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CPT104 - Operating Systems Concepts

CPU Scheduling I Tutorial

Length of Next CPU Burst

- Burst time for the process to be executed is taken as the average of all the processes that are executed till now.
- Can only estimate the length of Next CPU Burst .
- Can be done by using the length of previous CPU bursts, using exponential averaging.

$\mathbf{t_n}$ = actual burst time of process P_n

$\boldsymbol{\tau_n}$ = predicted burst time for process P_n

$\boldsymbol{\tau_{n+1}}$ = predicted value for the next CPU burst

a = weighing (smoothening) factor $(0 \le a \le 1)$

$$\tau_{n+1} = a \cdot t_n + (1 - a)\, \tau_n$$

Example

- Calculate the predicted burst time using exponential averaging for **the fifth process** if the predicted burst time for the first process is **10** ms and previous runs of the first four processes are **8, 7, 4, 16**.

- The scheduling algorithm is SJF.

- Given **a = 0.5**.

Solution:

- Actual burst time of processes: **4, 7, 8, 16**.
- a = 0.5
- Predicted burst time for 1st process = 10 ms

Predicted burst time for 2nd process

= a x Actual burst time of 1st process + (1 - a) x Predicted burst time for 1st process

= 0.5 x **4** + 0.5 x 10 = 2 + 5 = **7** ms

Actual burst time of processes : **4, 7, 8, 16**.

Predicted burst time for 3rd process

= a x Actual burst time of 2nd process + (1 - a) x Predicted burst time for 2nd process

= 0.5 x **7** + 0.5 x **7** = **7** ms

Predicted burst time for 4th process

= a x Actual burst time of 3rd process + (1 - a) x Predicted burst time for 3rd process

= 0.5 x **8** + 0.5 x **7** = **7.5** ms

Actual burst time of processes: **4, 7, 8, 16**.

Predicted burst time for 5th process

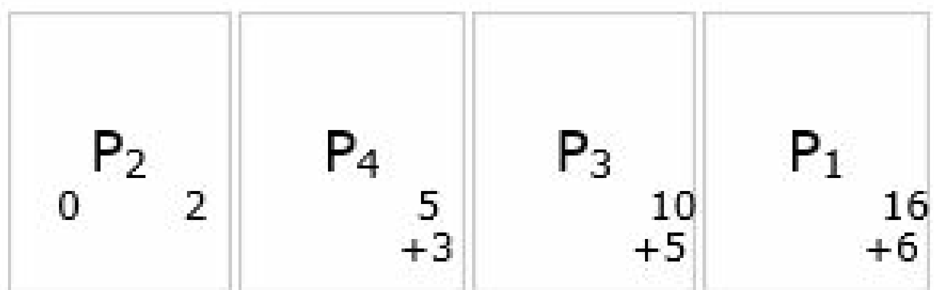
= a x Actual burst time of 4^{th} process + (1 - a) x Predicted burst time for 4^{th} process

= 0.5 x **16** + 0.5 x **7.5** = **11.75** ms

Shortest-Job-First (SJF) Scheduling (Ex.1.)

Process	Burst Time (ms)
P1	6
P2	2
P3	5
P4	3

SJF scheduling Gantt chart

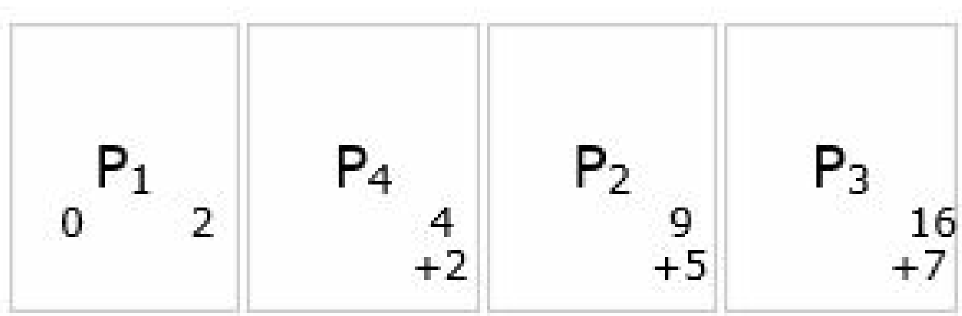


Average waiting time = (0 + 2 + 5 + 10) / 4 = 4.25

Shortest-Job-First (SJF) Scheduling (Ex.2.)

Process	Burst Time(ms)
P1	2
P2	5
P3	7
P4	2

SJF scheduling Gantt chart

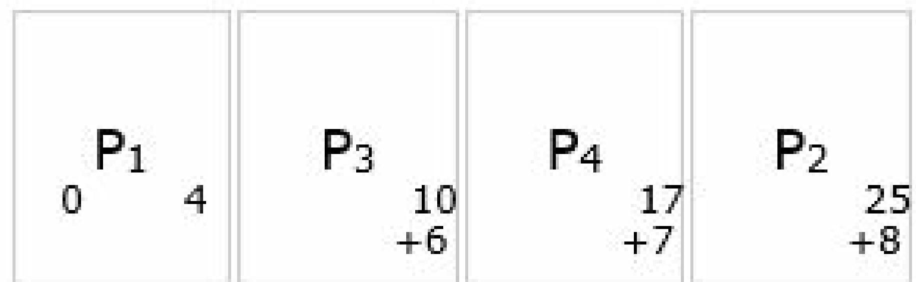


Average waiting time = (0 + 2 + 4 + 9) / 4 = 3.75

Shortest-Job-First (SJF) Scheduling (Ex.3)

Process	Burst Time(ms)
P1	4
P2	8
P3	6
P4	7

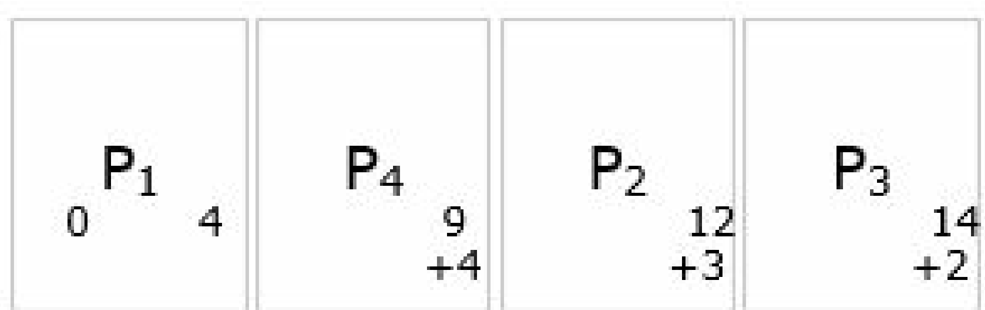
SJF scheduling Gantt chart



Average waiting time = (0 + 4 + 10 + 17) / 4 = 7.75

Priority Scheduling (Ex.1.)

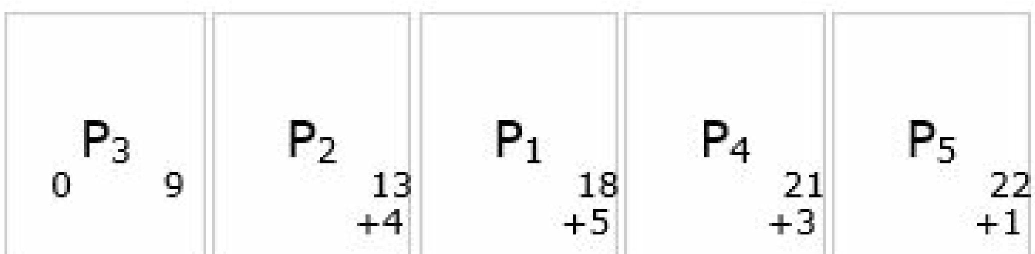
Process	**Burst Time**	**Priority**
P1	4	1
P2	3	3
P3	2	4
P4	5	2



Average waiting time = = (0 + 4 + 9 + 12) / 4 = 6.25

Priority Scheduling (Ex.2.)

Process	Burst Time	Priority
P1	5	3
P2	4	2
P3	9	1
P4	3	4
P5	1	5



Average waiting time = = (0 + 9 + 13 + 18 + 21) / 5 = 12.2

Round Robin (RR) Scheduling (Ex.1.)

Process	**Burst Time**
P1	10
P2	7
P3	5

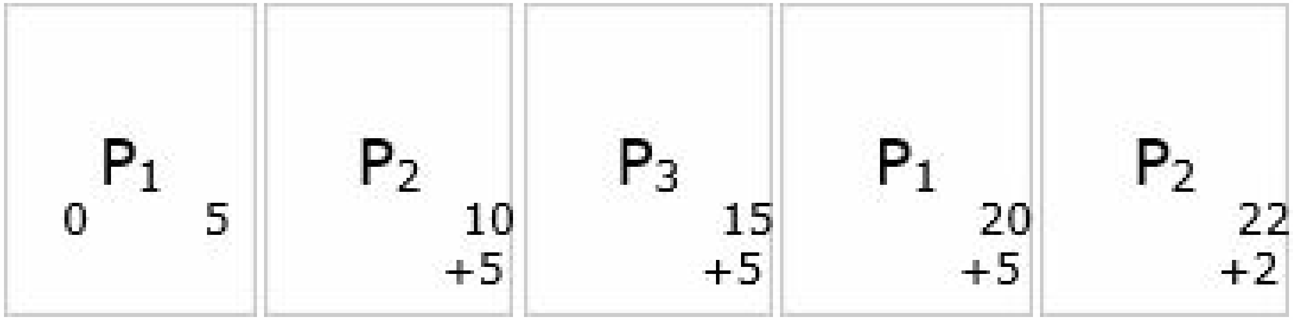
Time quantum = 5ms

$$P_{1_w} = 20 - 10 = 10$$

$$P_{2_w} = 22 - 7 = 15$$

$$P_{3_w} = 15 - 5 = 10$$

$$AWT = (10 + 15 + 10) / 3 = 11.67ms$$



Round Robin (RR) Scheduling (Ex.2.)

Process	Burst Time
P1	8
P2	4
P3	3

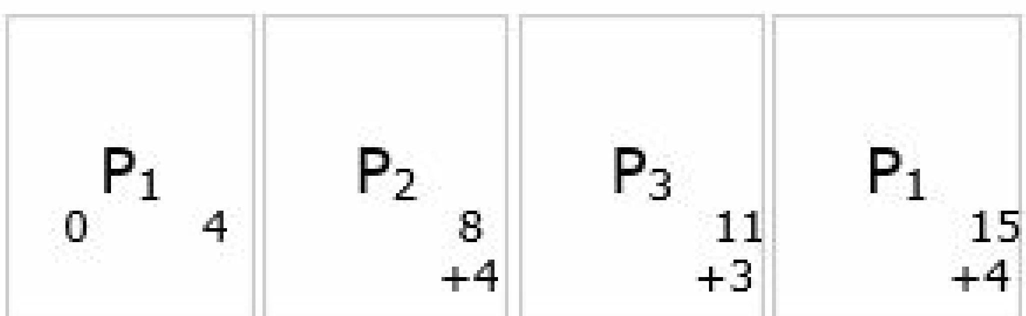
Time quantum = 4 ms

$$P_{1_w} = 15 - 8 = 7$$

$$P_{2_w} = 8 - 4 = 4$$

$$P_{3_w} = 11 - 3 = 8$$

$$AWT = (7 + 4 + 8) / 3 = 6.33ms$$



Round Robin (RR) Scheduling (Ex.3.)

Process	Burst Time
P1	5
P2	6
P3	3

Time quantum = 2 ms

$P_{1_w} = 12 - 5 = 7$

$P_{2_w} = 14 - 6 = 8$

$P_{3_w} = 11 - 3 = 8$

$AWT = (7 + 8 + 8) / 3 = 7.66ms$

P_1	P_2	P_3	P_1	P_2	P_3	P_1	P_2
0 2	4	6	8	10	11	12	14
	+2	+2	+2	+2	+1	+1	+2