



CS & IT ENGINEERING

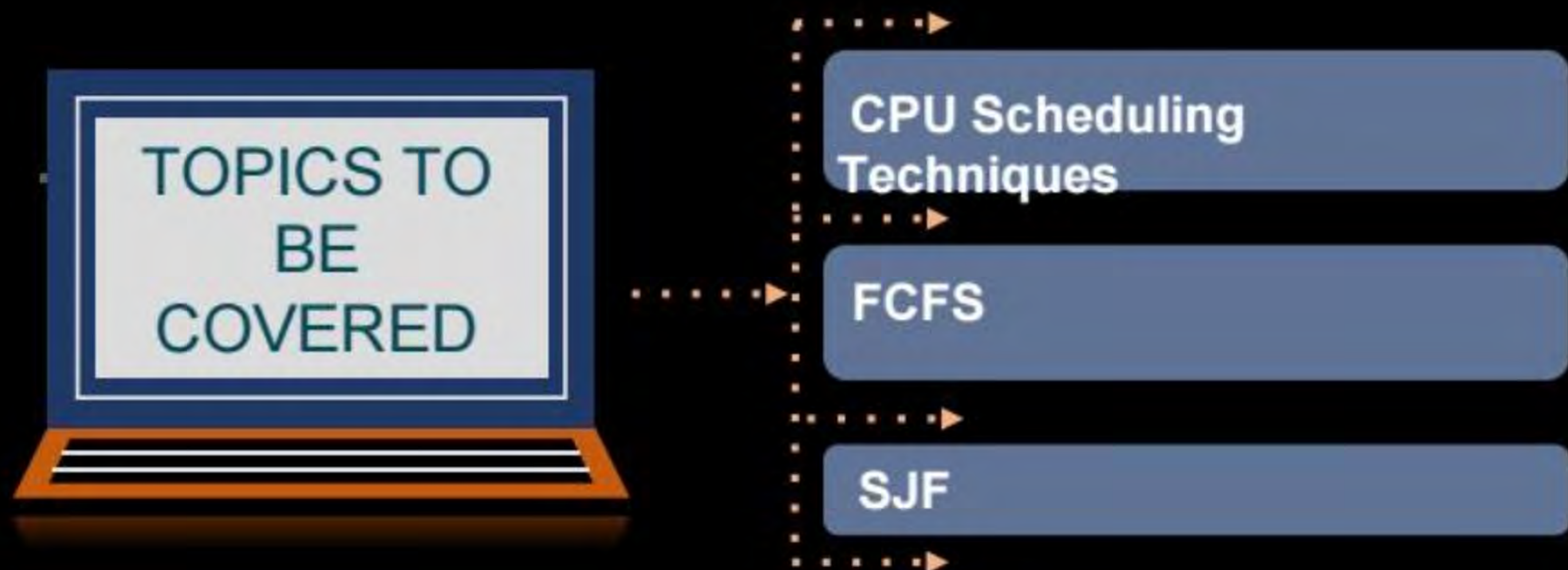
OPERATING SYSTEMS

CPU Scheduling

Lecture No. 2



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Fist come, first served

weew I could stay here forever Anyway, I'm not going back to the end of the queue



Hurry up. I'm waiting You've possessor for ages

Look at the size of that queue!



Process queue

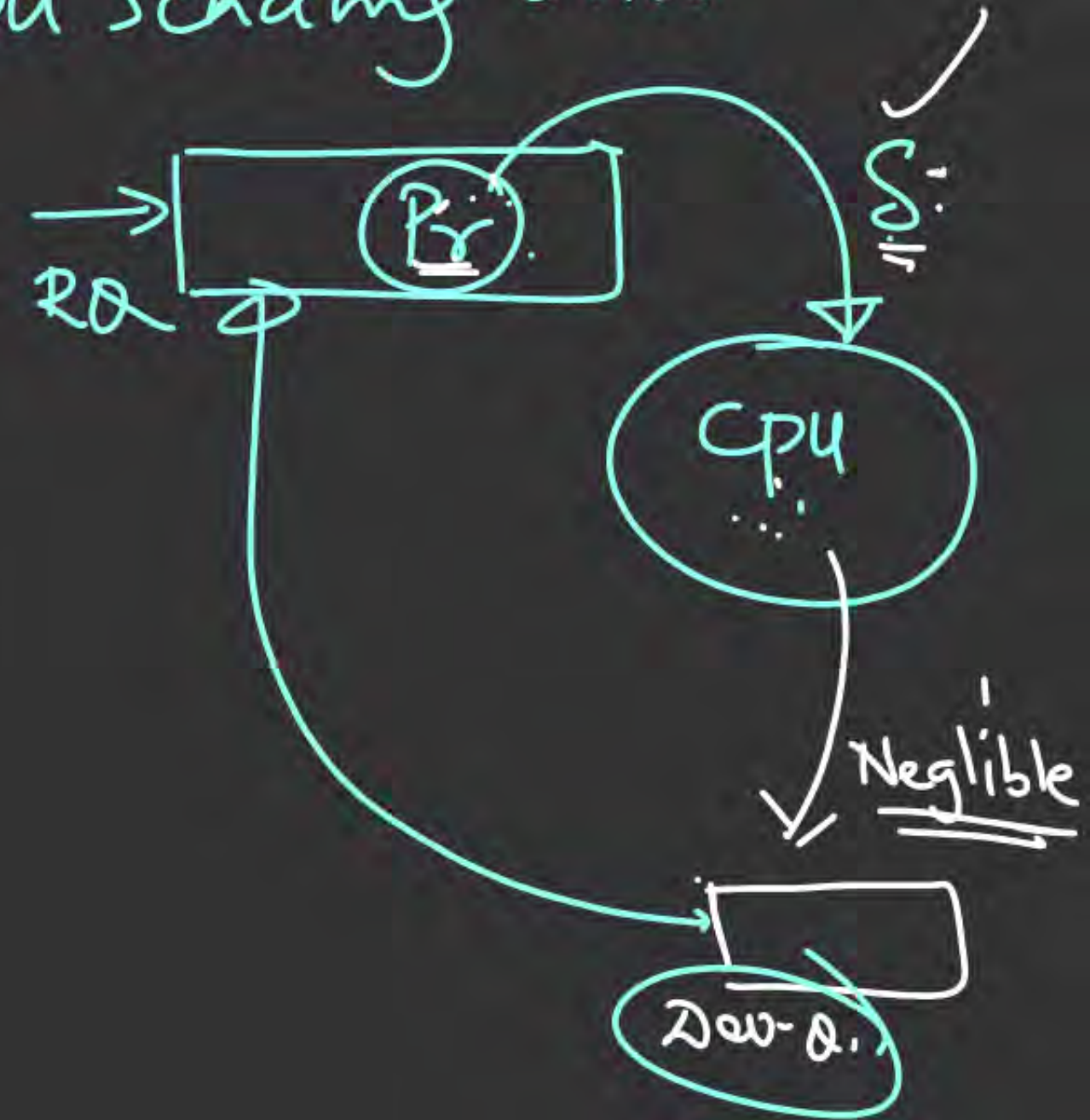
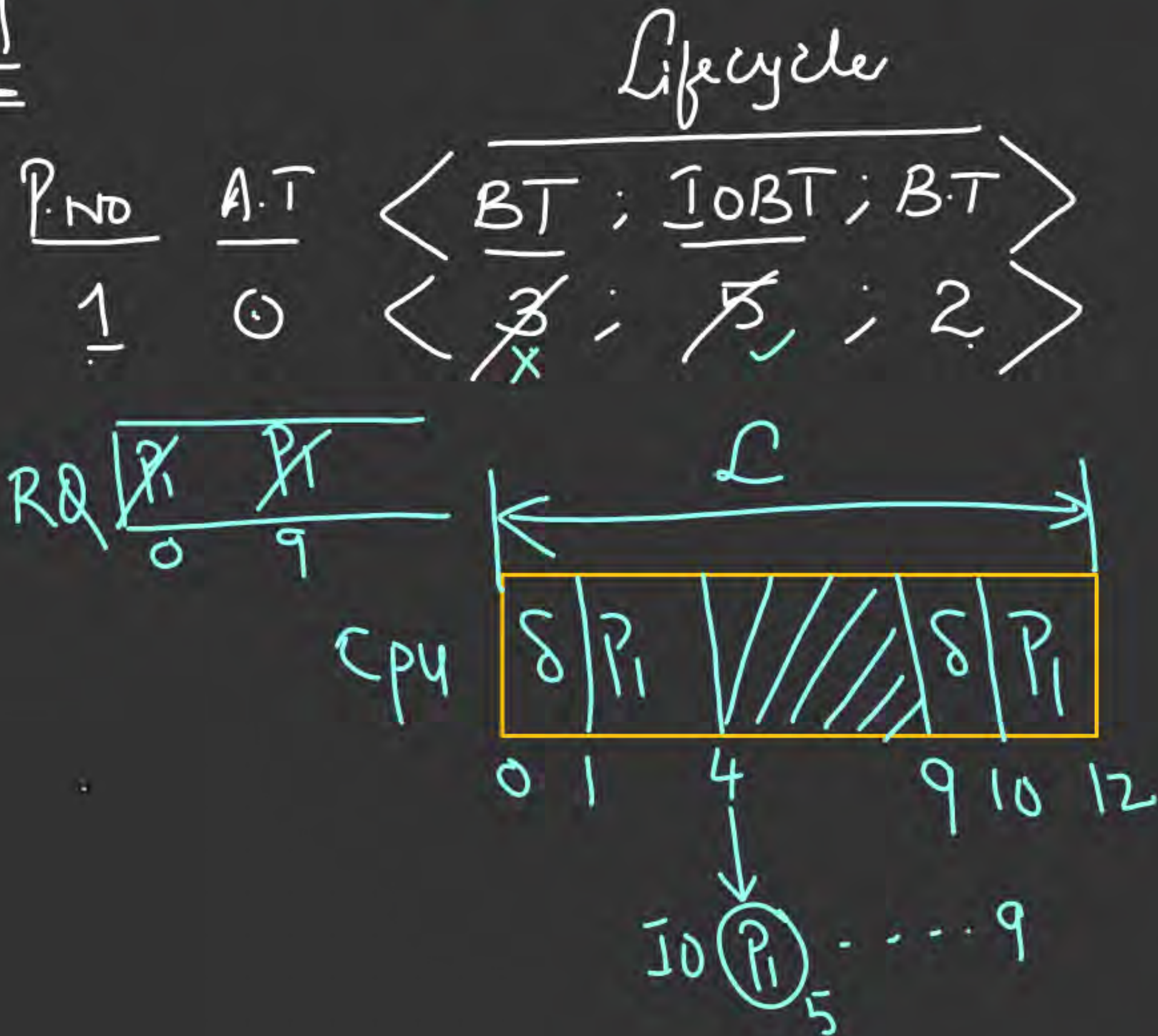
Sorry, First come first served.



CPU Scheduling Techniques/Algorithms

1) FCFS: Scheduling with IO-BT's and CPU Scheduling overhead

$$\underline{\underline{S=1}}$$



$$\underline{\underline{S=1}}$$

P.No	A.T	$\left\langle \overset{S}{R.T}; I/OBT; \overset{S}{BT} \right\rangle$
1-	0	$\left\langle \cancel{3}; \cancel{7}; 2 \right\rangle$
2-	2	$\left\langle \cancel{5}; \cancel{2}; 3 \right\rangle$
3-	5	$\left\langle 1; 4; 2 \right\rangle$

FCFS

: System has multiple I/O services

$$17 - 12 = 5$$

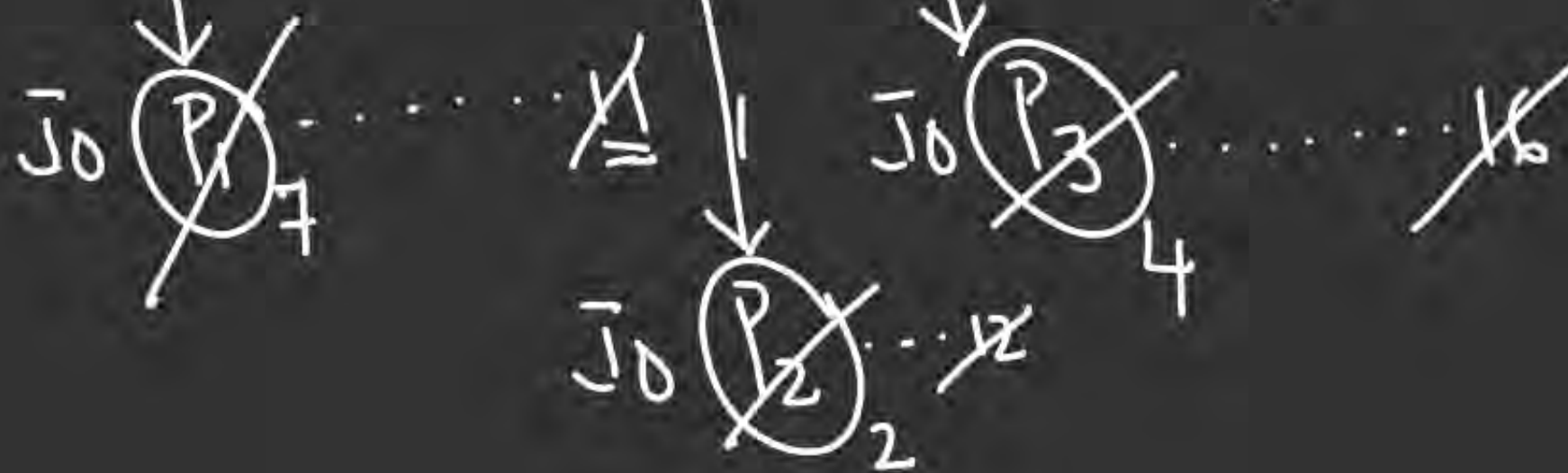
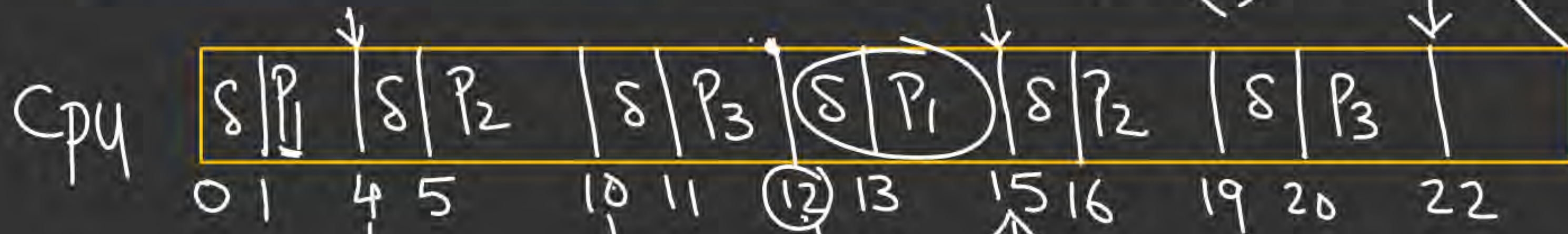
$$L = 22 - 0 = \underline{\underline{22}}$$

$$17 - (9) = 8$$

$$\text{Av. TAT; Av w.T}$$

$$\% \text{cpu idleness} = \underline{\underline{0\%}}$$

RQ $\boxed{\cancel{1} \cancel{2} \cancel{3} \cancel{1} \cancel{2} \cancel{3}}$ $2 + 3 = 5$



$$\begin{aligned} \text{TAT}(P_1) &= 15; \text{WT}(P_1) = 1 \\ \text{TAT}(P_2) &= 17; \text{WT}(P_2) = 5 \\ \text{TAT}(P_3) &= 17; \text{WT}(P_3) = 8 \end{aligned}$$

$$W.T = TAT - (BT + IORT)$$

$$= 15 - (5 + 7) = 3$$

With ' $\delta > 0$ ' the
Formula for W.T

$$* \quad W.T = TAT - (BT + IORT + \underline{\underline{n \cdot \delta}})$$

$$W.T(P_1) = 15 - (5 + 7 + 2 \cdot 1)$$

$$= 1$$

W.T = Time
Spent by
Process
in R.Q

' δ ' is not
considered
in W.T

(n = No. of Times
the Process gets
Scheduled into CPU)

Q.



Consider three Processes P_1, P_2, P_3 arriving in the Ready Queue at time 0 in the order P_1, P_2, P_3 . Their service time requirements are 10, 20 & 30 units respectively. Each Process spends 20% of its Service time on I/O followed by 70% of its Service time on Computation at CPU and last 10% on I/O before completion. $< \overline{BT + I/OBT}$

Assuming Concurrent I/O and negligible Scheduling

$S=0$ Overhead. Calculate for FCFS Scheduling

- (i) Average TAT of Processes
- (ii) % CPU idleness

S.T	P.No	A.T	< ^{20%} 10BT ; ^{70%} BT ; ^{10%} 10BT >
10	1	0	< 2 ; 7 ; 1 >
20	2	0	< 4 ; 14 ; 2 >
30	3	0	< 6 ; 21 ; 3 >

$$\underline{\underline{S=0}}$$

$$\underline{\underline{0.00000001}}$$

~ 0

$$0.000000002$$

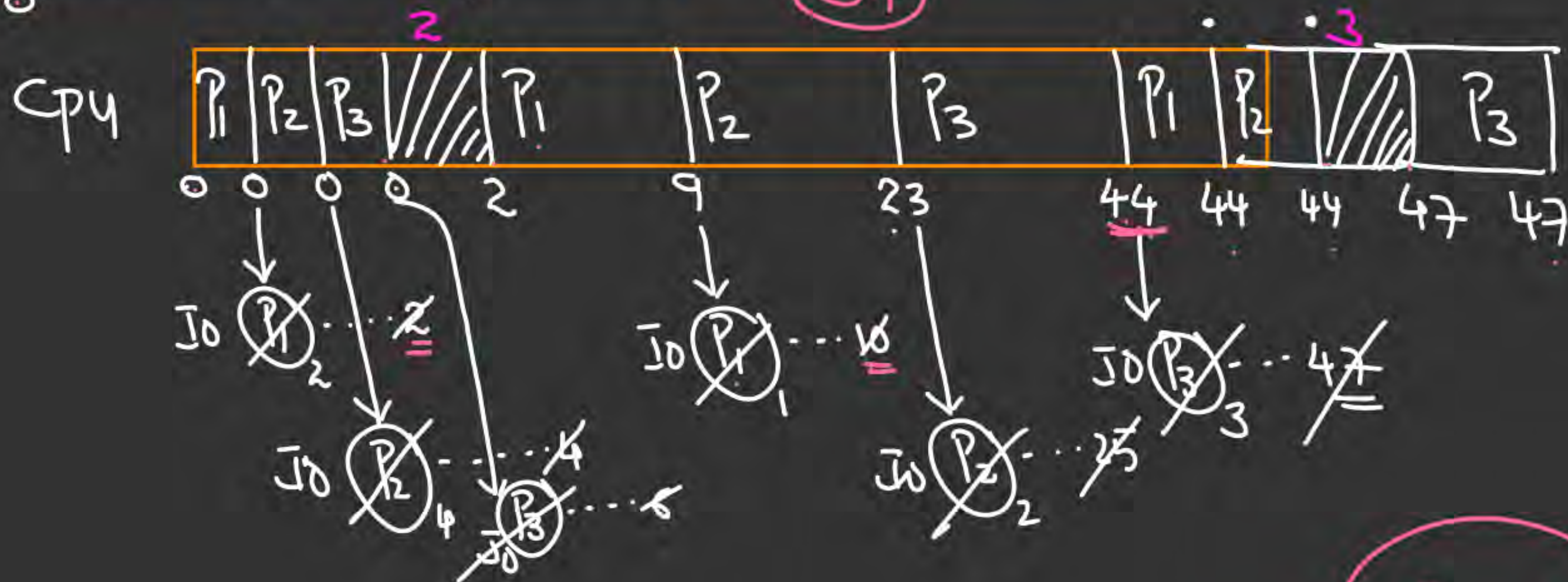
~ 0

$$L = 47$$

$$\% \text{cpu idleness} = 5/47$$

R.Q ~~P1~~ ~~P2~~ ~~P3~~ ²~~P1~~ ¹⁰~~P2~~ ~~P3~~ ~~P1~~ ~~P2~~ ~~P3~~

(34)



$$A_v.TAT = \frac{44 + 44 + 47}{3}$$

$$W.T(P_1) = TAT - (BT + 10BT)$$

$$= 44 - (10)$$

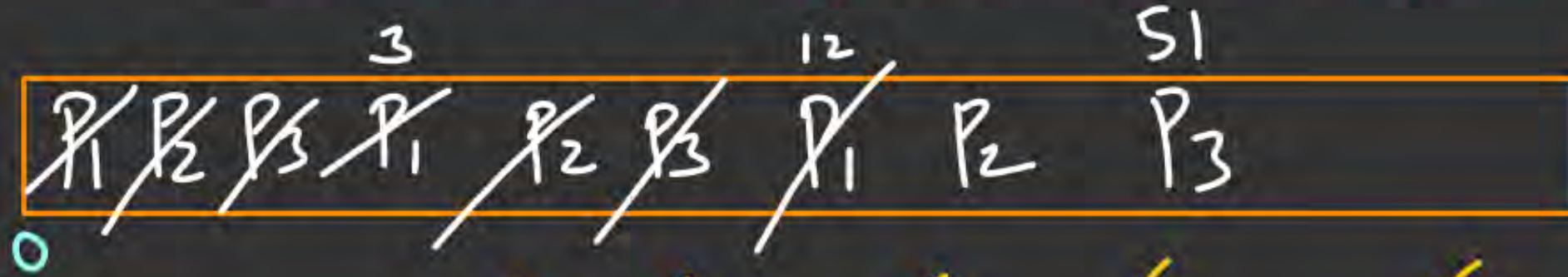
$$= \underline{\underline{34}}$$

$$\underline{\underline{S=1}}$$

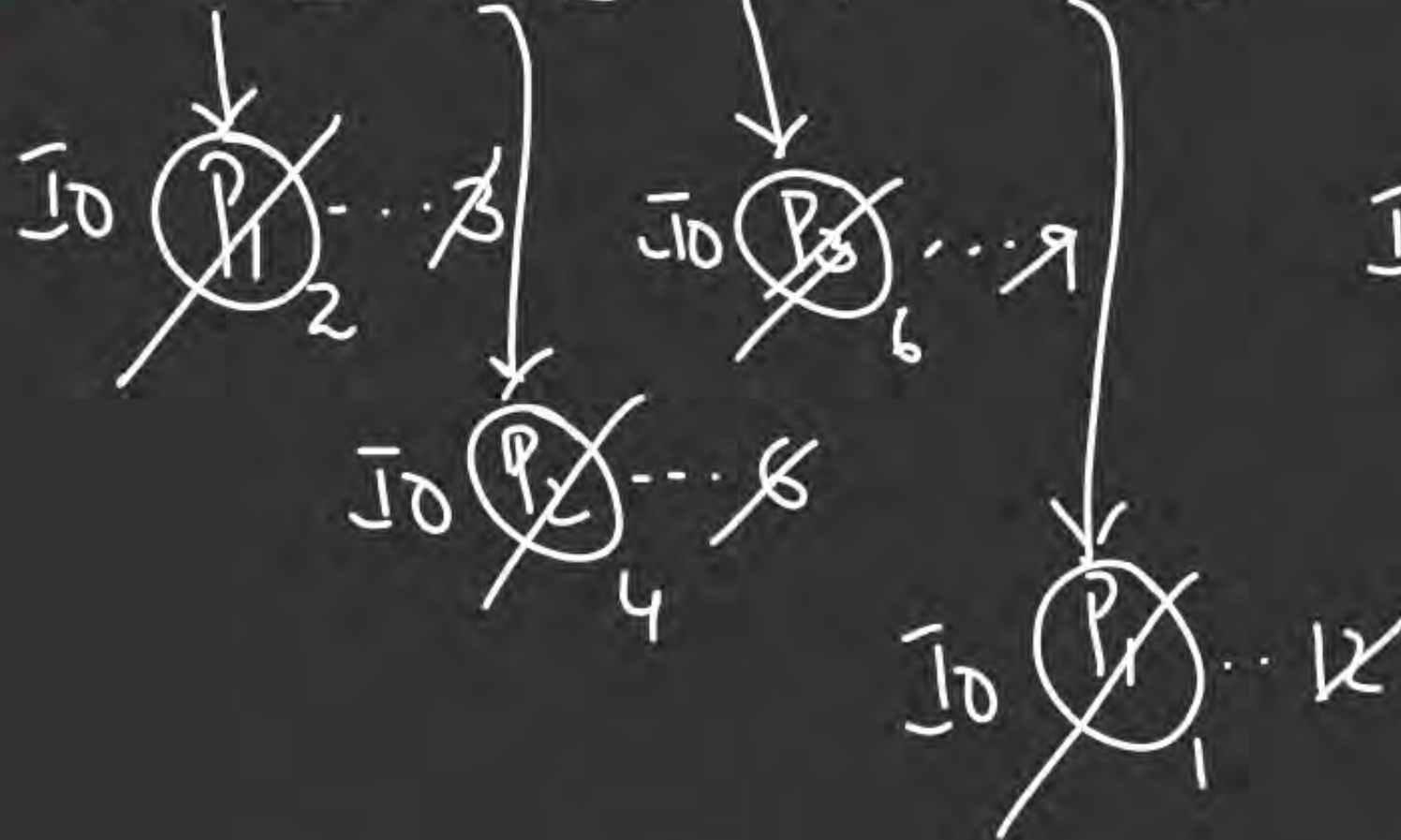
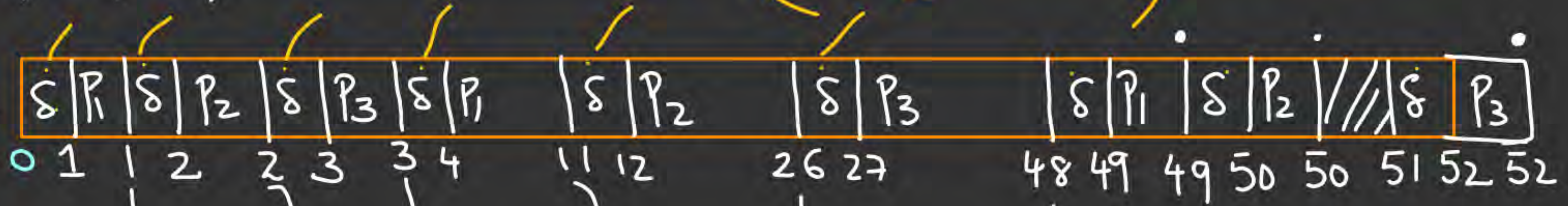
S=1:

S.I	P.NO	A.T	< IORT; BT; IORT >
10	1	0	< 2; 7; 1 >
20	2	0	< 4; 14; 2 >
30	3	0	< 6; 21; 3 >

RQ



cpu



$$\% \text{cpu Idleness} = \frac{1}{52} = x\%$$

$$L = 52 - 0 = 52$$

$$\left(\frac{\% \text{cpu-ovhd activity}}{L} \right) = \frac{9}{52} = y\%$$

$$\% \text{cpu eff} = 100 - (x+y)$$

① $S=2$;

<u>P.No</u>	<u>A.T</u>	<u>$\langle BT; IOB; BT \rangle$</u>
1	0	$\langle 3; 4; 2 \rangle$
2	5	$\langle 2; 0; 3 \rangle$
3	20	$\langle 1; 15; 6 \rangle$

② $S=1$;

<u>P.No</u>	<u>A.T</u>	<u>$\langle IOBT; BT; IOBT \rangle$</u>
1	3	$\langle 5; 2; 3 \rangle$
2	8	$\langle 2; 10; 4 \rangle$
3	12	$\langle 6; 2; 1 \rangle$

"
③ Repeat Q②
& ③
Assuming
System has
only one
IO-device"

