Scheduling Algorithms

Preemptive	Non-preemptive
SRTF (shortest Remaining time first)	- FCFS (First come First serve)
LRTF (largest remaining time first)	- SJF (shortest job first)
Round Robin	- LJF (largest job first)
Priority based	- HRRN (Highest response ratio next)

⊙ Concept to remember is scheduling:

1) **Arrival time**: The time at which the process enters the ready queue

2) **Burst time**: Time require by a process to get executed on CPU.

3) **Completion time**: The time at which the process completes its execution.

4) **Turn around time**: Completion time – Arrival time

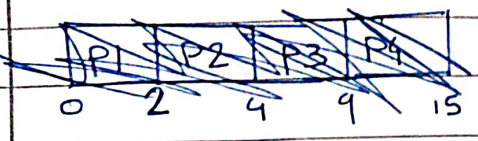
5) **Waiting time**: Turn around time – Burst time

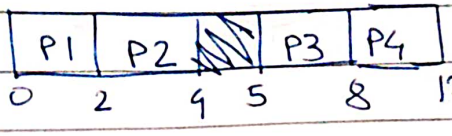
6) **Response time**: Time at which process gets the CPU first – Arrival time

1) **FCFS (First Come First Serve)**:

Process	Arrival time	Burst time	C.T	TAT	W.T
P1	0	2	2	2	0
P2	1	2	4	3	1
P3	5	3	8	3	0
P4	6	4	~~15~~ 12	~~9~~ 6	~~5~~ 2

Gantt chart





Avg TAT = $\frac{2+3+3+6}{4}$ = ~~6.25~~ 3.5

Avg WT = $\frac{0+1+0+2}{4}$ = ~~1.25~~ 0.75

2) SJF (Shortest Job First):

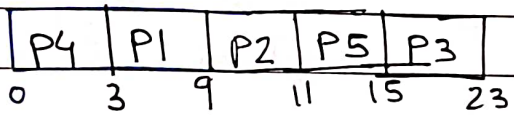
- SJF can be preemptive as well as Non-preemptive
- If it's preemptive is also called as SRTF (Shortest remaining time first)

Ex: For SJF:

Process	Arrival time	Burst time	CT	TAT	WT
P1	2	6	9	7	1
P2	5	2	11	6	4
P3	1	8	23	22	14
P4	0	3	3	3	0
P5	4	4	15	11	7

$\Sigma = 49$ $\Sigma = 26$

Gantt chart:



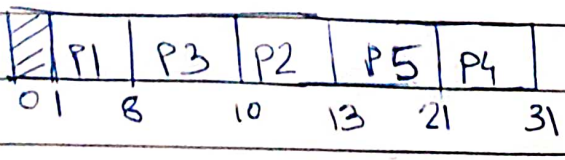
Avg. TAT : 9.8
Avg. WT : 5.2

2)

Process	Arrival time	Burst time	CT	TAT	WT
P1	1	7	8	7	0
P2	3	3	13	10	7
P3	6	2	10	4	2
P4	7	10	31	24	14
P5	9	8	21	12	4

$\Sigma = 57$ $\Sigma = 27$

Gantt chart:



Avg TAT : 11.4
Avg WT : 5.4

~~SRJT~~ SRTF : (Shortest remaining time first)

- It is preemptive

Ex:1)

Process	Arrival time	Burst time	C.T	TAT	W.T
P1	0	~~12~~ 10	27	27	15
✓ P2	2	4	6	4	0
✓ P3	3	6	12	~~3~~ 9	3
P4	8	5	17	9	4

$\Sigma = 49$ $\Sigma = 22$

~~Gantt chart:~~ | P1 | P2 | P3 |

0 2 3 9

~~Ready queue:~~

0

Gantt chart: | P1 | P2 | P3 | P4 | P1 |

0 2 6 12 17 27

Avg. TAT = 12.25

Avg W.T = 5.5

2)

Process	Burst time	Arrival time	C.T	TAT	W.T
✓ P1	~~6~~ 5	2	15	13	7
✓ P2	2	5	7	2	0
✓ P3	8	1	23	22	14
✓ P4	3	0	3	3	0
✓ P5	~~4~~ 3	4	10	6	2

$\Sigma = 46$ $\Sigma = 23$

Gantt chart: | P4 | P1 | P5 | P2 | P5 | P1 | P3 |

0 3 4 5 7 10 15 23

Avg TAT : 9.2

Avg WT : 4.6

Round Robin :

Ex1:

Process	A.T	B.T	C.T	TAT	W.T	R.T
P1	0	5	13	13	8	0
P2	1	3	12	11	8	1
P3	2	1	5	3	2	2
P4	3	2	9	6	4	4
P5	4	3	14	10	7	9

Consider Time quantum = 2

Ready queue : | P1 | P2 | P3 | P1 | P4 | P5 | P2 | P1 | P5 |

Gantt chart :

P1	P2	P3	P1	P4	P5	P2	P1	P5

0 2 4 5 7 9 11 12 13 14

Avg TAT : 8.6

Avg WT : 5.8

Process	A.T	B.T	C.T	TAT	W.T	R.T
P1	5	5	32	27	22	10
P2	4	6	27	23	17	5
P3	3	7	33	30	23	3
P4	1	9	30	29	20	0
P5	2	2	6	4	2	2
P6	6	3	21	15	12	12

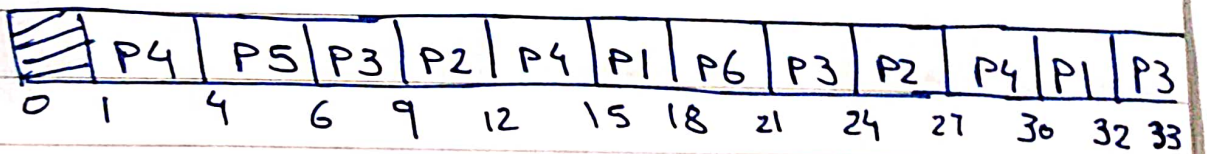
Consider Time quantum = 3

Ready Queue:

P4	P5	P3	P2	P4	P1	P6	P3	P2	P4

P1	P3

Gantt chart:



Avg TAT: 21.33

Avg W.T: 16

Preemptive Priority scheduling:

Criteria: Priority
Mode: Preemptive

Ex1:

Priority	Process	A.T	B.T	C.T	TAT	W.T	R.T
10	P1	0	54	12	12	7	0
20	P2	1	43	8	7	3	0
~~30~~	P3	2	20	4	2	0	0
~~40~~	P4	4	1	5	1	0	0
					Σ=22	Σ=10	

Gantt chart –

P1	P2	P3	P4	P2	P1
0	1	2	4	5	8	12

Avg TAT : 5.5
Avg W.T : 2.5

Ex2: Criteria : Priority
Mode: Non-preemptive

Process ID	Priority	A.T	B.T	C.T	TAT	W.T
P1	2	0	11	11	11	0
P2	0	5	28	39	34	6
P3	3	12	2	51	39	37
P4	1	2	10	49	47	37
P5	4	9	16	67	58	42

In this example, consider lesser the numeric value of priority higher the priority of process

Gantt chart:

P1	P2	P4	P3	P5
0	11	39	49	51	67

Avg TAT : 37.8
Avg W.T: 24.4