Department of Computer Science and Engineering

FACULTY OF ENGINEERING AND TECHNOLOGY
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CS-501

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SHORTEST-JOB-FIRST (SJF) SCHEDULING

SJF Scheduling

- Associate with each process the length of its *next CPU burst*. Use these lengths to schedule the process with the shortest time.

- Two schemes:
  - Non-preemptive – once CPU given to the process it cannot be preempted until completes its CPU burst.
  - Preemptive – if a new process arrives with CPU burst length less than remaining time of current executing process, preempt. This scheme is know as the Shortest-Remaining-Time-First (SRTF).

- SJF is optimal – gives minimum average waiting time for a given set of processes

NON-PREEMPTIVE SJF SCHEDULING

Non-Preemptive SJF Question

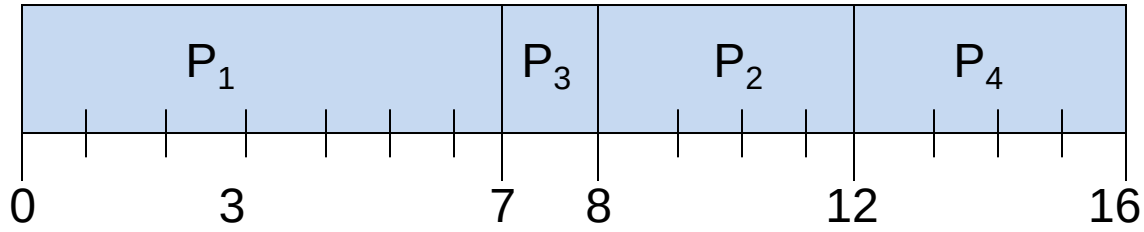
Process	Arrival Time	Burst Time
P_1	0.0	7
P_2	2.0	4
P_3	4.0	1
P_4	5.0	4

Suppose that the processes arrive in the order: P_1 , P_2 , P_3, *and* P_4.

Find:

1. *Waiting Time*
2. *Average Waiting Time*
3. *Turnaround Time*
4. *Average Turnaround Time*

Non-Preemptive SJF Question: Solution 1/2

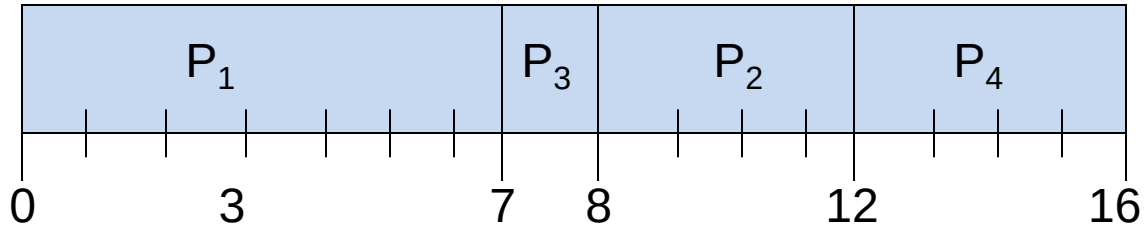


- *Waiting Time*
  - *P1wt=0 unit time*
  - *P2wt=(8-2)=6 unit time*
  - *P3wt=(7-4)=3 unit time*
  - *P4wt=(12-5)=7 unit time*

Process	Arrival Time	Burst Time
P_1	0.0	7
P_2	2.0	4
P_3	4.0	1
P_4	5.0	4

- *Average Waiting Time*
  - *AWT=(P1wt+P2wt+P3wt+P4wt)/4*
  - *AWT=(0+6+3+7)/4=16/4=4 unit time*

Non-Preemptive SJF Question: Solution 2/2



Process	Arrival Time	Burst Time
P_1	0.0	7
P_2	2.0	4
P_3	4.0	1
P_4	5.0	4

- *Turnaround Time*
  - *P1tt=(7-0)=7 unit time*
  - *P2tt=(12-2)=10 unit time*
  - *P3tt=(8-4)=4 unit time*
  - *P4tt=(16-5)=11 unit time*
- *Average Turnaround Time*
  - *ATT=(P1tt+P2tt+P3tt+P4tt)/4*
  - *ATT=(7+10+4+11)/4=32/4=8 unit time*

Non-Preemptive SJF Homework Question

Process	Arrival Time	Burst Time
P_1	0.0	8
P_2	2.0	5
P_3	4.0	6
P_4	6.0	7

Suppose that the processes arrive in the order: P_1 , P_2 , P_3, *and* P_4.

Find:

1. *Waiting Time*
2. *Average Waiting Time*
3. *Turnaround Time*
4. *Average Turnaround Time*

PREEMPTIVE SJF SCHEDULING

Preemptive SJF Question

Process	Arrival Time	Burst Time
P_1	0.0	7
P_2	2.0	4
P_3	4.0	1
P_4	5.0	4

Suppose that the processes arrive in the order: P_1 , P_2 , P_3, *and* P_4.

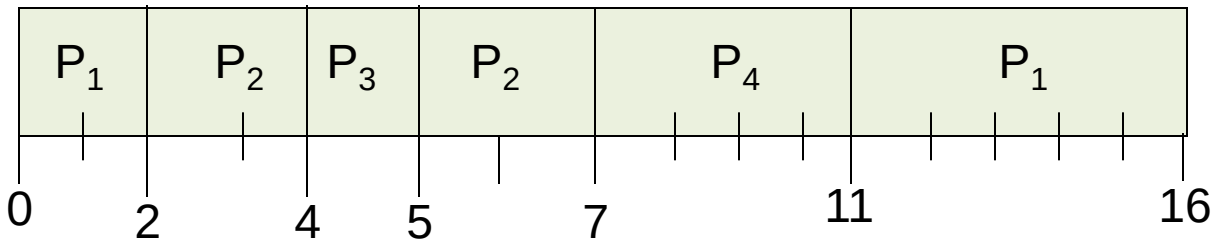
Find:

1. *Waiting Time*
2. *Average Waiting Time*
3. *Turnaround Time*
4. *Average Turnaround Time*

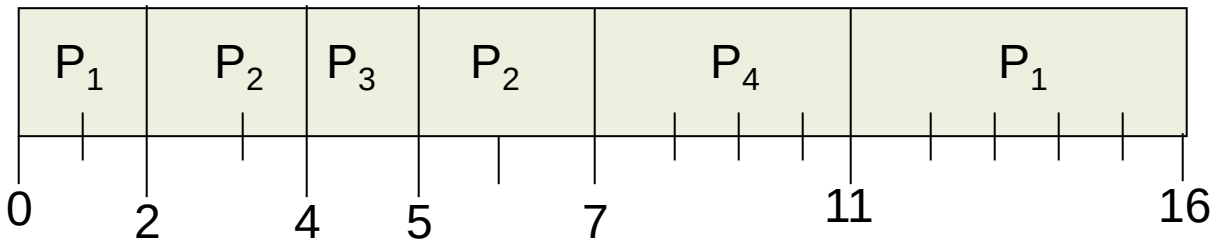
Preemptive SJF Question: Solution 1/3

Process	Arrival Time	Burst Time
P_1	0.0	7
P_2	2.0	4
P_3	4.0	1
P_4	5.0	4

Process	Arrival Time	Burst Time	Burst Time	Burst Time	Burst Time	Burst Time	Burst Time	Burst Time
P1	0.0	~~7~~	5	5	5	5	~~5~~	0
P2	2.0	4	~~4~~	2	~~2~~	0	0	0
P3	4.0	1	1	~~1~~	0	0	0	0
P4	5.0	4	4	4	4	4	0	0



Preemptive SJF Question: Solution 2/3

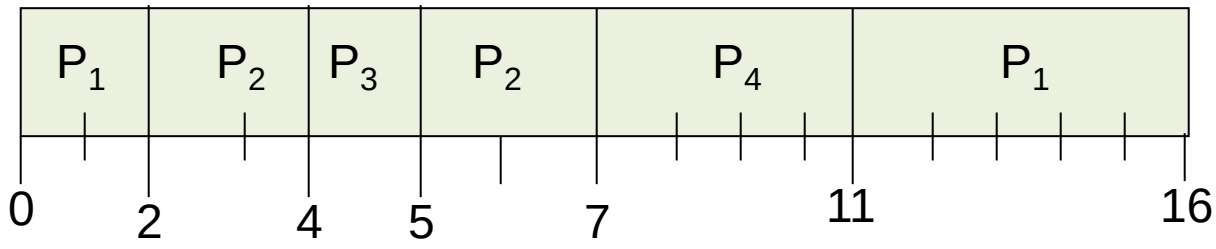


- *Waiting Time*
  - *P1wt=0+(11-2)=9 unit time*
  - *P2wt=0+(5-4)=1 unit time*
  - *P3wt=0 unit time*
  - *P4wt=(7-5)=2 unit time*

Process	Arrival Time	Burst Time
P_1	0.0	7
P_2	2.0	4
P_3	4.0	1
P_4	5.0	4

- *Average Waiting Time*
  - *AWT=(P1wt+P2wt+P3wt+P4wt)/4*
  - *AWT=(9+1+0+2)/4=12/4=3 unit time*

Preemptive SJF Question: Solution 3/3



- *Turnaround Time*
  - *P1tt=(16-0)=16 unit time*
  - *P2tt=(7-2)=5 unit time*
  - *P3tt=(5-4)=1 unit time*
  - *P4tt=(11-5)=6 unit time*

Process	Arrival Time	Burst Time
P_1	0.0	7
P_2	2.0	4
P_3	4.0	1
P_4	5.0	4

- *Average Turnaround Time*
  - *ATT=(P1tt+P2tt+P3tt+P4tt)/4*
  - *ATT=(16+5+1+6)/4=28/4=7 unit time*

Preemptive SJF Homework Question

Process	Arrival Time	Burst Time
P_1	0.0	8
P_2	2.0	5
P_3	4.0	6
P_4	6.0	7

Suppose that the processes arrive in the order: P_1 , P_2 , P_3, *and* P_4.

Find:

1. *Waiting Time*
2. *Average Waiting Time*
3. *Turnaround Time*
4. *Average Turnaround Time*

References

1. Silberschatz, Galvin and Gagne, “Operating Systems Concepts”, Wiley.

2. William Stallings, “Operating Systems: Internals and Design Principles”, 6th Edition, Pearson Education.

3. D M Dhamdhere, “Operating Systems: A Concept based Approach”, 2nd Edition, TMH.

Thank You.