Operating Systems
Course Code: **71203002004**
Scheduling 3(Preemptive Scheduling)

by -
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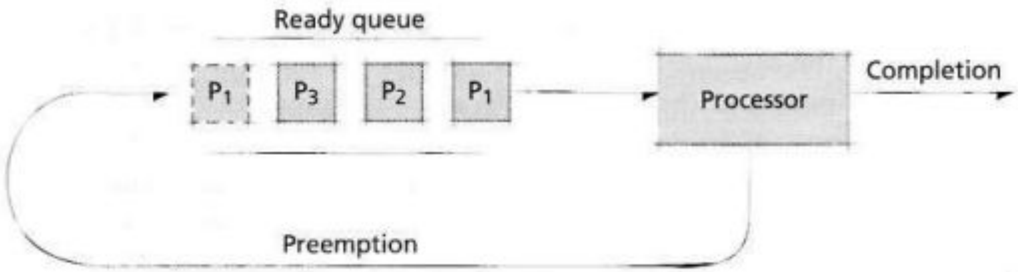
1. Round Robin (RR) Scheduling

a. are dispatched similar to FIFO but allotted a limited amount of processor time called “time slice or quantum”.
b. if the process is not completed before the quantum expires, the system interrupts and put process back to the ready queue.

Effective for interactive environments where system needs to guarantee reasonable response time.

Like FIFO, round-robin is commonly found within more sophisticated processor scheduling algos but is rarely the master scheme.



Example 1: Process With Same Arrival time.

Consider the following table of arrival time and burst time for three processes P1, P2 and P3 and given Time Quantum = 2ms.

Process	Arrival Time	Burst Time
P1	0	5
P2	0	3
P3	0	4

Gantt Chart

P1	P2	P3	P1	P2	P3	P1

0 2 4 6 8 9 11 12

Process	Arrival Time	Burst Time	Completion time(CT))	Turnaround Time TAT =(CT-AT)	Waiting Time WT=(TAT -BT)
P1	0	5	12	12	7
P2	0	3	9	9	6
P3	0	4	11	11	7

Example 2: Process With Different Arrival time.

Consider the following table of arrival time and burst time for three processes P1, P2 and P3 and given Time Quantum = 2ms.

Process	Arrival Time	Burst Time
P1	0	6
P2	1	4
P3	2	5

Gantt Chart

P1	P2	P3	P1	P2	P3	P1	P3

0 2 4 6 8 10 12 14 15

Process	Arrival Time	Burst Time	Completion time(CT))	Turnaround Time TAT =(CT-AT)	Waiting Time WT=(TAT -BT)
P1	0	6	14	14	8
P2	1	4	10	9	5
P3	2	5	15	13	8

2. Priority Scheduling

a. schedules process based on priority.

b. priority is assigned based on criteria such as memory requirement, time requirement and other resource needs.

c. process with highest priority is selected for execution first.

In non preemptive, cpu is not taken away even if process with high priority arrives.

in preemptive, the CPU can be taken away from a running process.

Preemptive priority Scheduling

Example 1: Process With Same Arrival time.

Consider the following table of arrival time and burst time for three processes P1, P2 and P3.

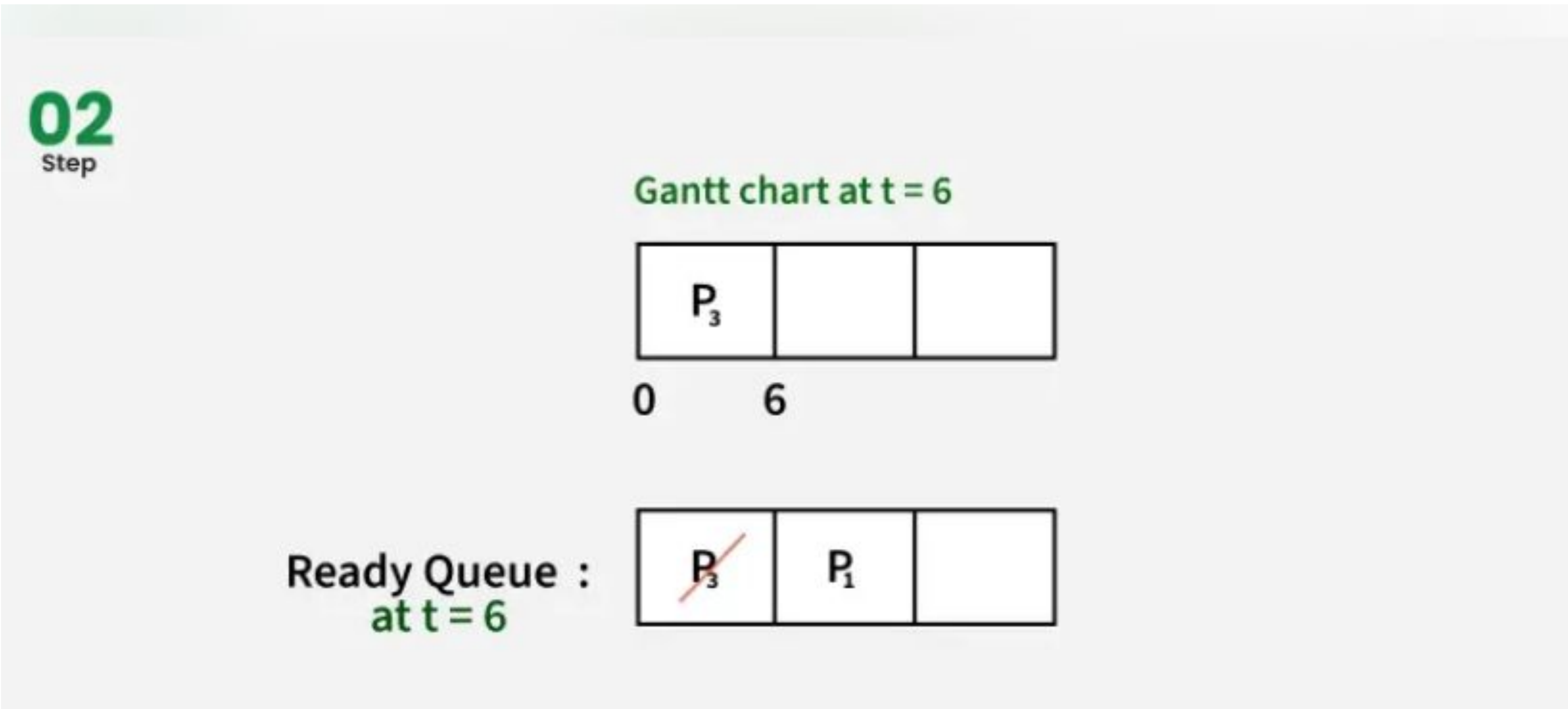
Process	Arrival Time	Burst Time	Priority
P1	0	7	2
P2	0	4	1
P3	0	6	3

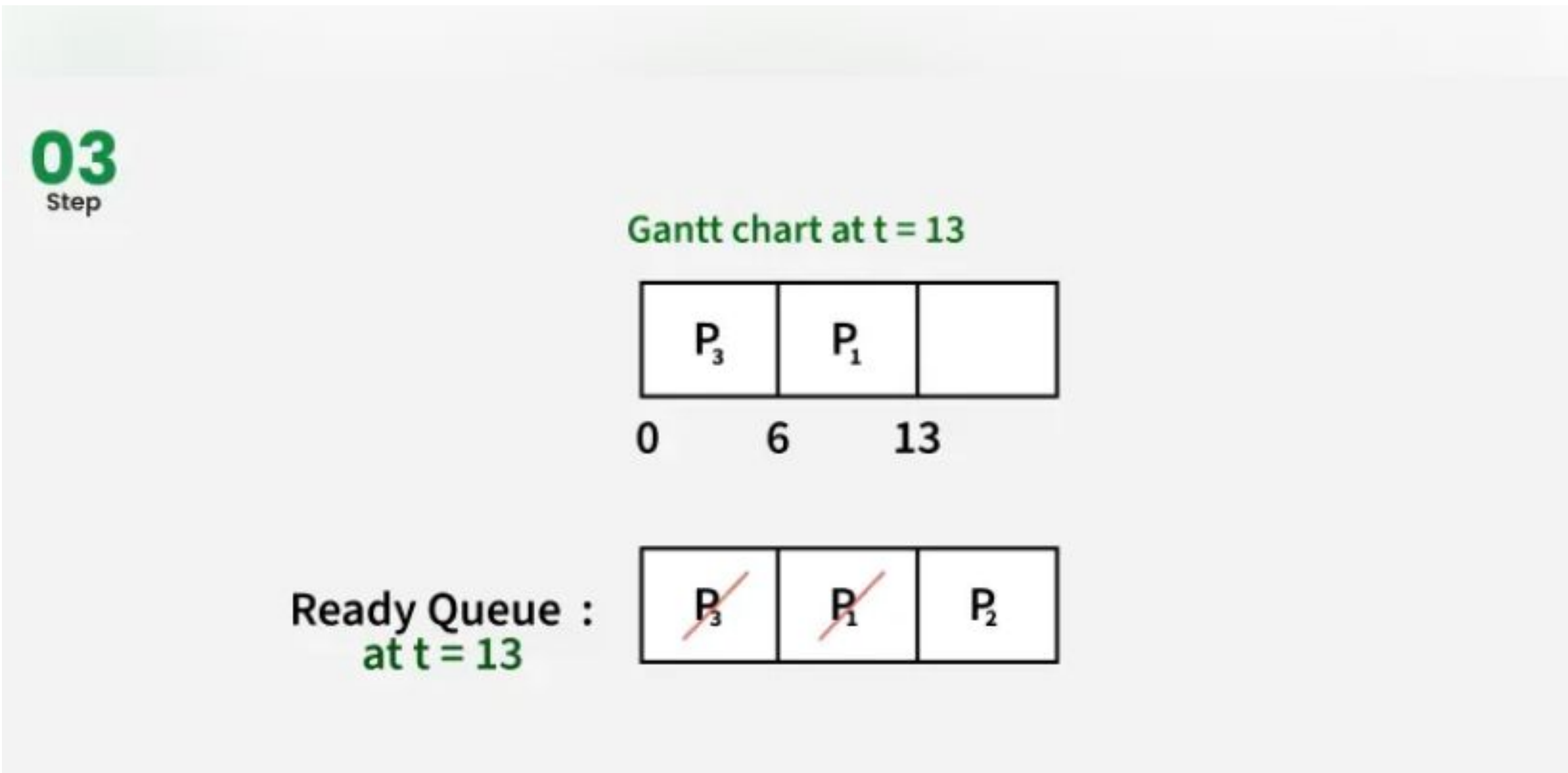
01
Step

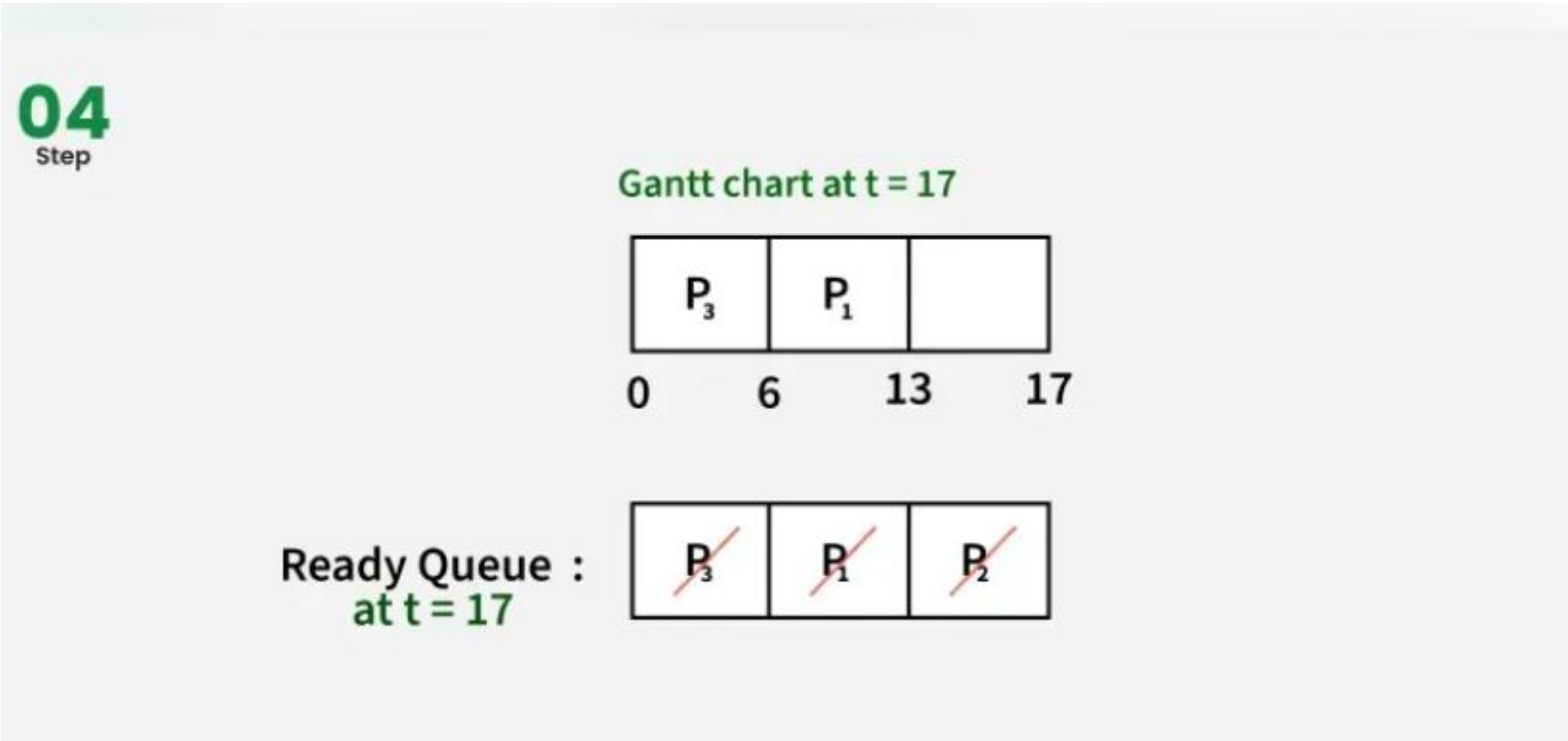
Process	Arrival Time	Burst Time	Priority
P_1	0 ms	7 ms	2 ms
P_2	0 ms	4 ms	1 ms
P_3	0 ms	6 ms	3 ms

Ready Queue :
at t = 0

P_3	P_1	P_2


02
Step
Gantt chart at t = 6
P3
0
6
Ready Queue :
at t = 6
P3
P1


03
Step
Gantt chart at t = 13
P_3
P_1
0
6
13
Ready Queue :
at t = 13
$\cancel{P_3}$
$\cancel{P_1}$
P_2


04
Step
Gantt chart at t = 17
P3
P1
0
6
13
17
Ready Queue :
at t = 17
P3
P1
P2

Gantt Chart

P3	P1	P2

0 6 13 17

Process	Arrival Time	Burst Time	Completion time(CT))	Turnaround Time TAT =(CT-AT)	Waiting Time WT=(TAT-BT)
P1	0	7	13	13	6
P2	0	4	17	17	13
P3	0	6	6	6	0

Preemptive priority Scheduling

Example 2: Process With Different Arrival time.

Consider the following table of arrival time and burst time for three processes P1, P2 and P3 and given Time Quantum = 2ms.

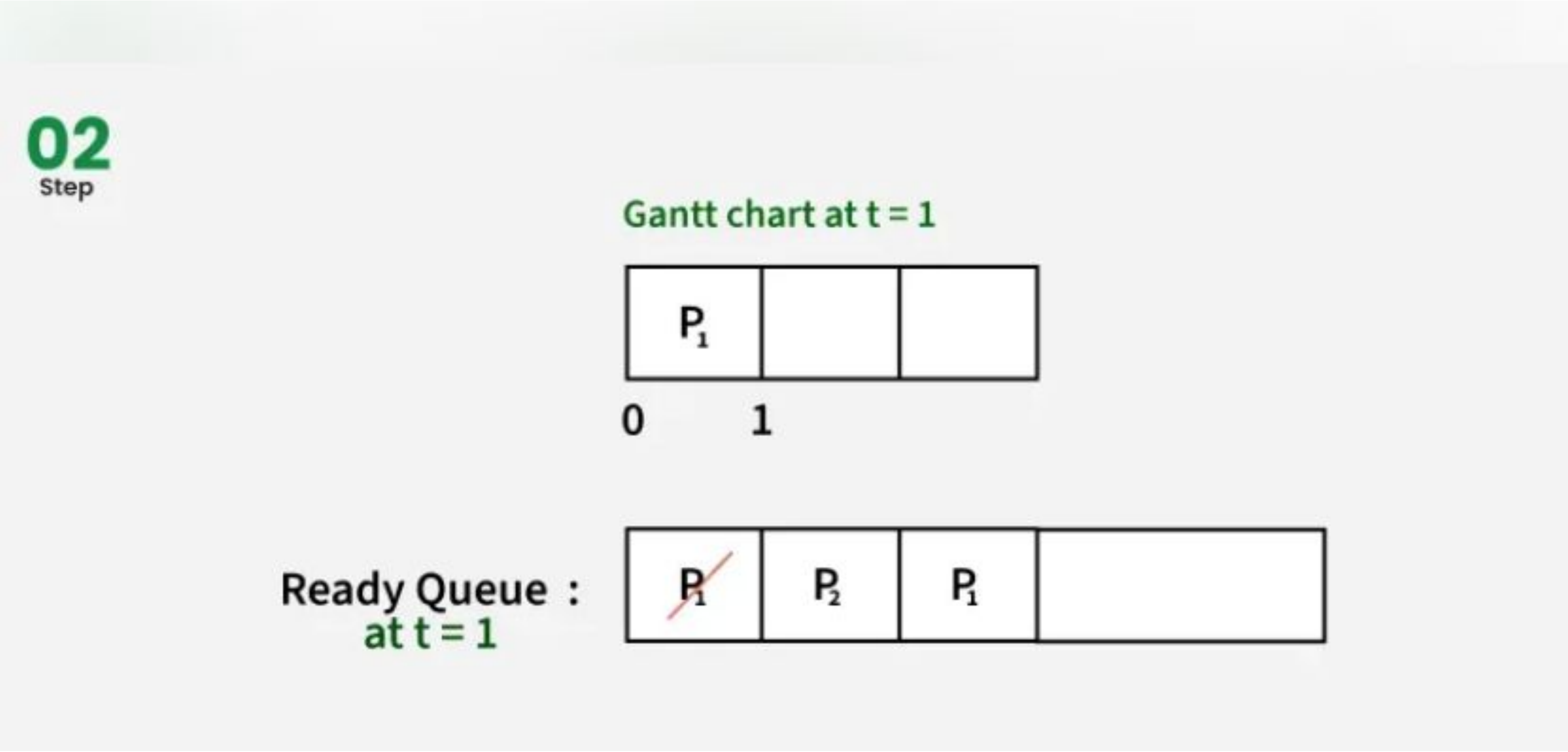
Process	Arrival Time	Burst Time	Priority
P1	0	6	2
P2	1	4	3
P3	2	5	1

01
Step

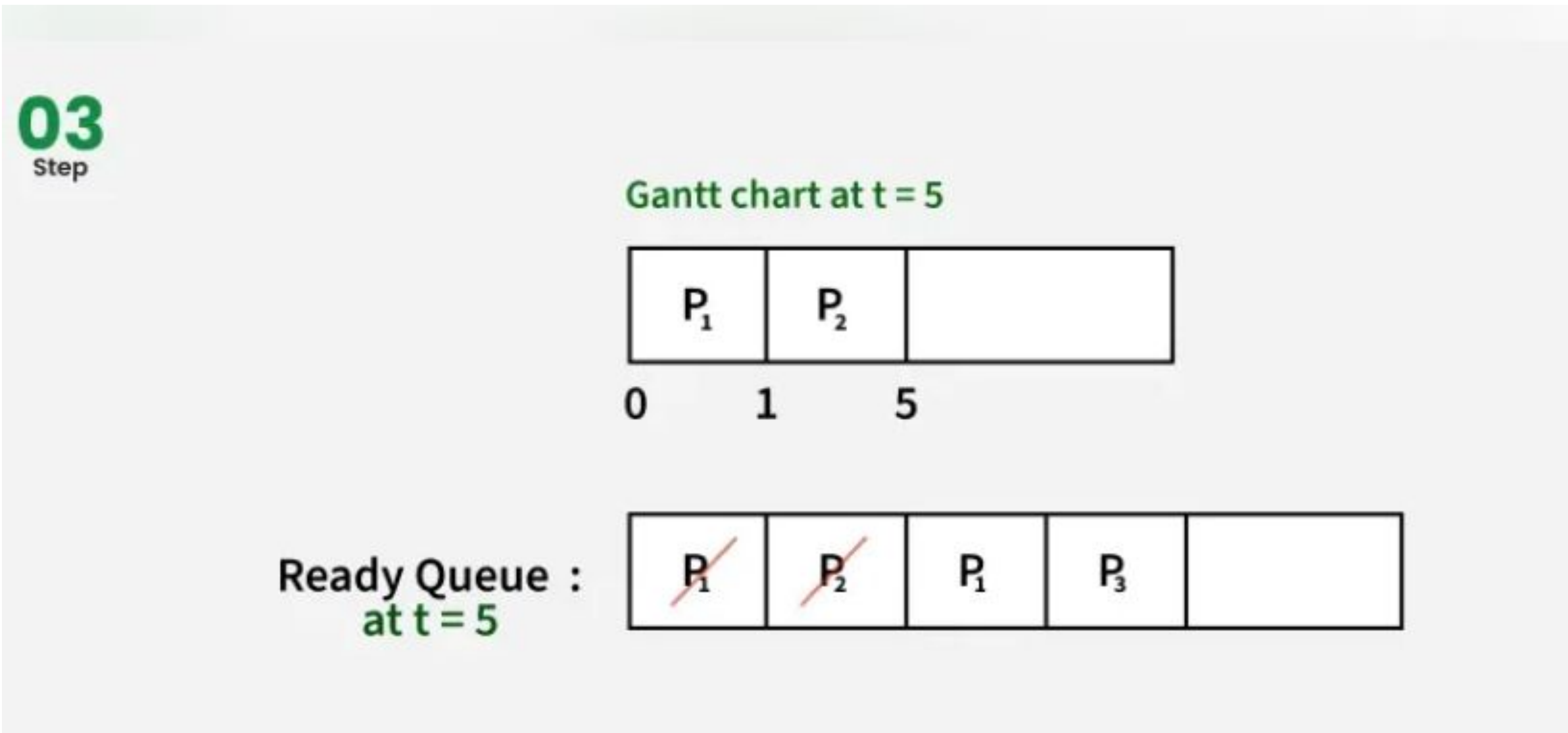
Process	Arrival Time	Burst Time	Priority
P_1	0 ms	6 ms	2 ms
P_2	1 ms	4 ms	3 ms
P_3	2 ms	5 ms	1 ms

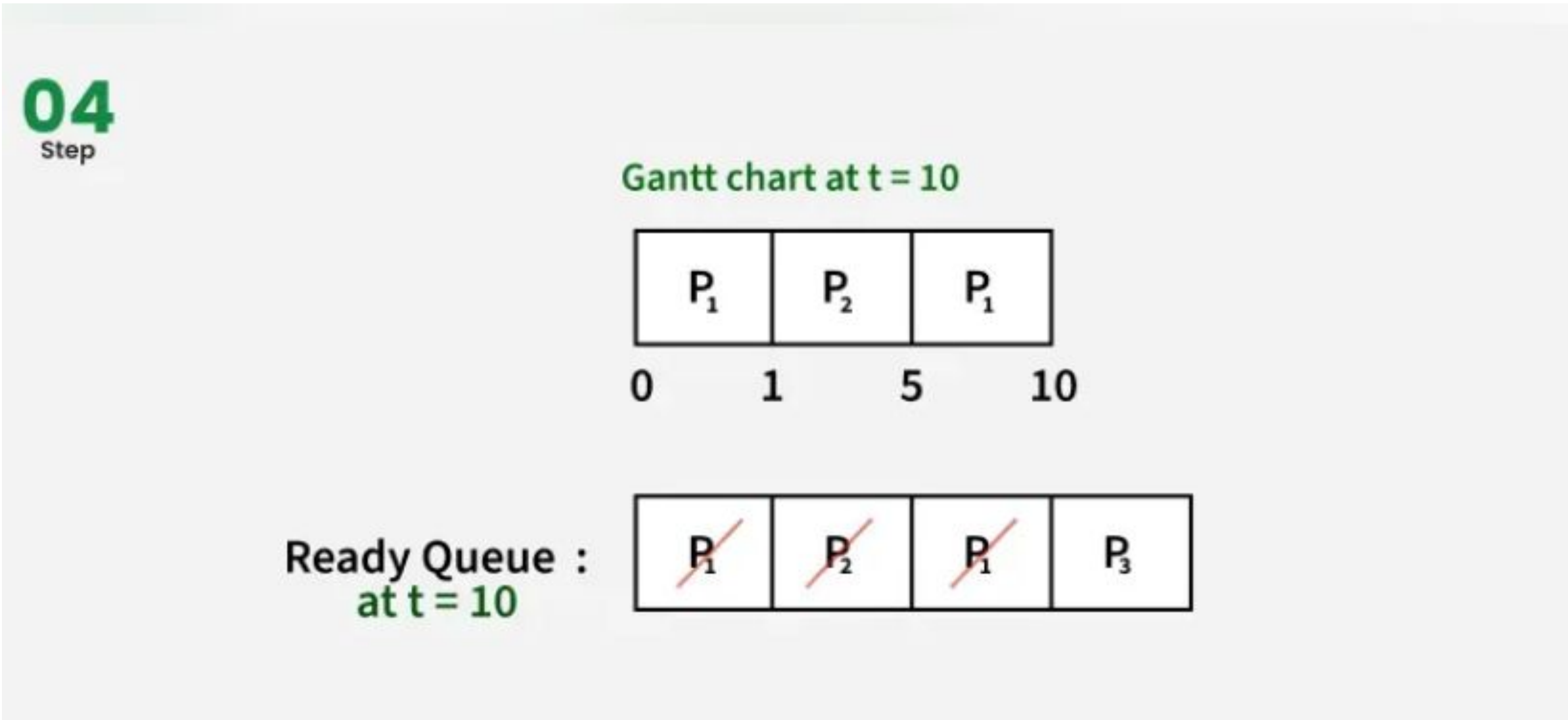
Ready Queue :
at t = 0

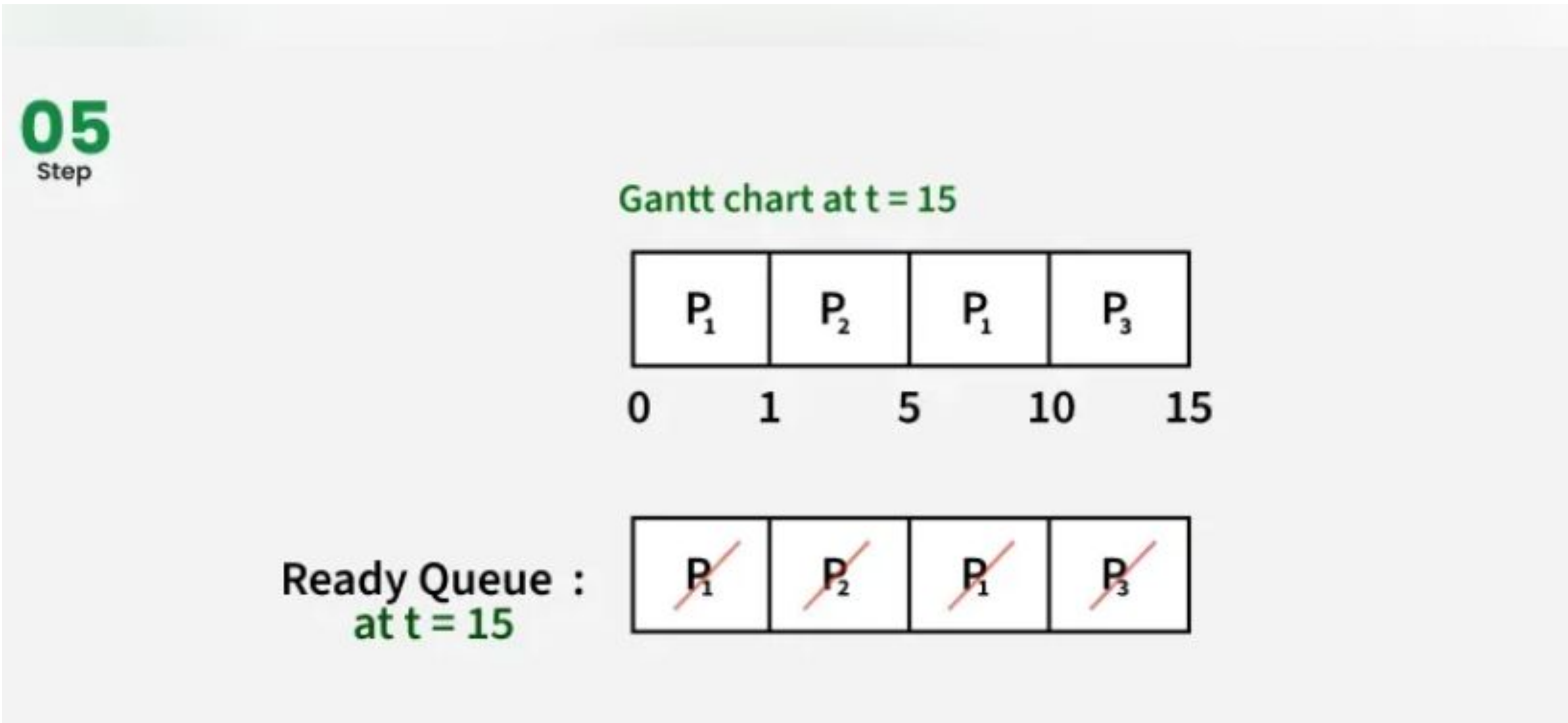
P_1	



02
Step
Gantt chart at t = 1
P_1
0
1
Ready Queue : at t = 1
$\cancel{P_1}$
P_2
P_1


03
Step
Gantt chart at t = 5
P_1
P_2
0
1
5
Ready Queue : at t = 5
$\cancel{P_1}$
$\cancel{P_2}$
P_1
P_3


04
Step
Gantt chart at t = 10
P1 P2 P1
0 1 5 10
Ready Queue : at t = 10
P1 P2 P1 P3


05
Step
Gantt chart at t = 15
P1
P2
P1
P3
0
1
5
10
15
Ready Queue :
at t = 15
P1
P2
P1
P3

Gantt Chart

P1	P2	P1	P3

0 1 5 10 15

Process	Arrival Time	Burst Time	Completion time(CT))	Turnaround Time TAT =(CT-AT)	Waiting Time WT=(TAT-BT)
P1	0	6	10	10	4
P2	1	4	5	4	0
P3	2	5	15	13	8

Non Preemptive priority Scheduling

Example 1: Process With Different Arrival time.

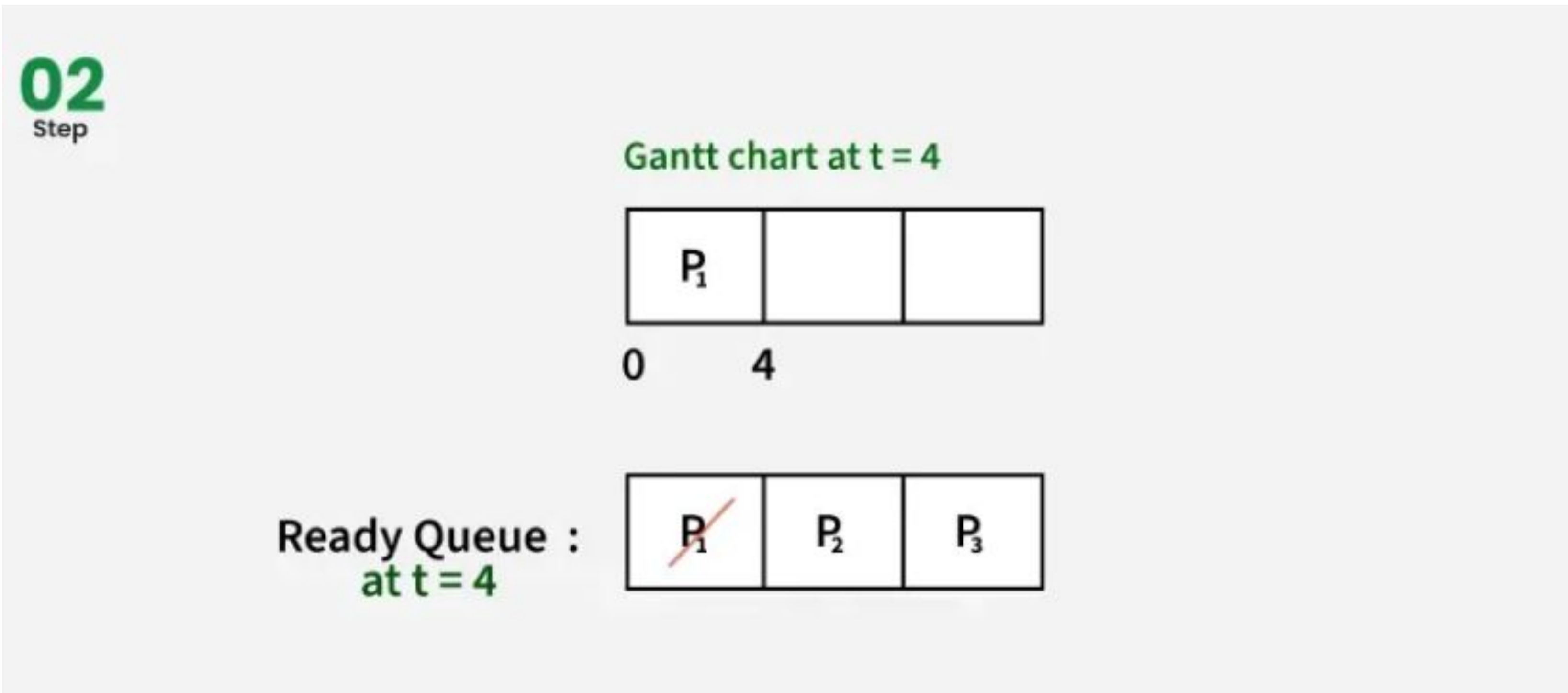
Consider the following table of arrival time and burst time for three processes P1, P2 and P3.

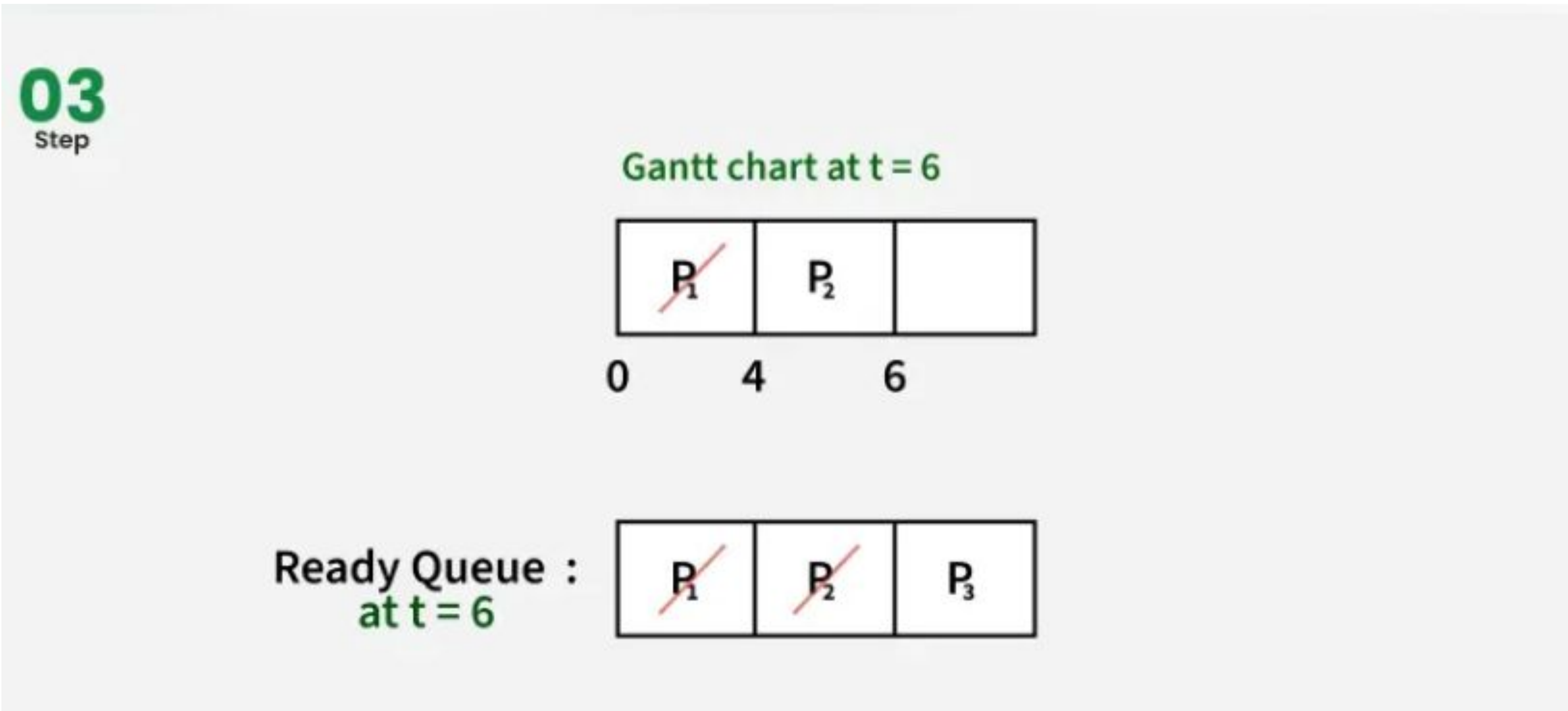
Process	Arrival Time	Burst Time	Priority
P1	0	4	2
P2	1	2	1
P3	2	6	3

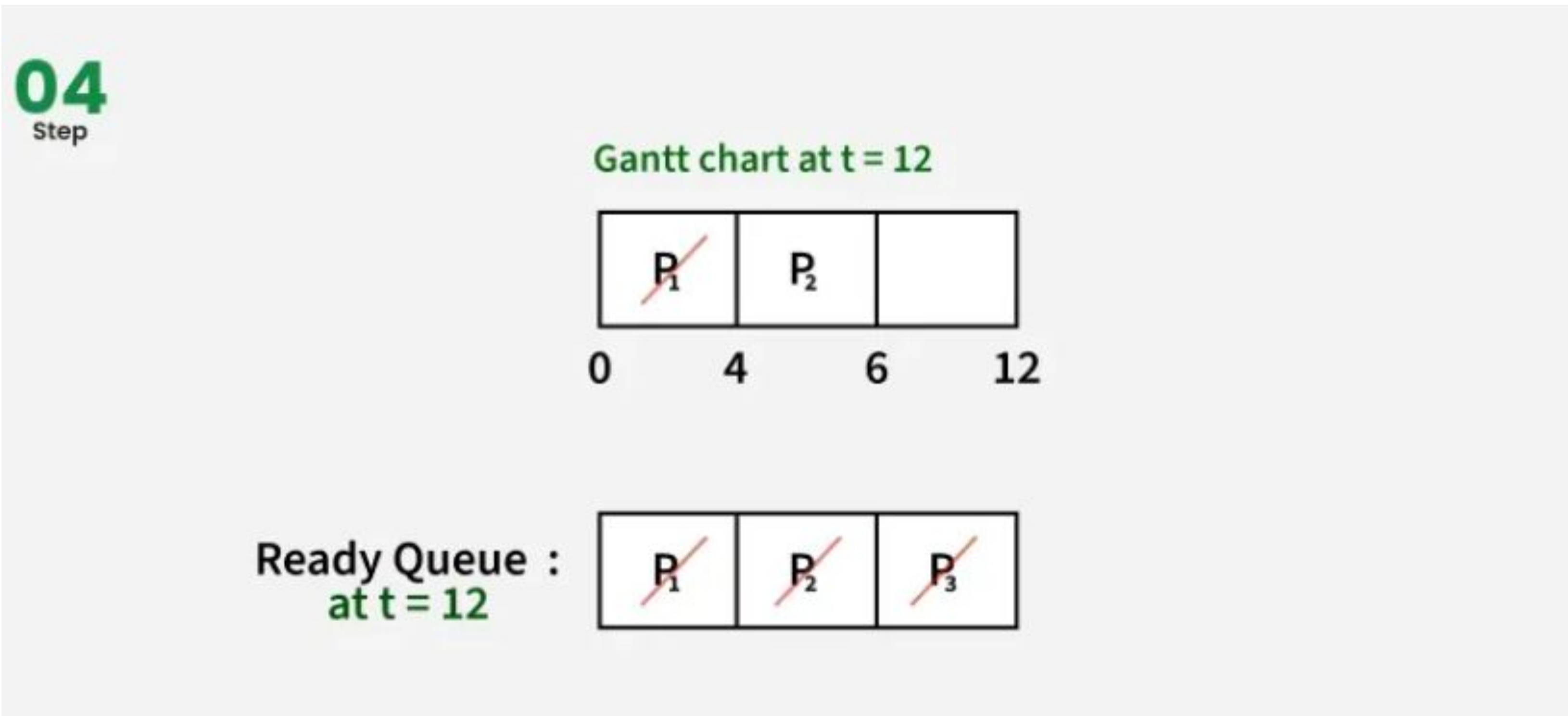
01
Step

Process	Arrival Time	Burst Time	Priority
P_1	0 ms	4 ms	2 ms
P_2	1 ms	2 ms	1 ms
P_3	2 ms	6 ms	3 ms

Ready Queue : | P_1 | |
at t = 0


02
Step
Gantt chart at t = 4
P_1
0
4
Ready Queue :
at t = 4
~~P_1~~
P_2
P_3


03
Step
Gantt chart at t = 6
P_1
P_2
0
4
6
Ready Queue :
at t = 6
P_1
P_2
P_3


04
Step
Gantt chart at t = 12
P1
P2
0
4
6
12
Ready Queue :
at t = 12
P1
P2
P3

Gantt Chart

P1	P2	P3

0 4 6 12

Process	Arrival Time	Burst Time	Completion time(CT))	Turnaround Time TAT =(CT-AT)	Waiting Time WT=(TAT-BT)
P1	0	4	4		
P2	1	2	6		
P3	2	6	12		

DISCUSSION & REVISION

1. Which scheduling uses priority numbers to pick the next process?
2. In Round Robin, what happens when a process uses all its time slice?
3. Can starvation happen in priority scheduling? Yes or No?
4. Which scheduling gives each process a fair turn — Priority or Round Robin?
5. What do we call the fixed time given to each process in Round Robin?

References

https://www.tutorialspoint.com/operating_system/os_priority_scheduling_algorithm.htm

http://geeksforgeeks.org/dsa/first-come-first-serve-cpu-scheduling-non-preemptive/

https://www.geeksforgeeks.org/operating-systems/shortest-job-first-or-sjf-cpu-scheduling/

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