allocated the CPU first.
Implementation is managed by a FIFO queue