FCFS Scheduling Mathematical Examples

In CPU-scheduling problems some terms are used while solving the problems, so for conceptual purpose the terms are discussed as follows –

- **Arrival time (AT)** − Arrival time is the time at which the process arrives in ready queue.
- **Burst time (BT) or CPU time of the process** − Burst time is the unit of time in which a particular process completes its execution.
- **Completion time (CT)** − Completion time is the time at which the process has been terminated.
- **Turn-around time (TAT)** − The total time from arrival time to completion time is known as turn-around time. TAT can be written as,

Turn-around time (TAT) = Completion time (CT) – Arrival time (AT) or, **TAT = Burst time (BT) + Waiting time (WT)**

- **Waiting time (WT)** − Waiting time is the time at which the process waits for its allocation while the previous process is in the CPU for execution. WT is written as,

Waiting time (WT) = Turn-around time (TAT) – Burst time (BT)

- **Response time (RT)** − Response time is the time at which CPU has been allocated to a particular process first time.
  In case of non-preemptive scheduling, generally Waiting time and Response time is same.
- **Gantt chart** − Gantt chart is a visualization which helps to scheduling and managing particular tasks in a project. It is used while solving scheduling problems, for a concept of how the processes are being allocated in different algorithms.

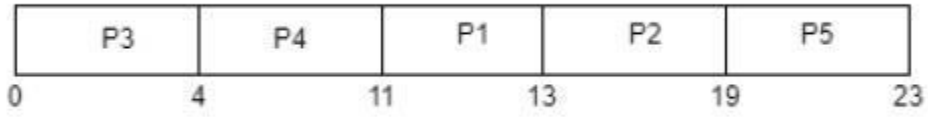
Problem 1

Consider the given table below and find Completion time (CT), Turn-around time (TAT), Waiting time (WT), Response time (RT), Average Turn-around time and Average Waiting time.

Process ID	Arrival time	Burst time
P1	2	2
P2	5	6
P3	0	4
P4	0	7
P5	7	4

Solution

Gantt chart



For this problem CT, TAT, WT, RT is shown in the given table −

Process ID	Arrival time	Burst time	CT	TAT=CT-AT	WT=TAT-BT	RT
P1	2	2	13	13-2= 11	11-2= 9	9
P2	5	6	19	19-5= 14	14-6= 8	8
P3	0	4	4	4-0= 4	4-4= 0	0
P4	0	7	11	11-0= 11	11-7= 4	4

P5	7	4	23	23-7= 16	16-4= 12	12

Average Waiting time = (9+8+0+4+12)/5 = 33/5 = 6.6 time unit (time unit can be considered as milliseconds)

Average Turn-around time = (11+14+4+11+16)/5 = 56/5 = 11.2 time unit (time unit can be considered as milliseconds)

Problem 2

Consider the given table below and find Completion time (CT), Turn-around time (TAT), Waiting time (WT), Response time (RT), Average Turn-around time and Average Waiting time.

Process ID	Arrival time	Burst time
P1	2	2
P2	0	1
P3	2	3
P4	3	5
P5	4	5

For this problem CT, TAT, WT, RT is shown in the given table −

Process ID	Arrival time	Burst time	CT	TAT=CT-AT	WT=TAT-BT	RT
P1	**2**	**2**	**4**	**4-2= 2**	**2-2= 0**	**0**
P2	**0**	**1**	**1**	**1-0= 1**	**1-1= 0**	**0**
P3	**2**	**3**	**7**	**7-2= 5**	**5-3= 2**	**2**

P4	**3**	**5**	**12**	**12-3= 9**	**9-5= 4**	**4**
P5	**4**	**5**	**17**	**17-4= 13**	**13-5= 8**	**8**

Average Waiting time = (0+0+2+4+8)/5 = 14/5 = 2.8 time unit (time unit can be considered as milliseconds)

Average Turn-around time = (2+1+5+9+13)/5 = 30/5 = 6 time unit (time unit can be considered as milliseconds)

*In idle (not-active) CPU period, no process is scheduled to be terminated so in this time it remains void for a little time.