BITS, PILANI – K. K. BIRLA GOA CAMPUS

Operating Systems

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OPERATING SYSTEMS

LECTURE 13: CPU SCHEDULING

Scheduling Algorithms

Shortest Job First Drawbacks

- Possibility of starvation for longer processes as long as there is a steady supply of shorter processes.
- Lack of preemption is not suited in a time sharing environment:
  - CPU bound process gets lower priority (as it should) but a process doing no I/O could still monopolize the CPU if it is the first one to enter the system.
- SJF implicitly incorporates priorities: shortest jobs are given preferences.

Quick lookup about SJF

- Which process to select? (scheduling policy)

- How long to schedule (Preemptive/NonPreemptive)

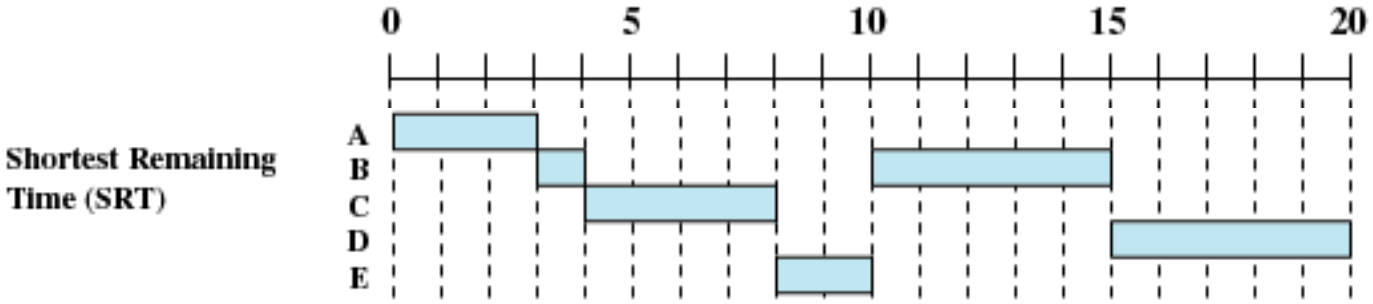
  OR

  When to invoke Scheduler?

  (Calculation of Next decision point)

- Implementation

Shortest Remaining Time



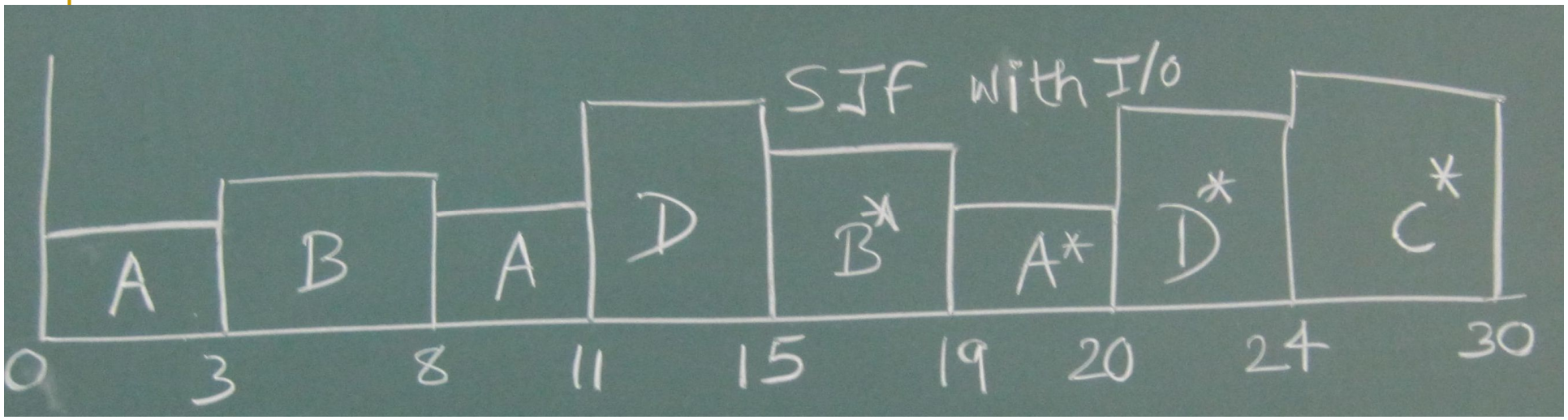
- Preemptive version of shortest process next policy
- Must estimate processing time

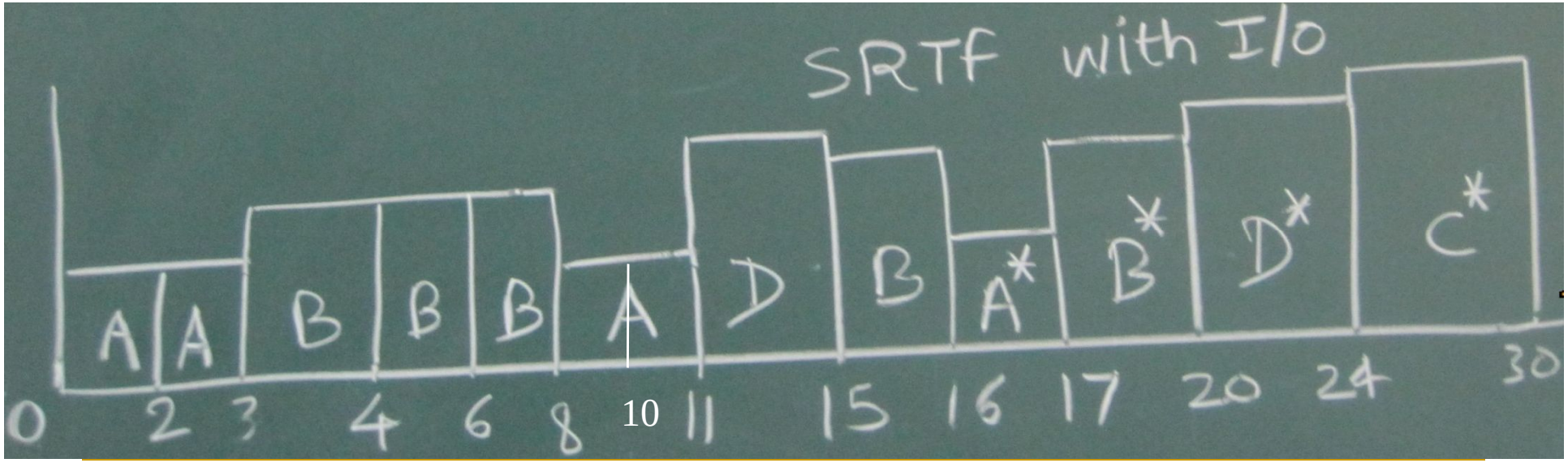
Process	Arrival Time	Execution Time
A	0	3
B	2	6
C	4	4
D	6	5
E	8	2

SJF and SRTF with I/O

Process	Arrival Time	Execution Time
A	0	7
B	2	9
C	4	6
D	6	8

- Assume process A goes for I/O for 5 units of time after every 3 unit execution in CPU
- Assume B goes for I/O for 2 units after 5 units of execution in CPU
- Process C is a CPU bound process with no I/O
- Process D goes for I/O for 1 unit after 4 units of execution in CPU.


SJF with I/O
A
B
A
D
B*
A*
D*
C*
0
3
8
11
15
19
20
24
30


SRTf with I/O
A
A
B
B
B
A
D
B
A*
B*
D*
C*
0
2
3
4
6
8
10
11
15
16
17
20
24
30

Quick lookup about SRTF

- Which process to select? (scheduling policy)

- How long to schedule (Preemptive/NonPreemptive)

  OR

  When to invoke Scheduler?

  (Calculation of Next decision point)

- Implementation

Priority Scheduling

- A priority number (integer) is associated with each process
- The CPU is allocated to the process with the highest priority (smallest integer ≡ highest priority)
  - Preemptive
  - Nonpreemptive
- SJF is a priority scheduling where priority is the predicted next CPU burst time
- Problem ≡ **Starvation** – low priority processes may never execute
- Solution ≡ **Aging** – as time progresses increase the priority of the process

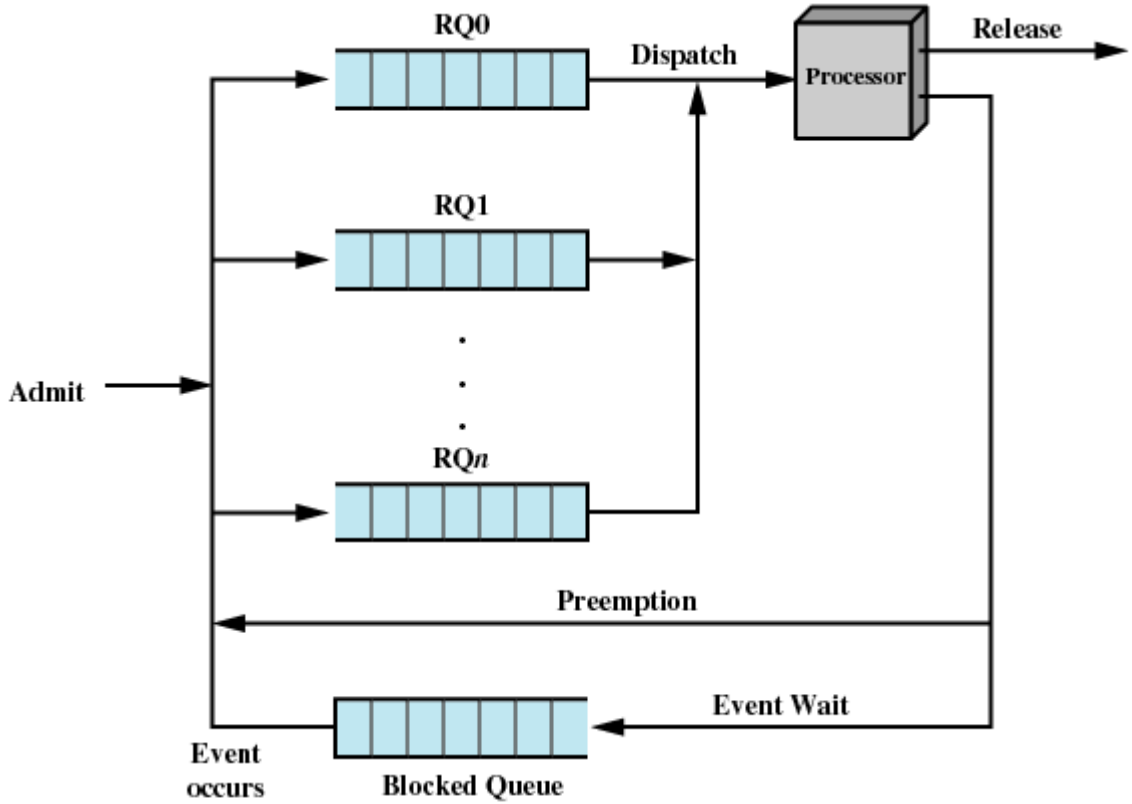


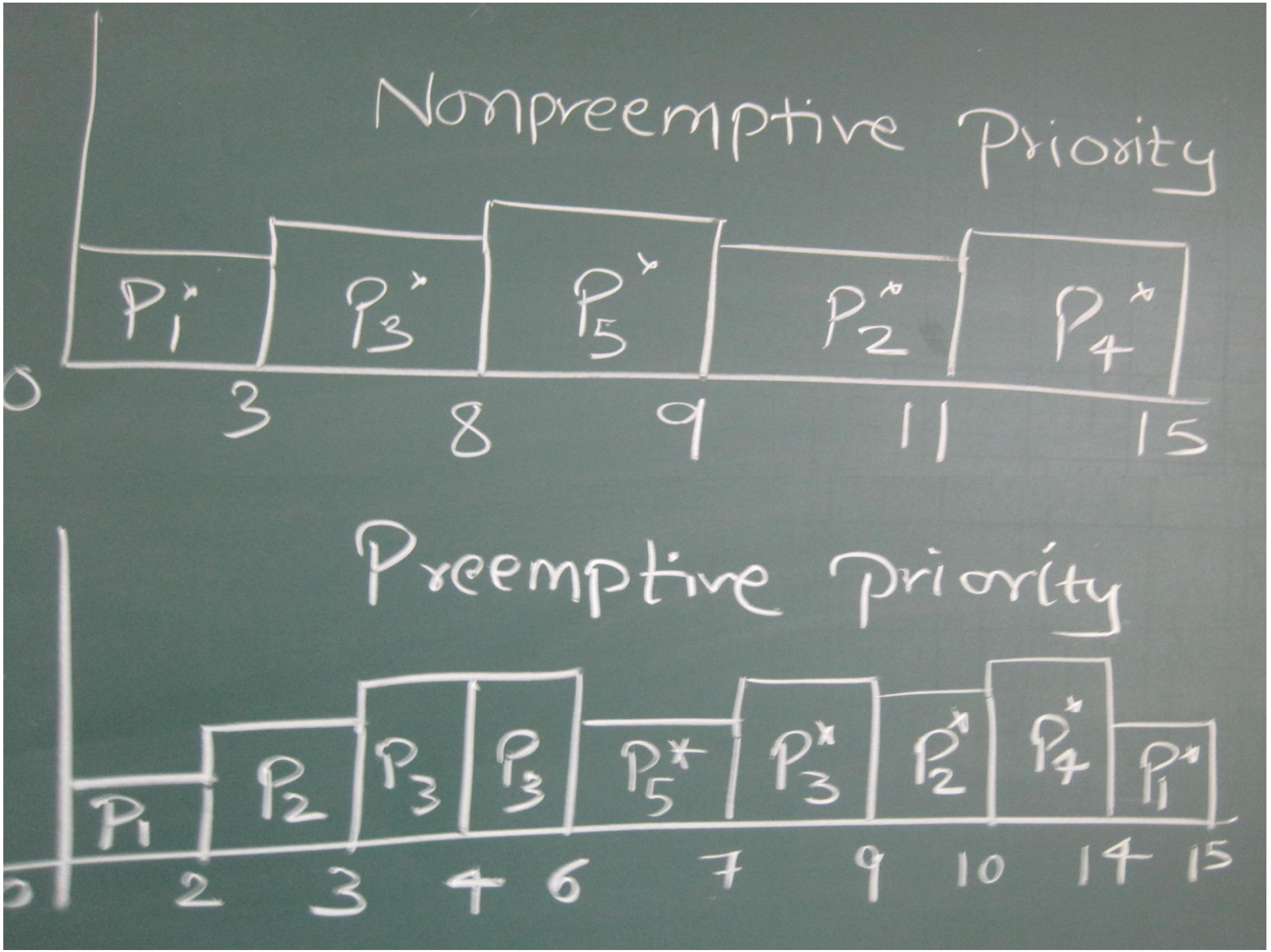
Figure 9.4 Priority Queuing

Decision Mode

- Nonpreemptive
  - Once a process is in the running state, it will continue until it terminates or blocks itself for I/O
- Preemptive
  - Currently running process may be interrupted and moved to the Ready state by the operating system
  - Allows for better service since any one process cannot monopolize the processor for very long

Priority – Preemptive & Non-preemptive Scheduling

Process	Arrival Time	Execution Time	Priority
P1	0	3	5
P2	2	2	3
P3	3	5	2
P4	4	4	4
P5	6	1	1


Nonpreemptive Priority
P1*
P3*
P5*
P2*
P4*
0
3
8
9
11
15
Preemptive Priority
P1
P2
P3
P3
P5*
P3*
P2*
P4*
P1*
0
2
3
4
6
7
9
10
14
15

Quick lookup about priority scheduling (Preemptive and NonPreemptive)

- Which process to select? (scheduling policy)

- How long to schedule (Preemptive/NonPreemptive)

  OR

  When to invoke Scheduler?

  (Calculation of Next decision point)

- Implementation