Operating System
Module – 3

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PRP – 217 4

CPU Scheduling – Sample Problem

- Consider three processes, P1, P2, and P3, that arrive at time t = 0 with the following characteristics:

Process	CPU Burst 1(ms)	I/O Burst(ms)	CPU Burst 2(ms)
P1	10	20	5
P2	7	15	3
P3	12	25	8

- Assume a Round Robin scheduler with a time quantum of 5 ms. Each context switch takes 1 ms. Processes begin with a CPU burst, followed by an I/O burst, and finally another CPU burst. Calculate average waiting time, average turnaround time, Response time, CPU utilization time and No. of Context switch.

CPU Scheduling – Sample Problem

At time 0: P1 runs for its first 5ms quantum.

CPU Scheduling – Sample Problem

At time 5: Context switch.

CPU Scheduling – Sample Problem

At time 6: P2 runs for its 5ms quantum..

CPU Scheduling – Sample Problem

At time 11: Context switch.

CPU Scheduling – Sample Problem

At time 12: P3 runs for its 5ms quantum.

CPU Scheduling – Sample Problem

At time 17: Context Switch

CPU Scheduling – Sample Problem

At time 18: P1 runs for its remaining 5ms of CPU Burst 1, then begins its 20ms I/O burst, which will complete at t = 43ms

CPU Scheduling – Sample Problem

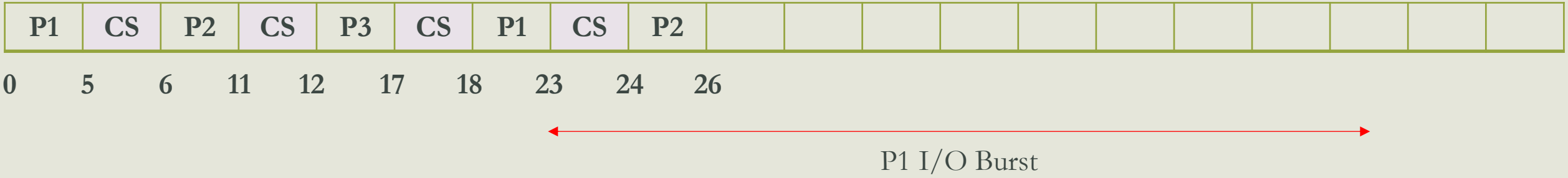
At time 18: P1 runs for its remaining 5ms of CPU Burst 1, then begins its 20ms I/O burst, which will complete at t = 43ms

CPU Scheduling – Sample Problem

At time 23: Context switch.

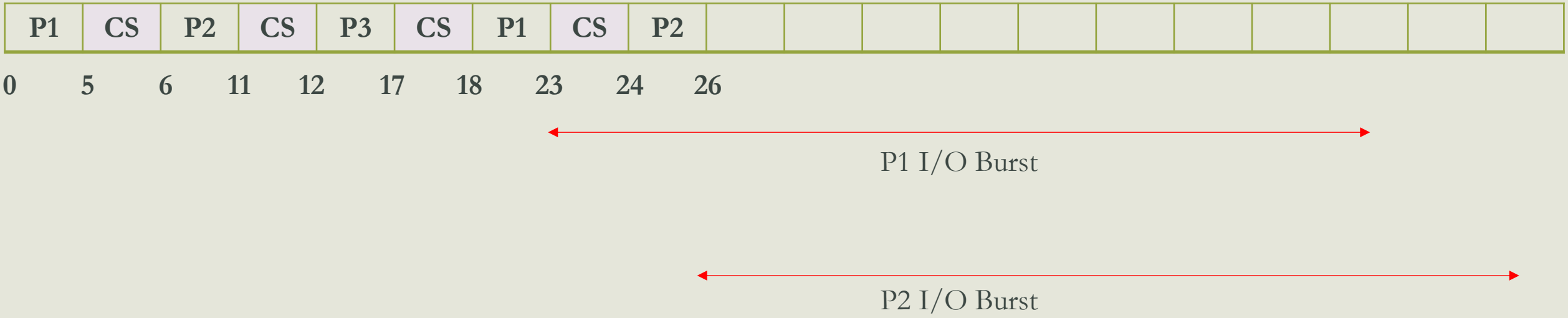
CPU Scheduling – Sample Problem

At time 24: P2 runs for its remaining 2ms of CPU Burst 1, then begins its 15ms I/O burst, which will complete at t = 41ms.



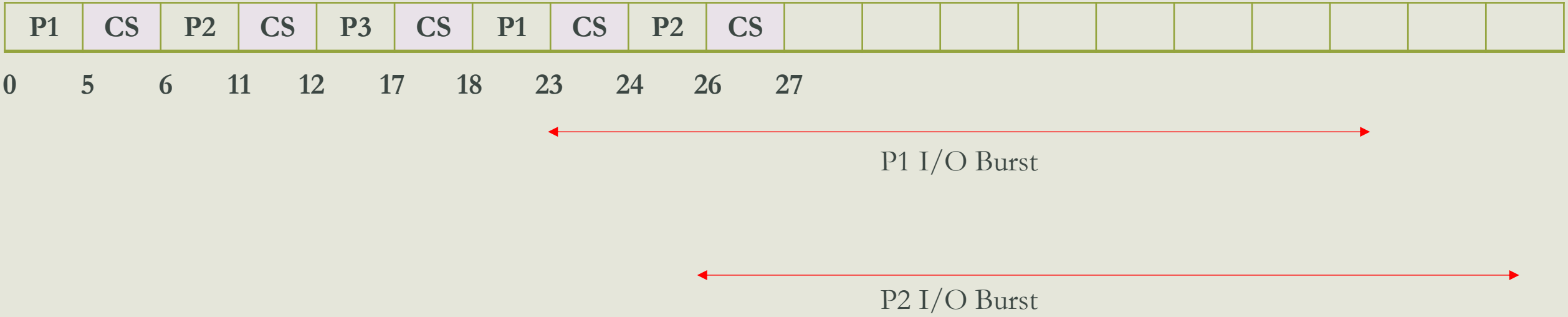
CPU Scheduling – Sample Problem

At time 24: P2 runs for its remaining 2ms of CPU Burst 1, then begins its 15ms I/O burst, which will complete at t = 41ms.



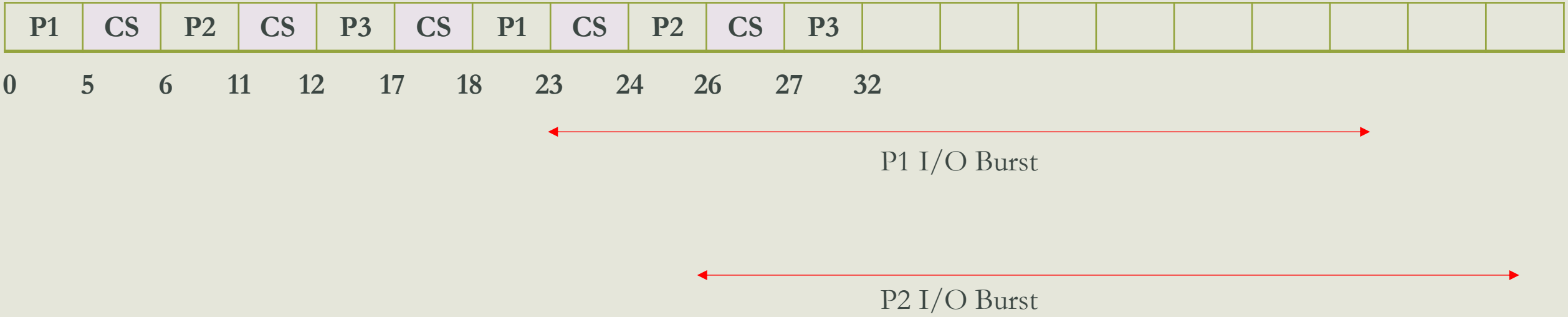
CPU Scheduling – Sample Problem

At time 26: Context Switch



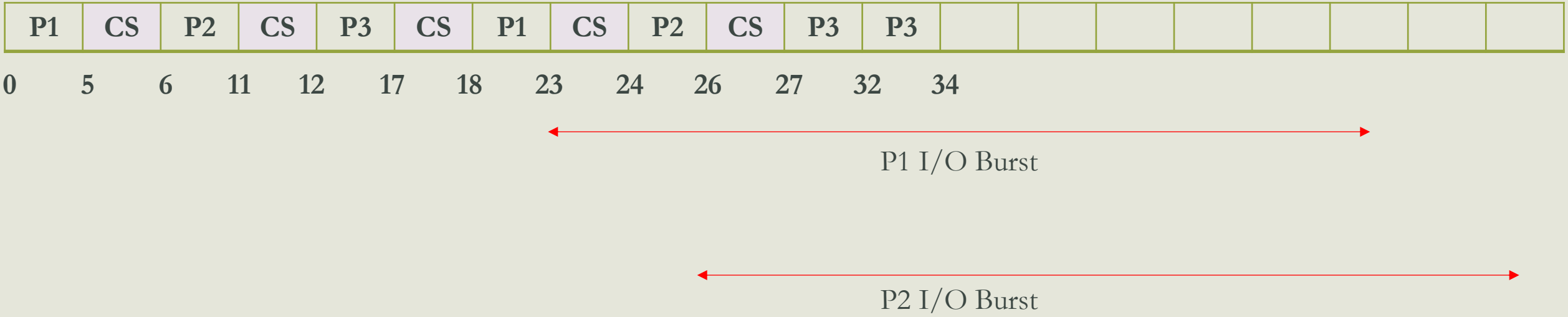
CPU Scheduling – Sample Problem

At time 27: P3 runs for another 5ms quantum.



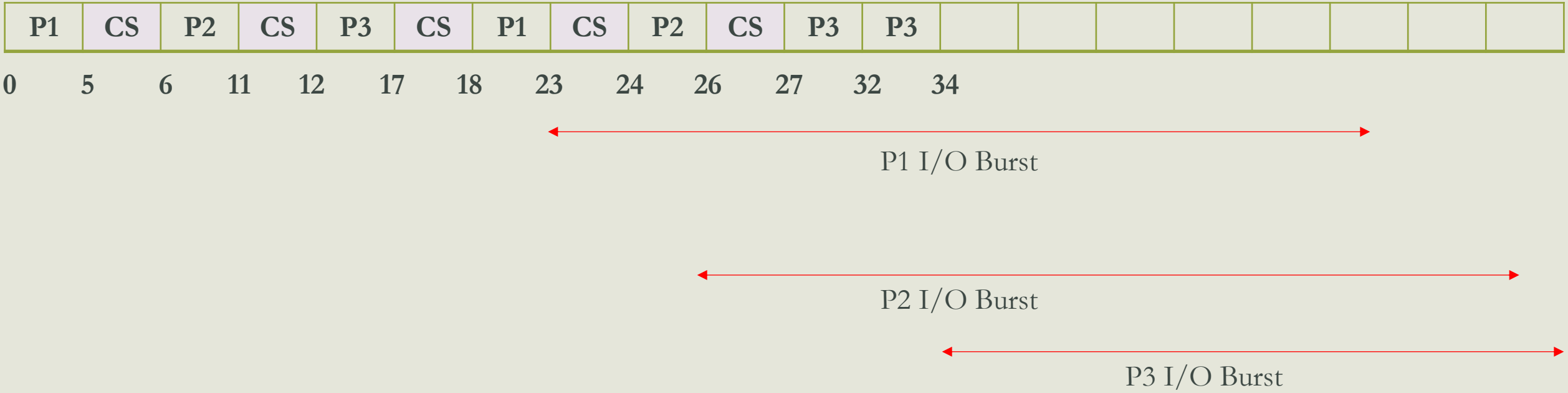
CPU Scheduling – Sample Problem

At time 32: P3 runs for another 2ms quantum. It then begins its 25ms I/O burst, which will complete at t = 59ms.



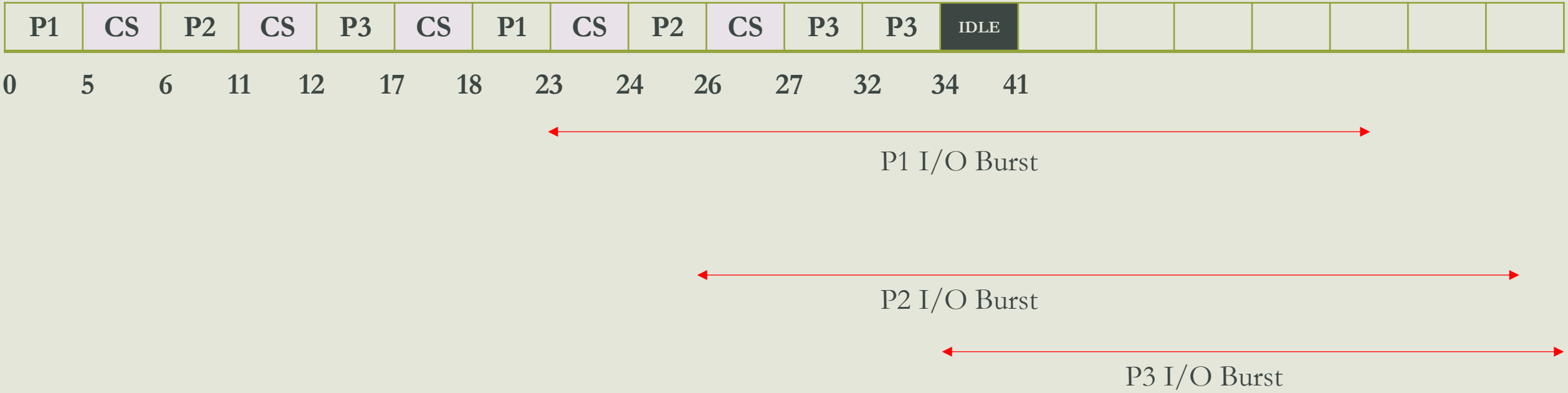
CPU Scheduling – Sample Problem

At time 32: P3 runs for another 2ms quantum. It then begins its 25ms I/O burst, which will complete at t = 59ms.



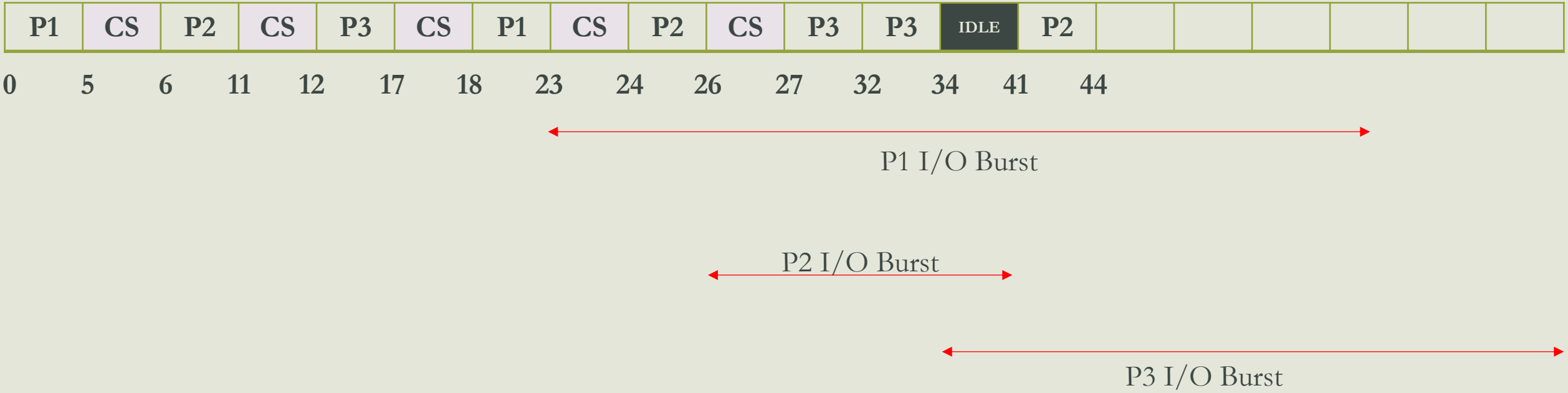
CPU Scheduling – Sample Problem

At time 34: CPU is IDLE



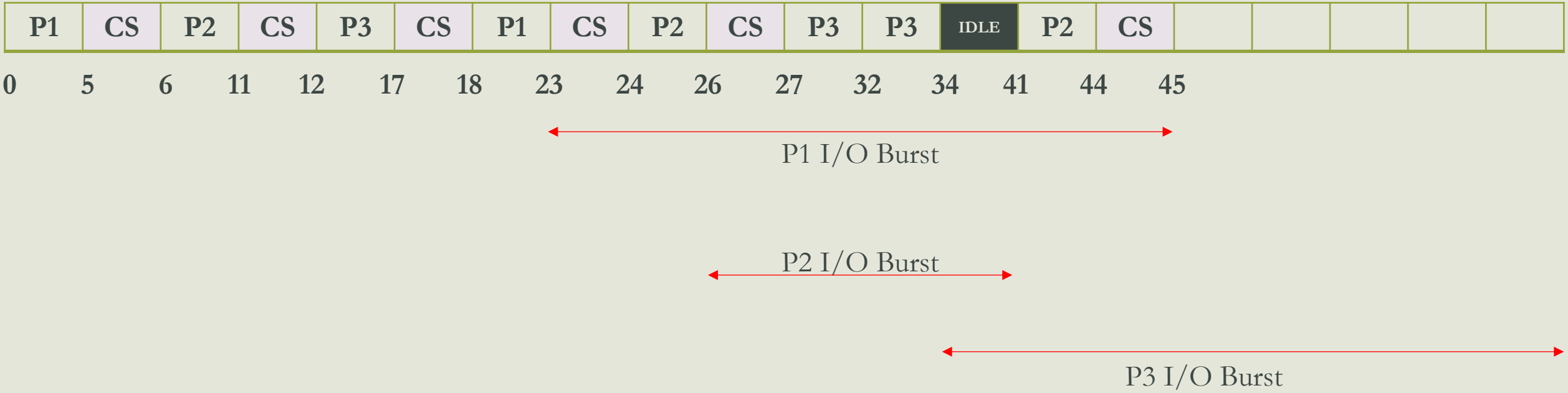
CPU Scheduling – Sample Problem

At time 41: P2's I/O completes. It runs for its 3ms CPU Burst 2. P2 finishes at t = 44ms.



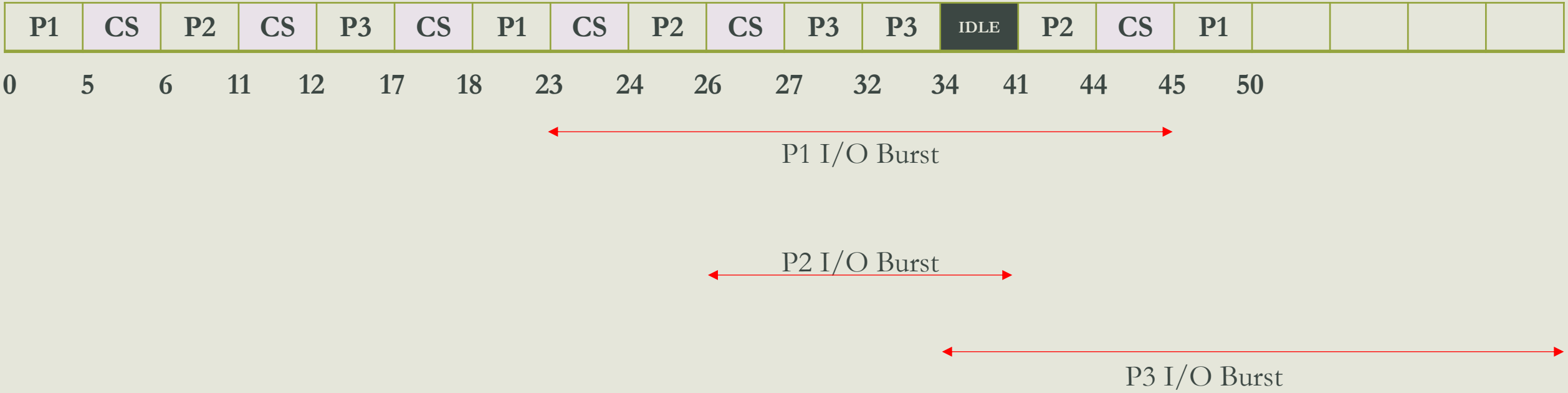
CPU Scheduling – Sample Problem

At time 44: Context Switch



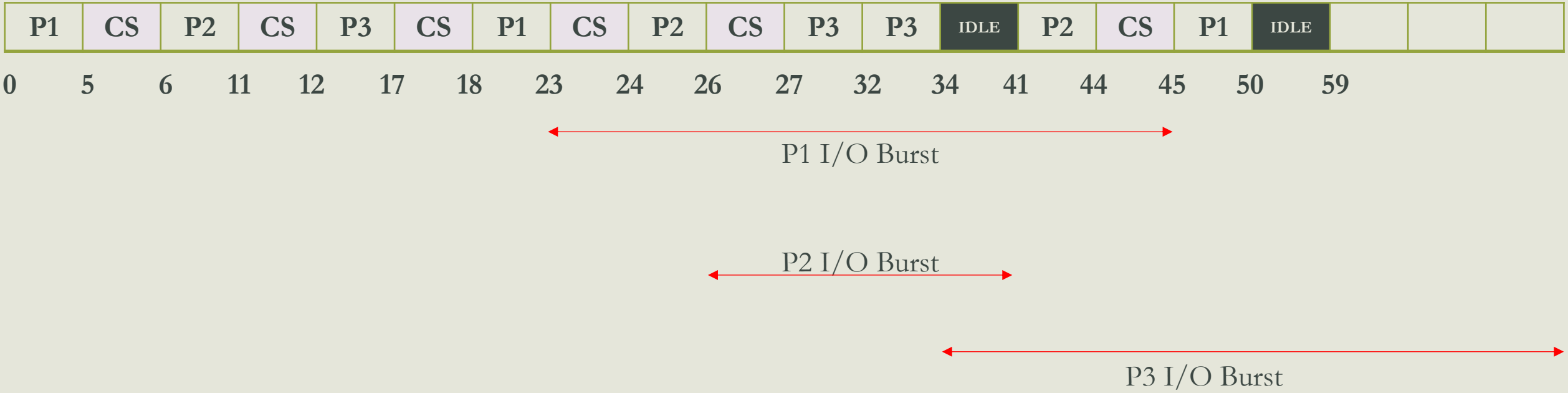
CPU Scheduling – Sample Problem

At time 45: P1's I/O completes (at t=43). It runs for its 5ms CPU Burst 2. P1 finishes at t = 50ms.



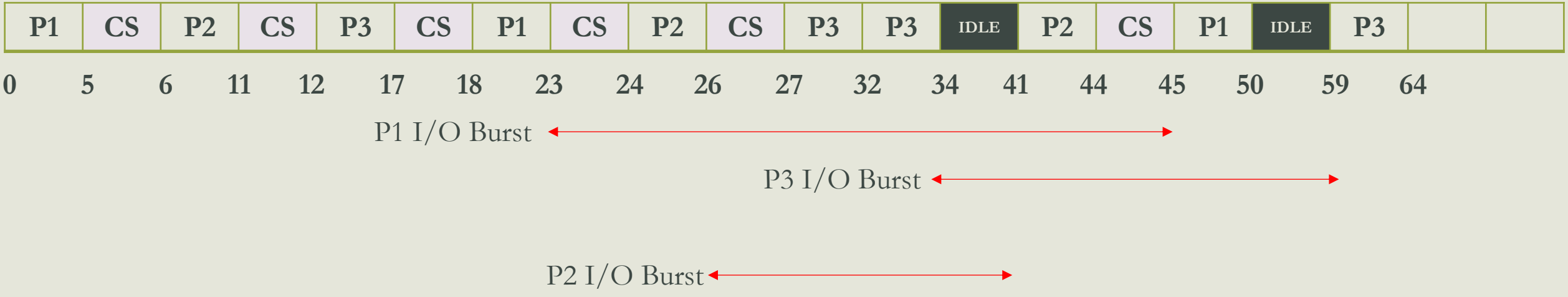
CPU Scheduling – Sample Problem

At time 50: The CPU is idle.



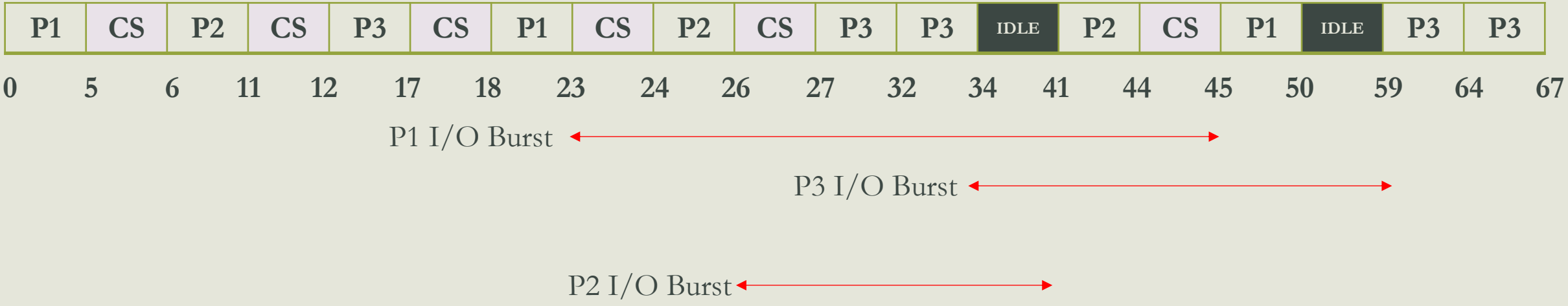
CPU Scheduling – Sample Problem

At time 59: P3's I/O completes. It runs for a 5ms quantum of its CPU Burst 2.

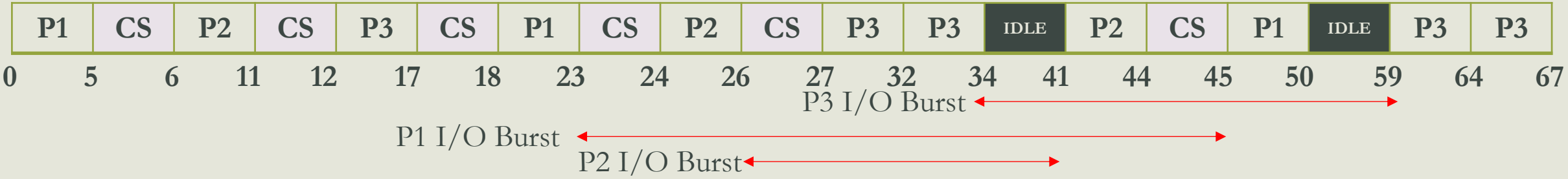


CPU Scheduling – Sample Problem

At time 64: P3 runs for its final 3ms of CPU Burst 2. P3 finishes at t = 67ms.



CPU Scheduling – Sample Problem



Process	Arrival Rate	Burst Time	Completion Time	Turnaround Time	Waiting Time	Response Time	CPU Utilization
P1	0	15	50	50 – 0 = 50	50 – 15 = 35	0 – 0 = 0	15 / 51 = 29.41
P2	0	10	44	44 – 0 = 44	44 – 10 = 34	6 – 0 = 6	10 / 51 = 19.60
P3	0	20	67	67 – 0 = 67	67 – 20 = 47	12 – 0 = 12	20 / 51 = 39.21

Total CPU Burst Time = 15 + 10 + 20 + 6 = 51
Total Elapsed Time = 67
Total CPU utilization = (51 / 67) * 100 = **76.11**
Idle CPU time = 67 – 51 = **16**
Total Idle time = (16/67) * 100 = **23.88**
No. of Context Switch = 06