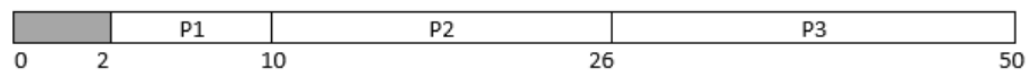


1. FCFS scheduling – CPU utilization

Q1. Three process P1, P2 and P3 arrive at time zero. The total time spent by the process in the system is 10ms, 20ms, and 30ms respectively. They spent first 20% of their execution time in doing I/O and the rest 80% in CPU processing. What is the percentage utilization of CPU using FCFS scheduling algorithm?

Solution:

Process	Execution time	I/O time	CPU time
P1	10	2	8
P2	20	4	16
P3	30	6	24



Total time = 50ms

CPU utilized for 48ms (starting from 2 and ending at 50)

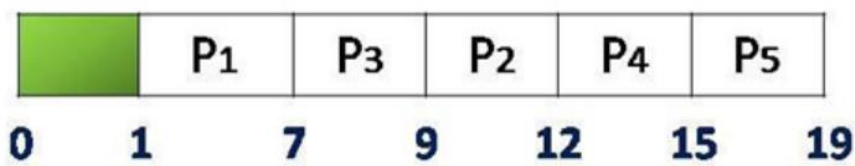
Therefore utilization = $(48/50) \times 100 = 96\%$

2. SHORTEST JOB FIRST SCHEDULING – SJF (Non-Premptive)

Example 1:

Process No.	Arrival Time (AT)	Burst Time (BT)
1	1	6
2	2	3
3	3	2
4	4	3
5	5	4

Gantt chart:



TAT = CT - AT and WT = TAT - BT

Process No.	AT	BT	CT	TAT	WT
1	1	6	7	$(7 - 1) = 6$	$(6 - 6) = 0$
2	2	3	12	$(12 - 2) = 10$	$(10 - 3) = 7$
3	3	2	9	$(9 - 3) = 6$	$(6 - 2) = 4$
4	4	3	15	$(15 - 4) = 11$	$(11 - 3) = 8$
5	5	4	19	$(19 - 5) = 14$	$(14 - 4) = 10$

- Waiting Time = Start time – Arrival time

Shortest Remaining Time First (preemptive scheduling –SJF)

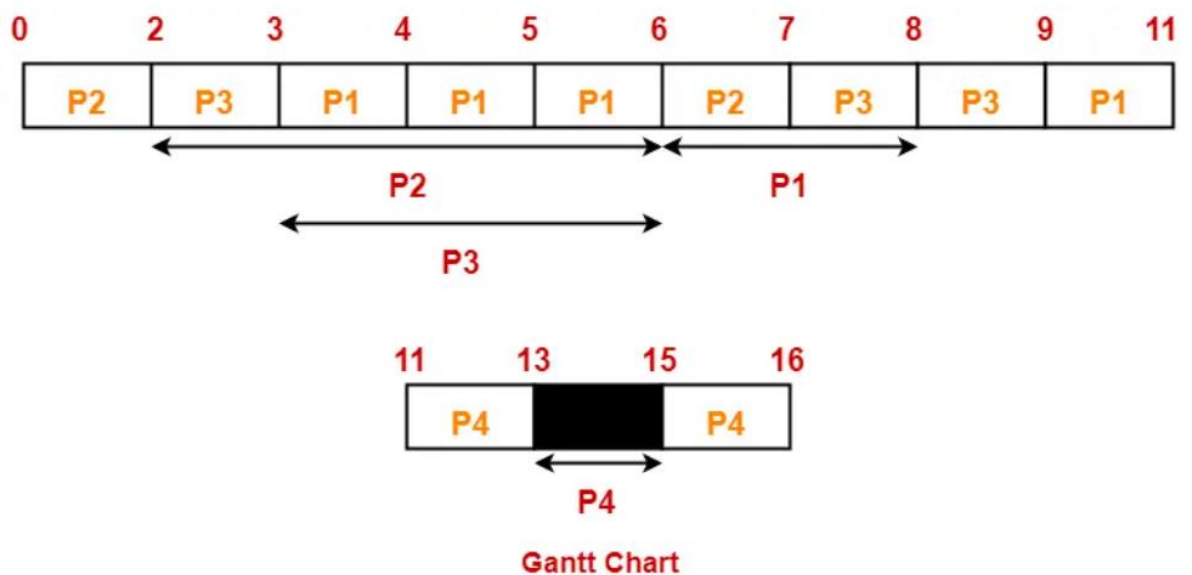
1. Consider the set of 4 processes whose arrival time and burst time are given below: If the CPU scheduling policy is Shortest Remaining Time First, calculate the average waiting time and average turnaround time.

Process No.	Arrival Time	Burst Time		
		CPU Burst	I/O Burst	CPU Burst
P1	0	3	2	2
P2	0	2	4	1
P3	2	1	3	2
P4	5	2	2	1

•

Solution-

Gantt Chart-



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

Process Id	Exit time	Turn Around time	Waiting time
P1	11	$11 - 0 = 11$	$11 - (3+2) = 6$
P2	7	$7 - 0 = 7$	$7 - (2+1) = 4$
P3	9	$9 - 2 = 7$	$7 - (1+2) = 4$
P4	16	$16 - 5 = 11$	$11 - (2+1) = 8$

Now,

- Average Turn Around time = $(11 + 7 + 7 + 11) / 4 = 36 / 4 = 9$ units
- Average waiting time = $(6 + 4 + 4 + 8) / 4 = 22 / 4 = 5.5$ units