

CPU Second Scheduling Algorithm

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

↳ Can be implemented in both Pre-emptive and non-pre-emptive mode.

→ Minimum Waiting time.

→ Pre-emptive SJF is also known as Shortest Remaining Time Algo.

Example of Non-Pre-emptive SJF

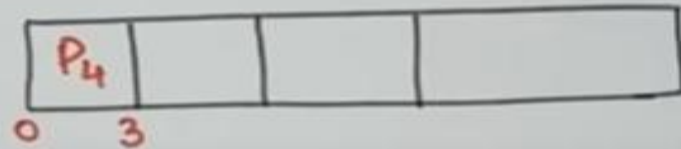
Calculate

Calculate avg. waiting time.

Process	Burst time (in ms)
P ₁	6
P ₂	8
P ₃	7
P ₄	3

JF

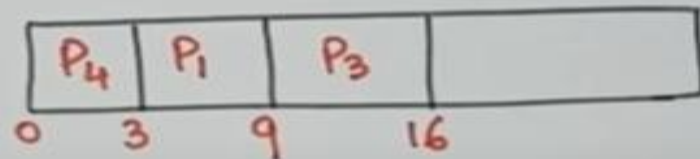
Gantt chart



w.t of P₄ = 0

JF

Gantt chart



w.t of P₄ = 0

w.t of P₁ = 3

w.t of P₃ = 9

JF

Gantt chart



w.t of P₄ = 0

w.t of P₁ = 3

w.t of P₃ = 9

w.t of P₂ = 16

Avg. waiting time

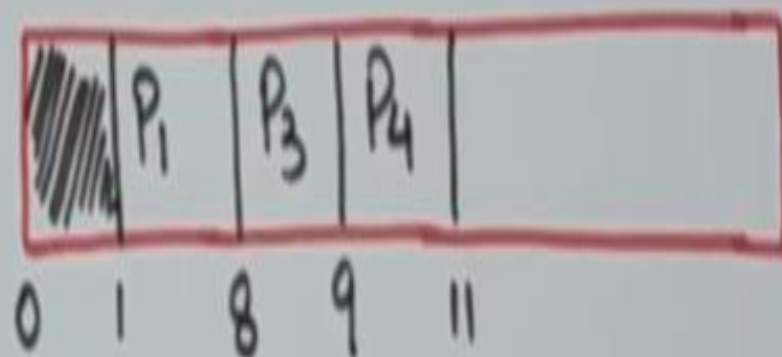
$$= \frac{0+3+9+16}{4} = \frac{28}{4} = 7 \text{ ms.}$$

Example of SJF(Non Pre-emptive)

Ques1. Calculate Waiting Time and Turn Around Time

Process Number	Arrival Time	Burst Time	Completion Time	T.A.T	W.T
P1 ✓	1	7	8		
P2	2	5			
P3 ✓	3	1 ✓	9		
P4	4	2	11		
P5	5	8			

Draw Gantt chart

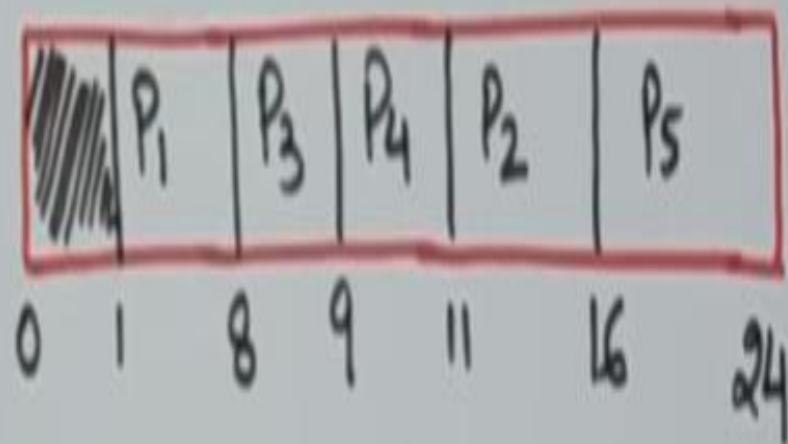


Questions on SJF CPU Scheduling(Non-Preemptive)

Ques1. Calculate Waiting Time and Turn Around Time

Process Number	Arrival Time	Burst Time	Completion Time	T.A.T	W.T
P1 ✓	1	7	8		
P2	2	5	16		
P3 ✓	3	1 ✓	9		
P4	4	2	11		
P5	5	8	24		

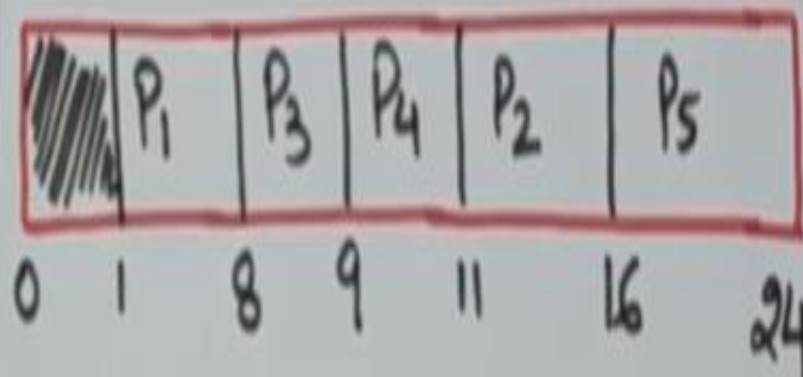
Draw Gantt chart



Process number	Arrival Time	Burst Time	Completion Time	T.A.T	W.T
P1 ✓	1	7	8	7	0
P2	2	5	16	14	9
P3 ✓	3	1 ✓	9	6	5
P4	4	2	11	7	5
P5	5	8	24	19	11

(~~1~~, ~~2~~, ~~3~~, ~~4~~, ~~5~~)
 1 ————— 8

Draw Gantt chart



$$\text{Avg. w.t} = \frac{0+9+5+5+11}{5}$$

$$= \frac{30}{5} = 6$$

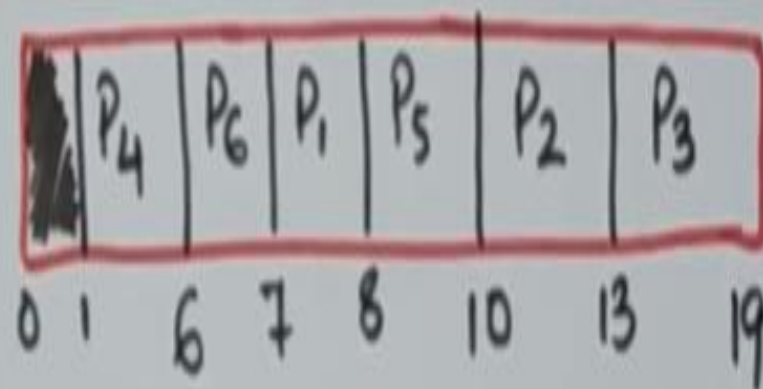
Questions on SJF CPU Scheduling(Non-Preemptive)

Ques2. Calculate Waiting Time and Turn Around Time

Process Number	Arrival Time	Burst Time	Completion Time	T.A.T	W.T
P1	6	1			
P2	3	3			
P3	4	6			
P4	1	5			
P5	2	2			
P6	5	1			

Process Number	Arrival Time	Burst Time	Completion Time	T.A.T	W.T
P1	6	1 ✓	8		
P2	3	3 ✓	13		
P3	4	6 ✓	19		
P4	1	5 ✓	6		
P5	2	2 ✓	10		
P6	5	1 ✓	7		

Draw Gantt chart,



Ready Queue → P4, P6, P1, P3, P5, P2

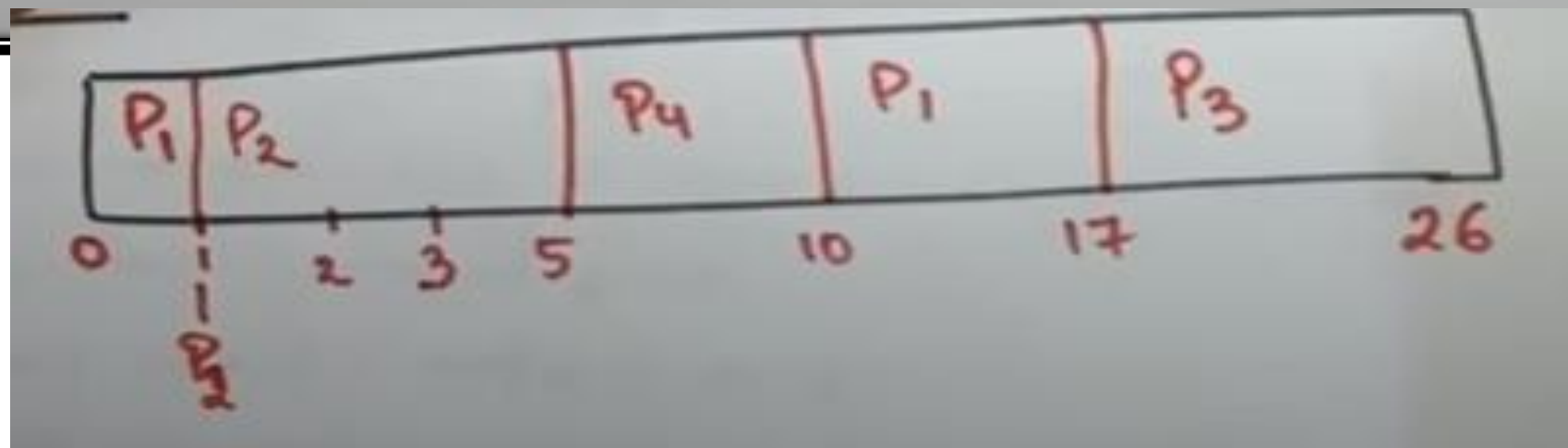
1 6

Example of SJF or SRT (Pre-emptive)

Example. of Pre-emptive SJF or SRT.

Ques Calculate average waiting time

Process	Arrival time	Burst time (in ms)
P ₁	0	8
P ₂	1	4
P ₃	2	9
P ₄	3	5



Process	Arrival time	Burst time (in ms)
P ₁	0	8 (7)
P ₂	1	4
P ₃	2	9 (9)
P ₄	3	5 (5)

chart

$$\text{w.t of } P_1 = 0 + (10 - 1) = 9$$

$$\text{w.t of } P_2 = 0$$

$$\text{w.t of } P_3 = 17 - 2 = 15$$

$$\text{w.t of } P_4 = 5 - 3 = 2$$

$$\text{Average w.t.} = \frac{9 + 0 + 15 + 2}{4}$$

$$= \frac{26}{4}$$

26

Task SRT (Pre-emptive)

Questions on Preemptive SJF(SRT) CPU Scheduling

Ques1. Calculate Waiting Time and Turn Around Time

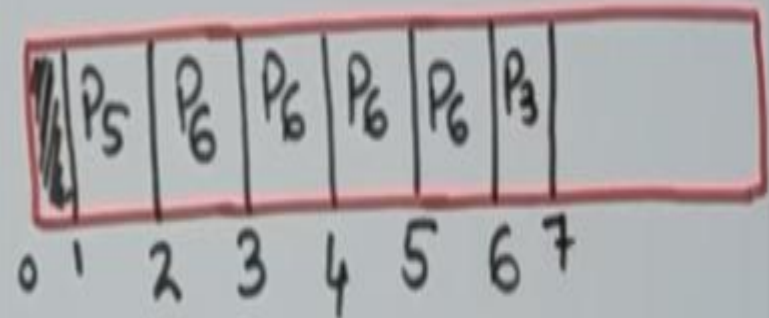
Process Number	Arrival Time	Burst Time	Completion Time	T.A.T	W.T
P1	3	4			
P2	4	2			
P3	5	1			
P4	2	6			
P5	1	8			
P6	2	4			

Questions on Preemptive SJF(SRT) CPU Scheduling

Ques1. Calculate Waiting Time and Turn Around Time

Process Number	Arrival Time	Burst Time	Completion Time	T.A.T	W.T
P1	3	4			
P2	4	2			
P3	5	1			
P4	2	6			
P5	1	8			
P6	2	2	6		

Draw Gantt chart,



$P_5(7)$ $P_1(4)$ $P_3(1)$
 $P_4(6)$ $P_2(2)$

P_5 P_4 P_1 P_2 P_3

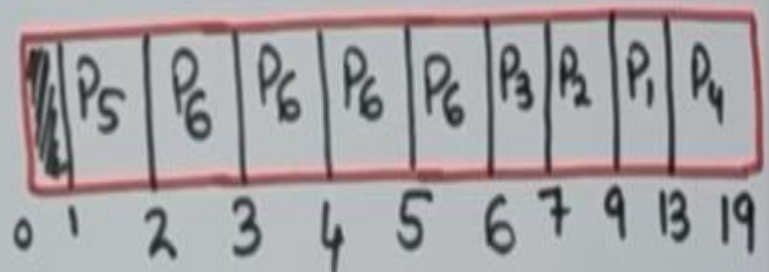
1 2 3 4 5

Questions on Preemptive SJF(SRT) CPU Scheduling

Ques1. Calculate Waiting Time and Turn Around Time

Process Number	Arrival Time	Burst Time	Completion Time	T.A.T	W.T
P1	3	4	13		
P2	4	2	9		
P3	5	1	7		
P4	2	6	19		
P5	1	8	7		
P6	2	2	6		

Draw Gantt chart,



Handwritten notes below the table and Gantt chart:

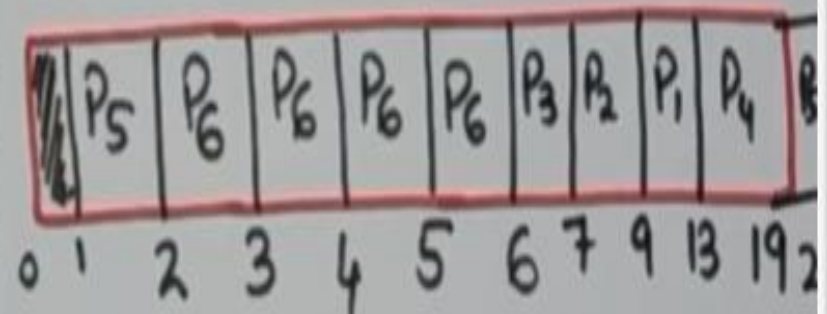
- Below the table:
 - For P5: 7, 6, 5, 4, 3, 2, 1
 - For P4: 19, 18, 17, 16, 15, 14, 13, 12, 11, 10, 9, 8, 7, 6, 5, 4, 3, 2, 1
 - For P3: 7, 6, 5, 4, 3, 2, 1
 - For P2: 9, 8, 7, 6, 5, 4, 3, 2, 1
 - For P1: 13, 12, 11, 10, 9, 8, 7, 6, 5, 4, 3, 2, 1
 - For P6: 6, 5, 4, 3, 2, 1
- Below the Gantt chart:
 - P5(7)
 - P4(6)
 - P3(1)
 - P2(2)
 - P1(4)
 - P6(2)

Questions on Preemptive SJF(SRT) CPU Scheduling

Ques1. Calculate Waiting Time and Turn Around Time

Process Number	Arrival Time	Burst Time	Completion Time	T.A.T	W.T
P1	3	4	13		
P2	4	2	9		
P3	5	1	7		
P4	2	6	19		
P5	1	8	26		
P6	2	2	6		

Draw Gantt chart,



Handwritten notes below the Gantt chart:

7 P5, 6 P4, 5 P3, 4 P2, 3 P1, 2 P6, 1 P6

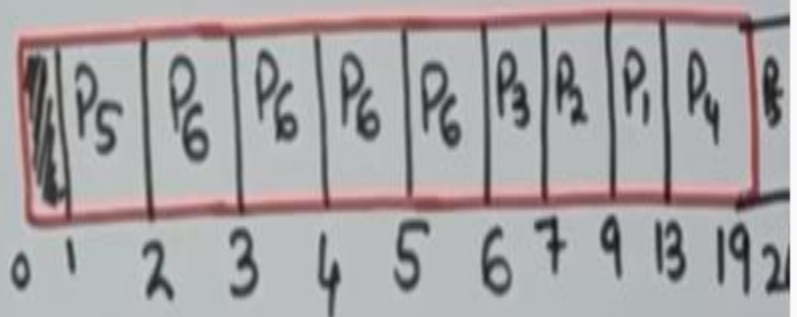
1 P5, 2 P4, 3 P3, 4 P2, 5 P1, 6 P6, 7 P6

P5(7) P4(6) P3(1) P2(2) P1(4) P6(2)

Ques1. Calculate Waiting Time and Turn Around Time

Process Number	Arrival Time	Burst Time	Completion Time	T.A.T	W.T
P1	3	4	13	10	6
P2	4	2	9	5	3
P3	5	1	7	2	1
P4	2	6	19	17	11
P5	1	8	26	25	17
P6	2	4	6	4	0

Draw Gantt chart,



$$\text{Avg. w.t} = \frac{6+3+1+11+17+0}{6}$$

$$= \frac{38}{6} = 6.3$$

7 P5 6 P4, P2 3 P1 4 P2 2 P3 1 P3

1 2 3 4 5

Process 1 Process 2 Process 3 Process 4 Process 5 Process 6

Questions on Preemptive SJF(SRT) CPU Scheduling

Ques2. Calculate Waiting Time and Turn Around Time

Process Number	Arrival Time	Burst Time	Completion Time	T.A.T	W.T
P1	2	8			
P2	7	1			
P3	6	2			
P4	3	6			
P5	5	4			

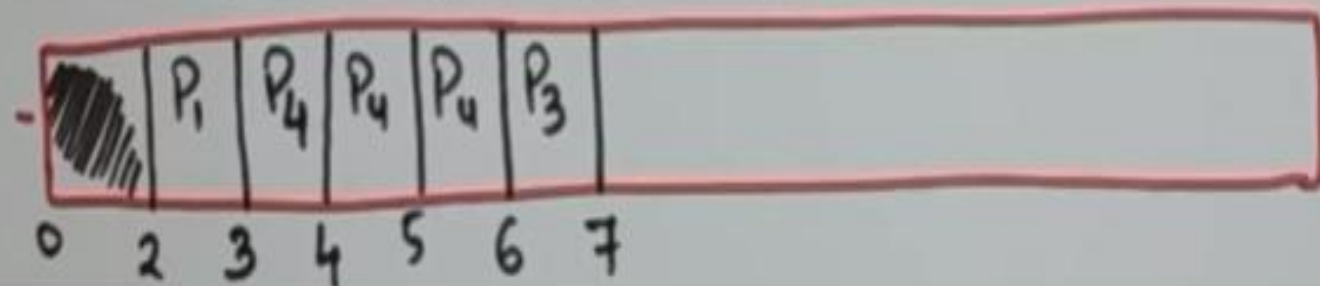
Gantt, chart

Questions on Preemptive SJF(SRT) CPU Scheduling

Ques2. Calculate Waiting Time and Turn Around Time

Process Number	Arrival Time	Burst Time	Completion Time	T.A.T	W.T
P1	2	8,7			
P2	7	1			
P3	6	2			
P4	3	6,5,8			
P5	5	4			

Gantt, chart



Questions on Preemptive SJF(SRT) CPU Scheduling

ques2. Calculate Waiting Time and Turn Around Time

Process Number	Arrival Time	Burst Time	Completion Time	T.A.T	W.T
P1	2	8,7			
P2	7	1	9		
P3	6	2,1	8		
P4	3	6,5,4	12		
P5	5	4	16		

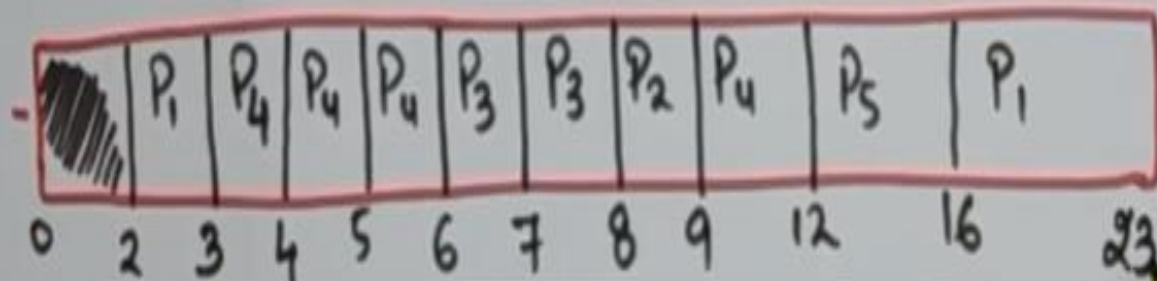
Gantt, chart

P₁(7)

~~P₂(1)~~

~~P₄(3)~~

~~P₅(4)~~



Example of FCFS(Non Pre-emptive)

Questions on FCFS CPU Scheduling

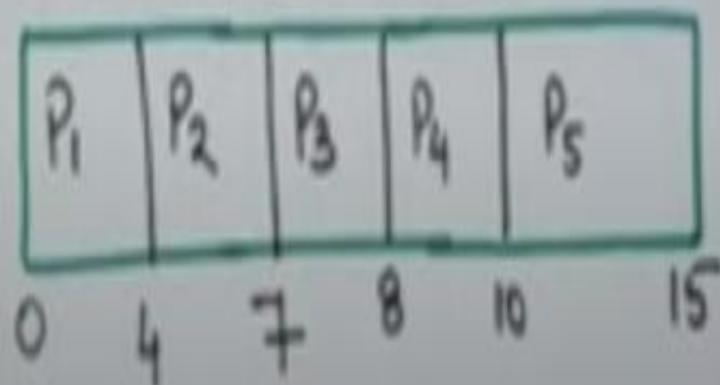
Ques1. Calculate Waiting Time and Turn Around Time

Process Number	Arrival Time	Burst Time	Completion Time	T.A.T	W.T
P1	0	4			
P2	1	3			
P3	2	1			
P4	3	2			
P5	4	5			

Ques1. Calculate Waiting Time and Turn Around Time

Process Number	Arrival Time (AT)	Burst Time (BT)	Completion (CT) Time	T.A.T (CT-AT)	W.T (T.A.T-BT)
P1	0	4	4		
P2	1	3	7		
P3	2	1	8		
P4	3	2	10		
P5	4	5	15		

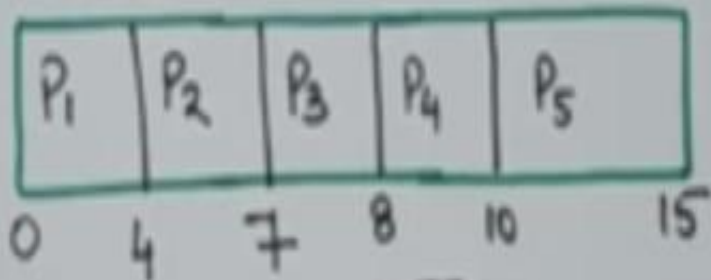
Draw Gantt chart.



Ques1. Calculate Waiting Time and Turn Around Time

Process Number	Arrival Time (AT)	Burst Time (BT)	Completion Time (CT)	T.A.T (CT-AT)	W.T (T.A.T-BT)
P1	0	4	4	4	0
P2	1	3	7	6	3
P3	2	1	8	6	5
P4	3	2	10	7	5
P5	4	5	15	11	6

Draw Gantt chart.



$$\sum = 19$$

$$\text{Avg w.t} = \frac{19}{5} = 3.8$$

Task FCFS(Non Pre-emptive)

Ques2. Calculate Waiting Time and Turn Around Time

Process Number	Arrival Time	Burst Time	Completion Time	T.A.T	W.T
P1	6	4			
P2	2	5			
P3	3	3			
P4	1	1			
P5	4	2			
P6	5	6			

Ques2. Calculate Waiting Time and Turn Around Time

Process Number	Arrival Time	Burst Time	Completion Time	T.A.T	W.T
P1	6	4			
P2	2	5	7		
P3	3	3	10		
P4	1	1	2		
P5	4	2	12		
P6	5	6	18		

Draw Gantt chart.

