Operating System (PCC CS 502)

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Priority Scheduling

A priority is a positive integer value associated with each process by the operating system. CPU time is allocated to a process from the ready queue that has the highest priority.

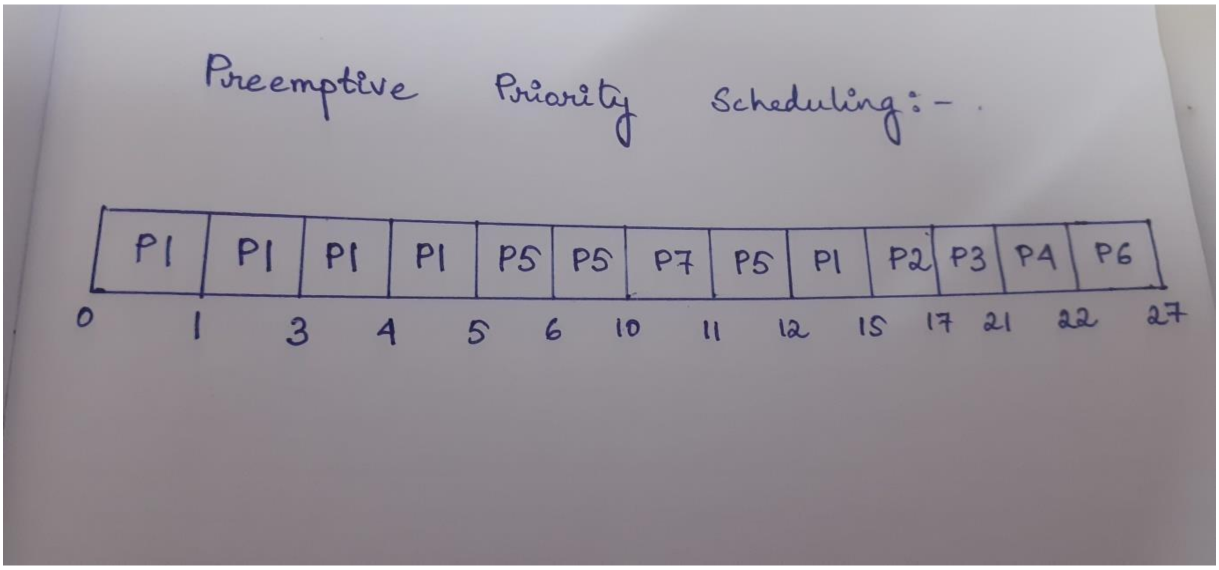
- Higher integer values mean lower priority
- Lower integer values mean higher priority
- Equal priority processes are scheduled using FCFS policy
- Priority of a process may be determined by the operating system internally based on factors like memory requirements, number of open files by the process, type of i/o devices held by the process, average CPU burst time of the process etc.
- Priority policy may be preemptive or non-preemptive

Priority scheduling can be of two types:

1. **Preemptive Priority Scheduling**: If the new process arrived at the ready queue has a higher priority than the currently running process, the CPU is preempted, which means the processing of the current process is stopped and the incoming new process with higher priority gets the CPU for its execution.

Consider the following processes each having its own unique burst time and arrival time and priority.

Process id	Arrival Time	Burst Time	Priority
P1	0	8	3
P2	1	2	4
P3	3	4	4
P4	4	1	5
P5	5	6	2
P6	6	5	6
P7	10	1	1



Process	AT	BT	CT	TT	WT	RT
P1	0	8	15	15	7	0
P2	1	2	17	16	14	14
P3	3	4	21	18	14	14
P4	4	1	22	18	17	17
P5	5	6	12	7	1	0
P6	6	5	27	21	16	16
P7	10	1	11	1	0	0

Here,

AT – Arrival time

BT – Burst time

CT – Completion time

TT – Turnaround time

WT- Waiting time

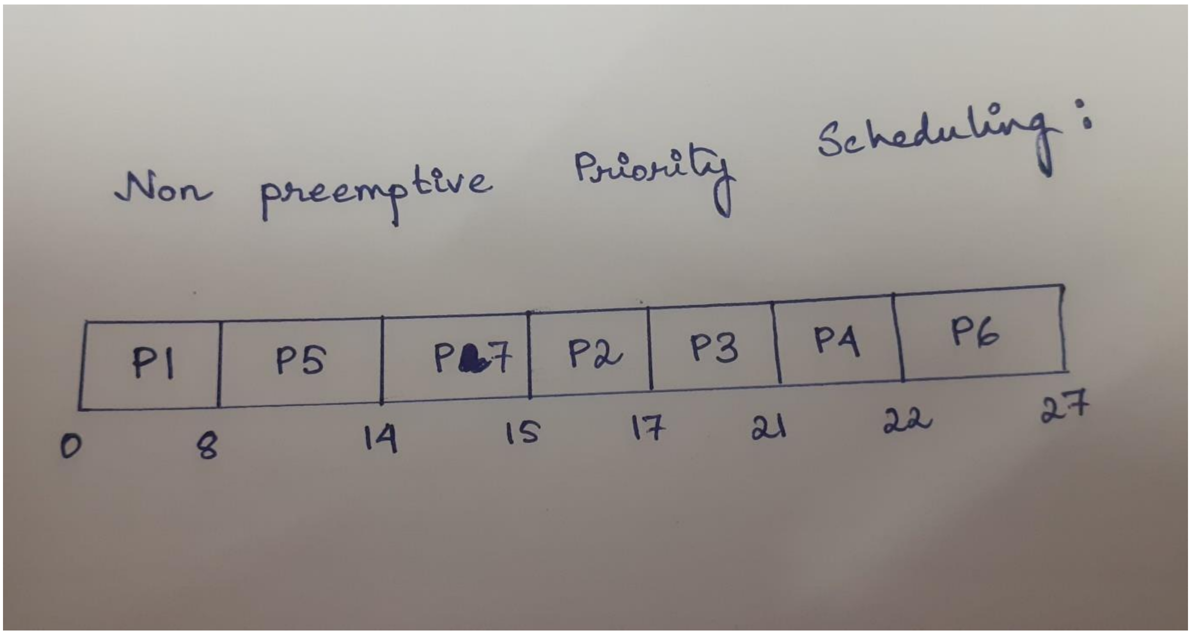
RT – Response time

Average waiting time= 69/7 = 16/4 = 9.8 milliseconds

Average turnaround time= 96/7 = 13.7 milliseconds

Average response time = 61/7 = 8.71 milliseconds

2. **Non-Preemptive Priority Scheduling**: In case of non-preemptive priority scheduling algorithm if a new process arrives with a higher priority than the current running process, the incoming process is put at the head of the ready queue, which means after the execution of the current process it will be processed.



Process	AT	BT	CT	TT	WT	RT
P1	0	8	8	8	0	0
P2	1	2	17	16	14	14
P3	3	4	21	18	14	14
P4	4	1	22	18	17	17
P5	5	6	14	9	3	3
P6	6	5	27	21	16	16
P7	10	1	15	5	4	4

Here,
AT – Arrival time
BT – Burst time
CT – Completion time
TT – Turnaround time
WT- Waiting time
RT – Response time

Average waiting time= 68/7 = 9.71 milliseconds

Average turnaround time= 95/7 = 13.57 milliseconds

Average response time = 68/7 = 9.71 milliseconds

Disadvatanges :

Steady submission of higher priority processes may cause the lower priority processes in the ready queue to wait indefinitely without getting CPU time for execution. In this situation, a process that is present in the ready state and has low priority, keeps on waiting for the CPU allocation because some other process with higher priority comes with due respect to time.This situation is called **starvation**.

Solution (Ageing):

The priority of the lower priority processes in the ready queue is gradually increased after fixed time intervals and eventually it will have a priority that will allow it to get the CPU time.