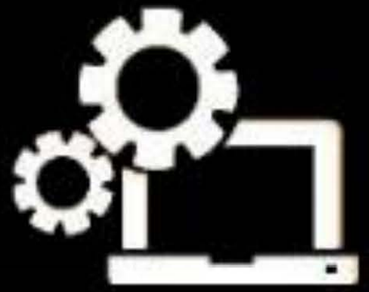
CS & IT ENGINEERING

OPERATING SYSTEMS

CPU Scheduling



Lecture No. 3

By- Dr. Khaleel Khan Sir

- CPU Scheduling Techniques
- SJF
- SRTF

2). Shortest Job First (SJF) / Shortest Process Next (SPN)

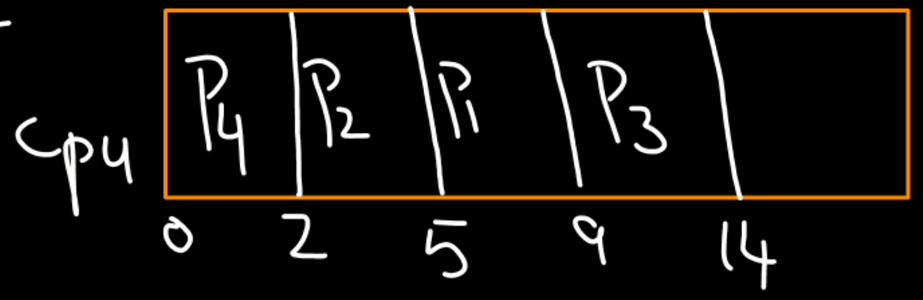
Sel. criteria : Burst time (B.T)

Mode of o/p : Non-Pre Emptive

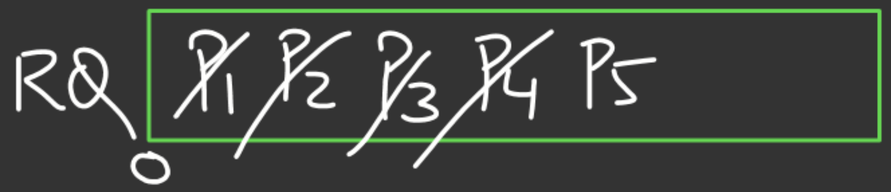
Conflict Resolution : Lower Pid

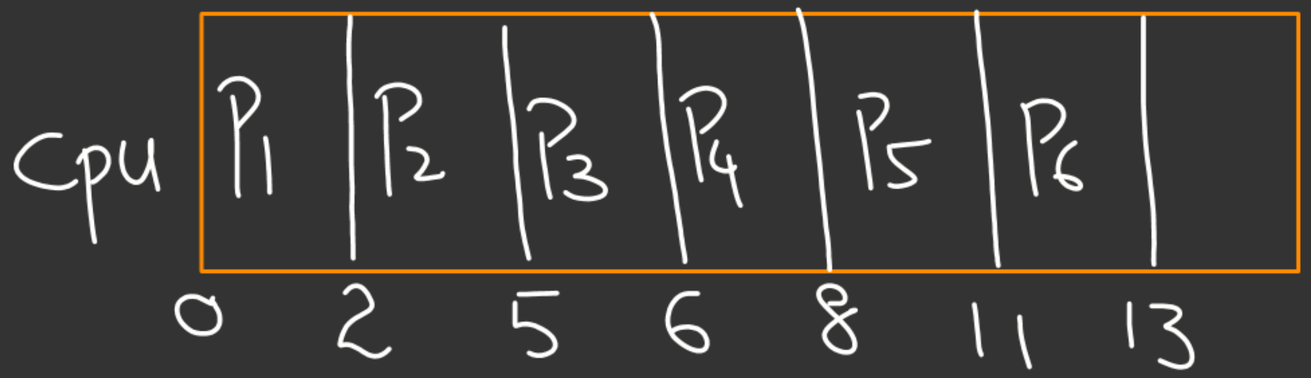
P.No	A.T	B.T
1	0	4
2	0	3
3	0	5
4	0	2

: Among the Processes present in 'R.Q', Select the one, having least B.T & Schedule it onto cpu;



P.No	A.T ↓	B.T ↓
1	0	2
2	2	3
3	3	1
4	5	2
5	8	3
6	10	2





3) Shortest Remaining Time First (SRTF) / Preemptive SJF

Sel. criteria: B.T

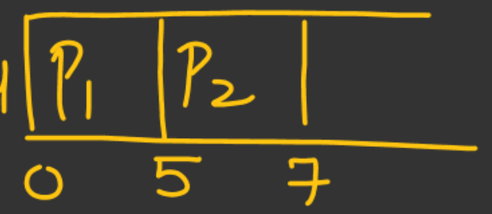
Mode of operation: Preemptive

Conflict: "Preemption of running process is based on availability of (less than) strictly shorter process"

Tie breaking rule

P.No	A.T	B.T
1	0	~~5~~ 3
2	2	2

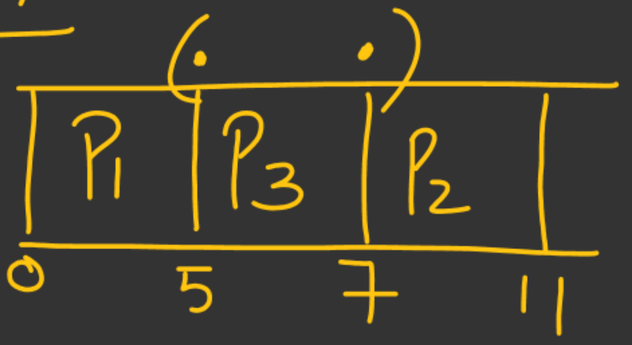
SJF (N.Pr)



S.R.T.F (Pr)

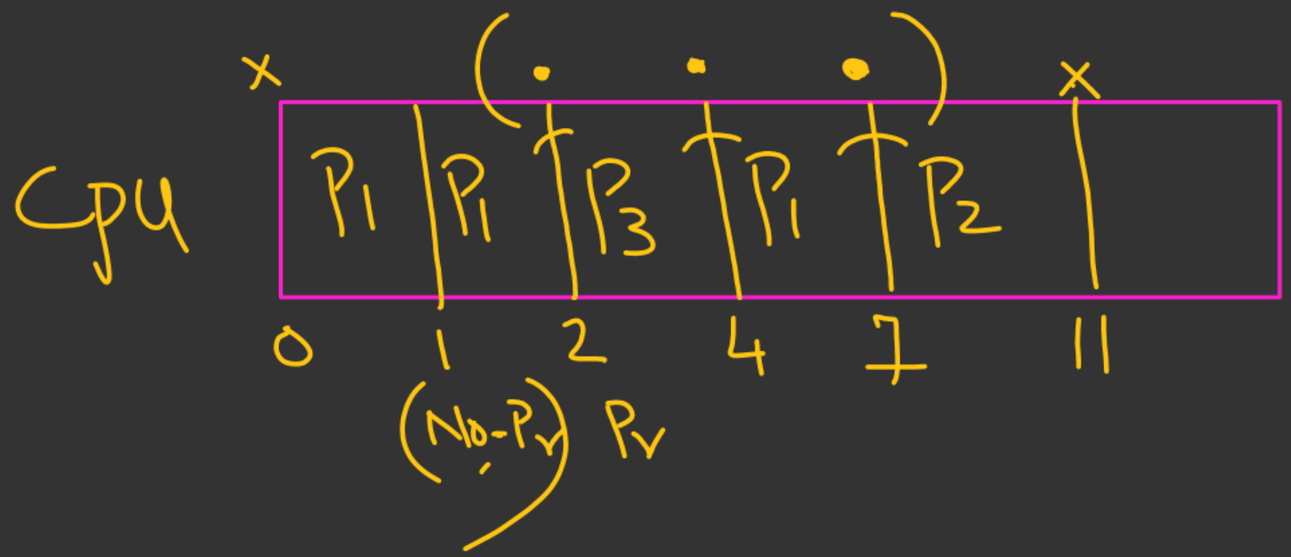
P.NO	A.T	B.T
1 —	0 —	~~5 4~~ 3
2 —	1 —	4
3 —	2 —	2 x

S.J.F :

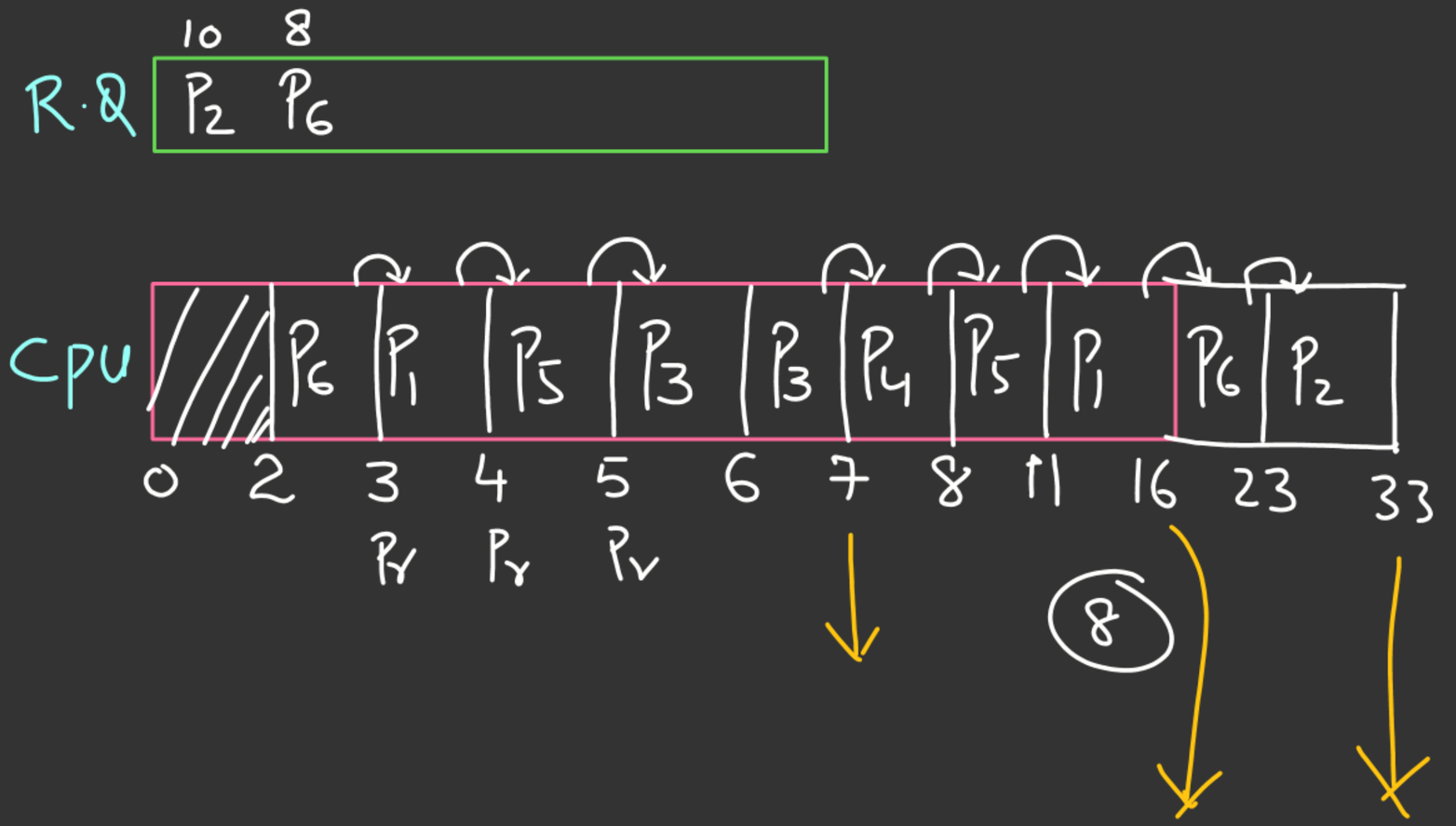


S.R.T.F

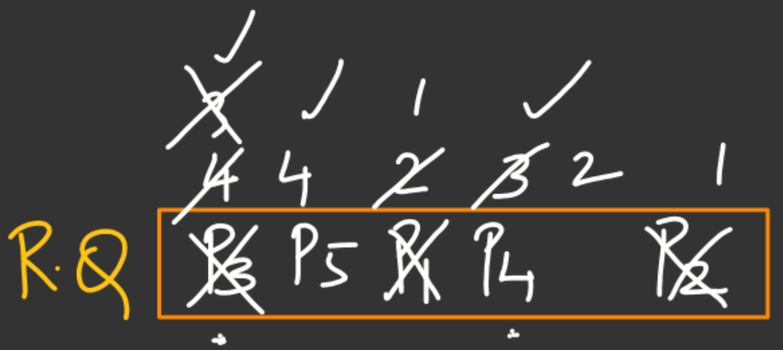
3- Content-switching.

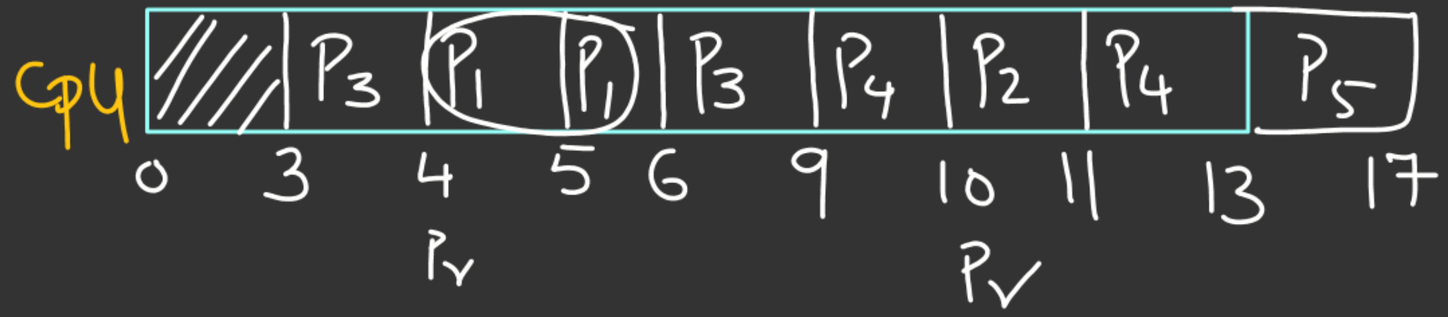


P.No	A.T	B.T	
1	3	~~6~~	5 X
2	2	10	
3	5	~~2~~	1 X
4	6	1	X
5	4	~~4~~	3 X
6	2	~~8~~	7



P.NO	A.T	B.T
1	4	2
2	10	1
3	3	~~4~~ 3
4	5	3
5	3	4

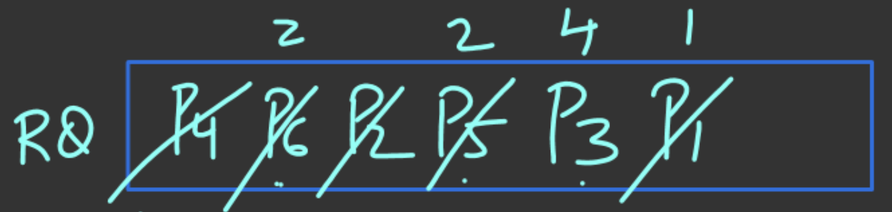




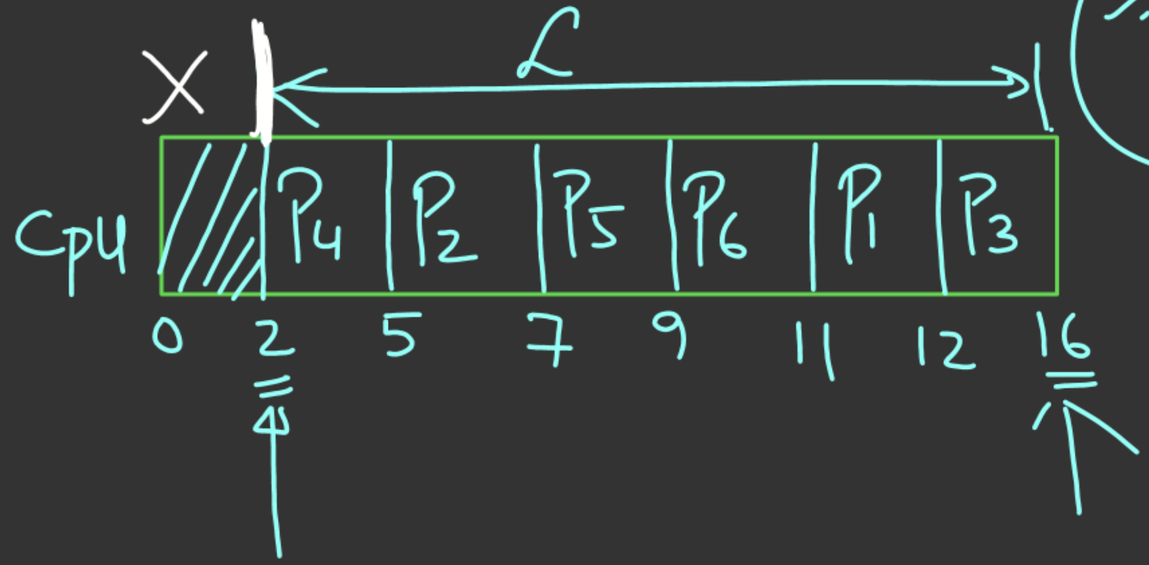
$\ell = 17 - 3 = 14$

3-1-3-4-2-4-5

P.No	A.T	B.T
1	10	1
2	4	2
3	6	4
4	2	3
5	5	2
6	3	2



$\mathcal{L} = 16 - 2 = 14$



$$\left(\frac{\% \text{ CPU-Idleness}}{\mathcal{L}}\right) = 0$$

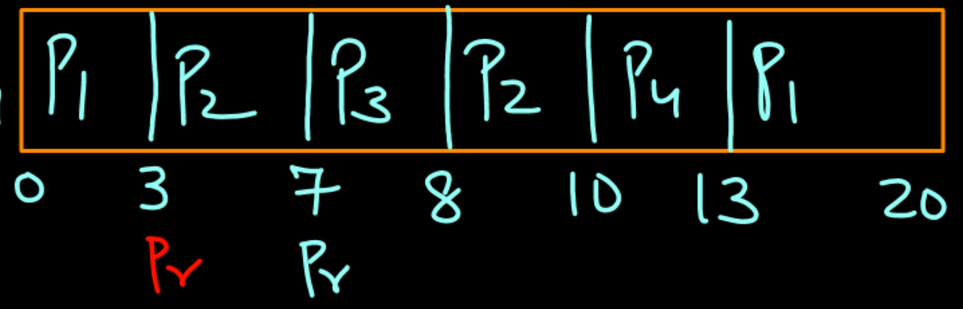
Q.

GII

NAT

Consider the following processes, with the arrival time and the length of the CPU burst given in milliseconds. The scheduling algorithm used is preemptive Shortest Remaining-Time First (SRTF).

Process	Arrival Time	Burst Time
P1	0	~~10~~ 7 ✓
P2	3	~~6~~ 2 ✓
P3	7	1 ✗
P4	8	3 ✓



The average turnaround time of these processes is 8.25 ✓ milliseconds.

$$\text{Av. TAT} = \frac{20+7+1+5}{4} = \frac{33}{4}$$

Q.

Consider the following four processes with arrival times (in milliseconds) and their length of CPU bursts (in milliseconds) as shown below:

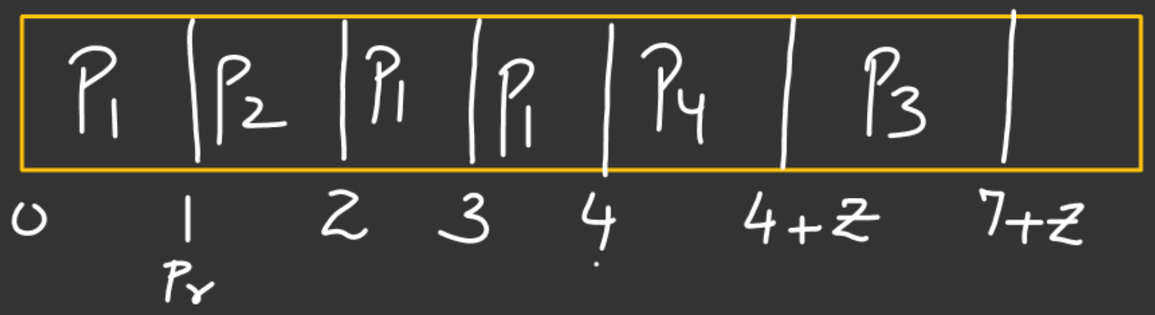
Process	P_1	P_2	P_3	P_4
Arrival time	0	1	3	4
CPU burst time	3	1	3	Z

These processes are run on a single processor using preemptive Shortest Remaining Time First (SRTF) Scheduling Algorithm. If the average waiting time of the processes is 1 millisecond, then the value of Z is _____ ; (NAT)

P.No	A.T	B.T
1	0	~~3~~ ~~2~~ 1 X
2	1	1 X
3	3	3
4	4	(2)

Av. W.T = 1 ms (SRTF)

(WT = TAT − BT)



I. if $z < 3$

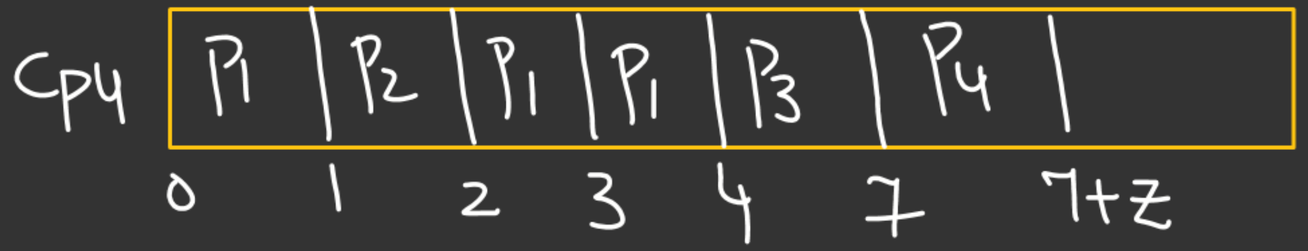
$$Av.WT = \frac{1+0+(z+1)+0}{4}$$

$$1 = \frac{z+2}{4}$$

$z = 4-2 = 2$ ✓

II. if $z > 3$

$$Av.WT = \frac{1+0+1+3}{4} = \frac{5}{4} = 1.25$$



✗

Performance of SJF/SRTF

characteristic

Favors Shorter Process

(Optimal Algo)

Advantage

1.

Complete more Processes

→ Max. Thruput

→ Min. of Av. TAT; Av. WT

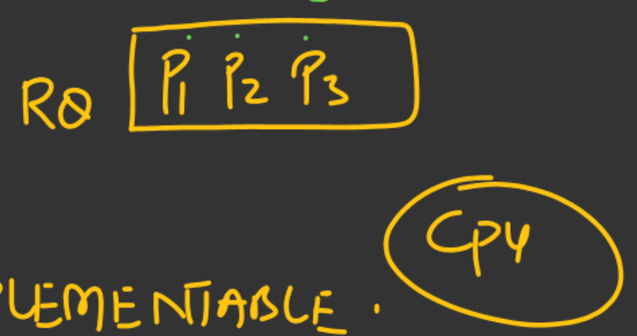
drawback

1. Starvation to longer Processes

outset

↳ Problem of SJF: Implementation ?

→ Since B.T's of Processes are not known apriori, ∴ S.J.F/SRTF is practically NOT IMPLEMENTABLE.



→ S.J.F is used as a Benchmark to measure Performance of other Algorithms

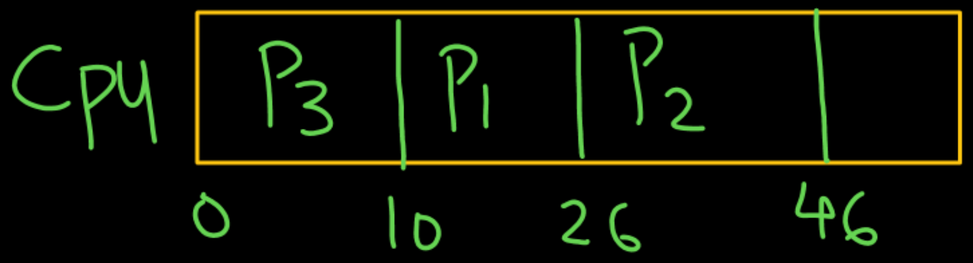
→ S.J.F can be Implemented with Predicted B.T's;

Q.

Three Processes arrive at time zero with CPU bursts of 16, 20 and 10 milliseconds. If the scheduler has prior knowledge about the length of the CPU bursts, the minimum achievable average waiting time for these three processes in a Non-Preemptive Scheduler (rounded to nearest integer) is _____ milliseconds.

(P_1 P_2 P_3)

(NAT)



$$\text{Av. w.t} = \frac{10 + 26 + 0}{3} = \frac{36}{3} = 12$$

S.J.F
N.P.V

a) 15.3
b) 12
c) 4
d) 23
e) 15
f) 10

8) FCFS is also not Implementable

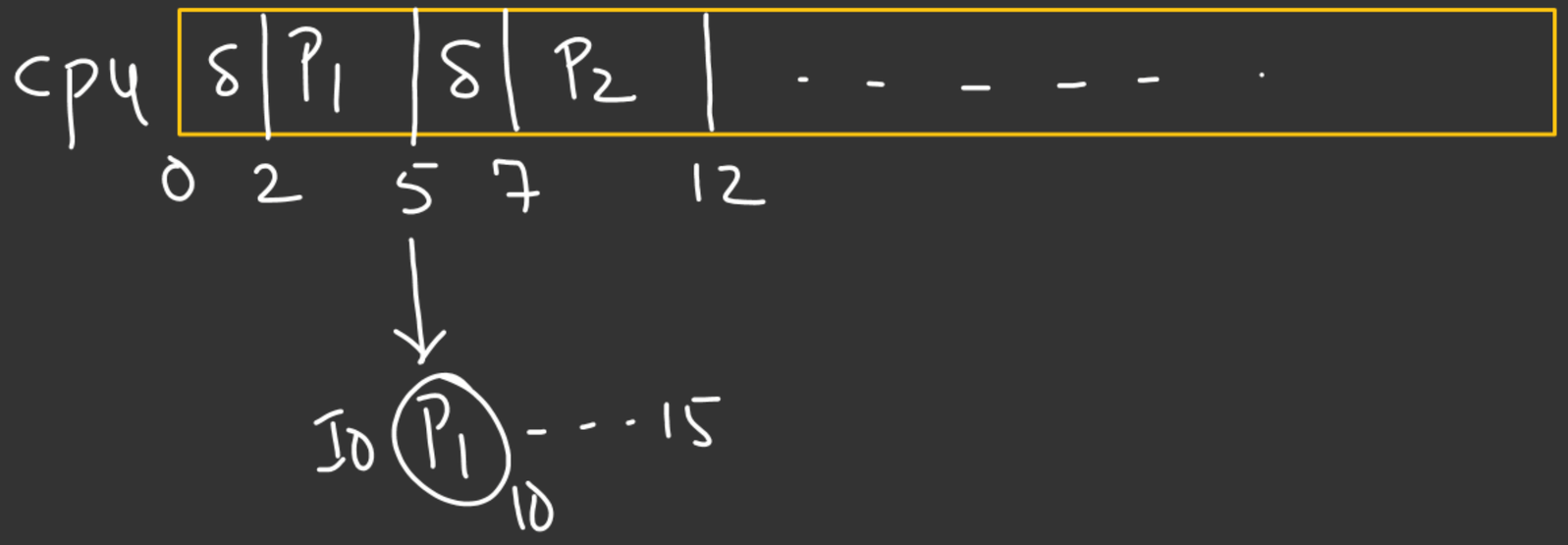
S = 2

FCFS

P.No	A.T	< B.T ; IOBT ; B.T >
1	0	< 3 ; 10 ; 5 >
2	2	< 2 ; 0 ; 3 > ; B.T = 5
3	3	< 1 ; 5 ; 3 >

(Concurrent — IO)

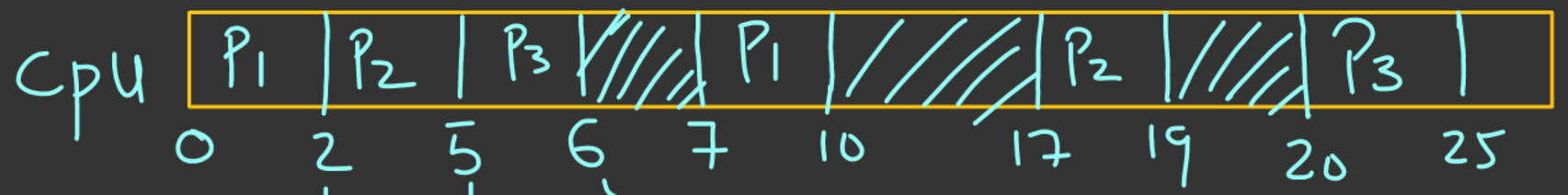
(Multiple IO-devices)

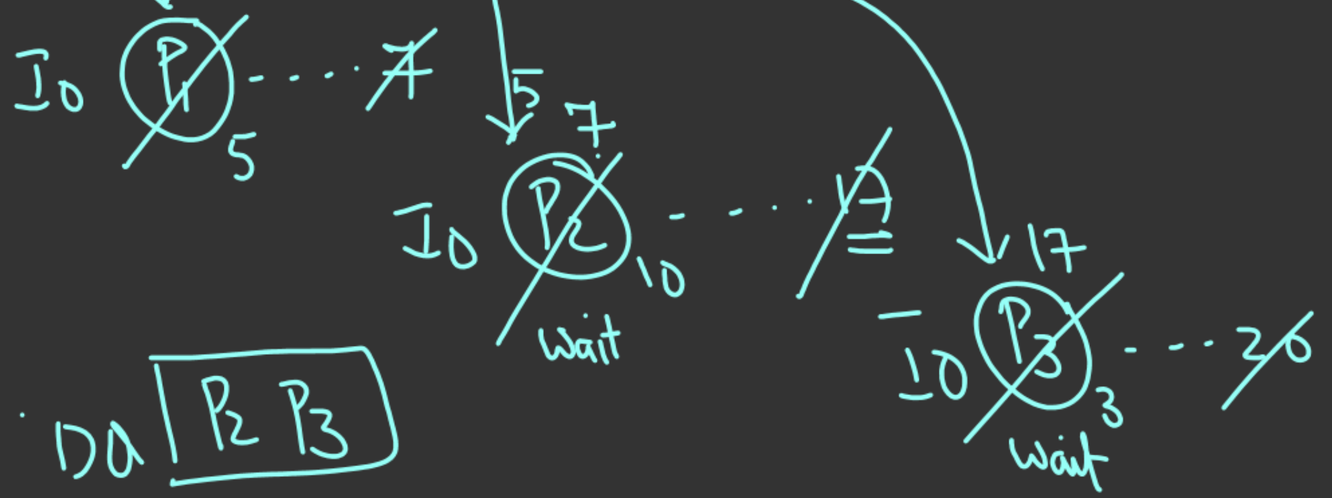


P.No	A.T	<B.T ; IO13 ; B.T>
1	0	<2 ; 5 ; 3>
2	2	<3 ; 10 ; 2>
3	3	<1 ; 3 ; 5>

There is only one IO-device ;

<Non-Concurrent IO>





DQ | P2 P3 |


THANK YOU
GW
SOLDIERS !