

## OPERATING SYSTEMS

### CPU Scheduling

#### LECTURE 02



Dr. KHALEEL KHAN





A collection of various tools and cables, including pliers, wire cutters, and multi-colored wires, arranged in a circular pattern around a central dark blue circle.

# **Topics to be Covered**

SRTF

LRTF



# \* FCFS with IOBT & Scheduling overhead

P.No	A.T	Life cycle		<u>S=1</u>	[A
		<u>B.T ; IOBT ; B.T</u>			
1	0	< 3 ; 5 ; 2 >		12	0
2	2	< 4 ; 7 ; 3 >		18	2

[ Assuming each Process has its own IO-Dev. ]

Concurrent IO

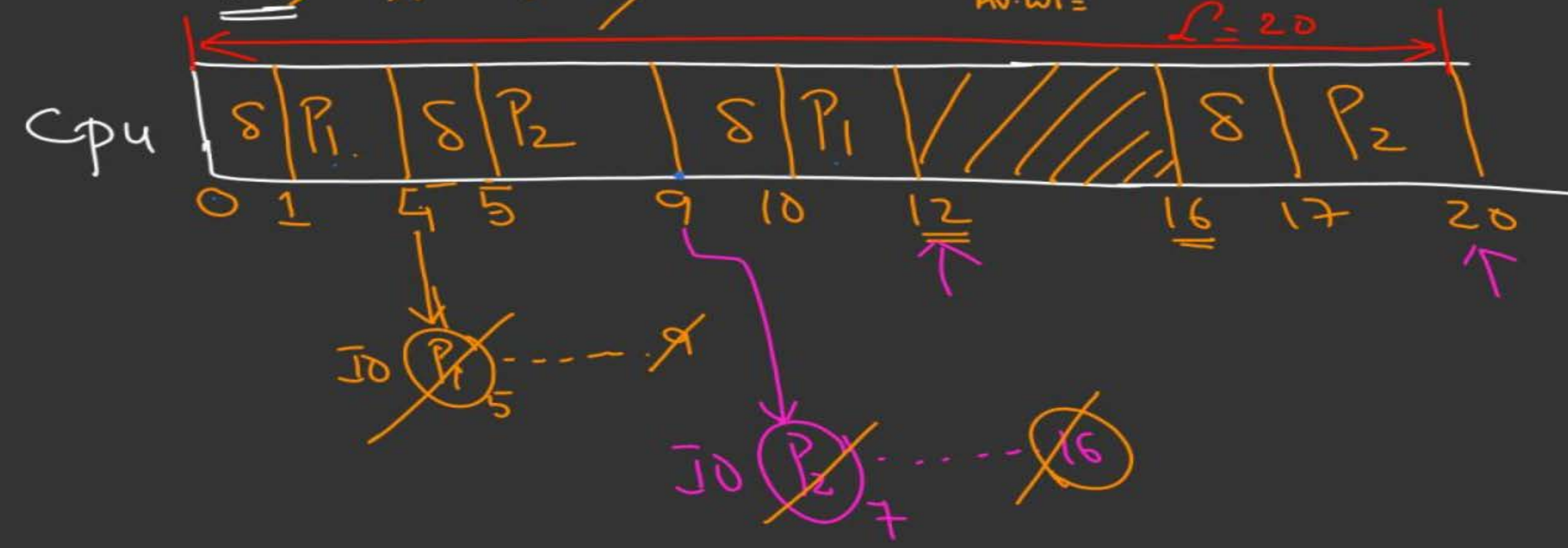
R.O. ~~P1, P2; P1, P2~~

Av. TAT =  
Av. WT =

$$WT = TAT - (BT + IOBT + S)$$

$$P_1 = 12 - (10 + 2) = 0$$

$$P_2 = 18 - (14 + 2) = 2$$





$S=0$

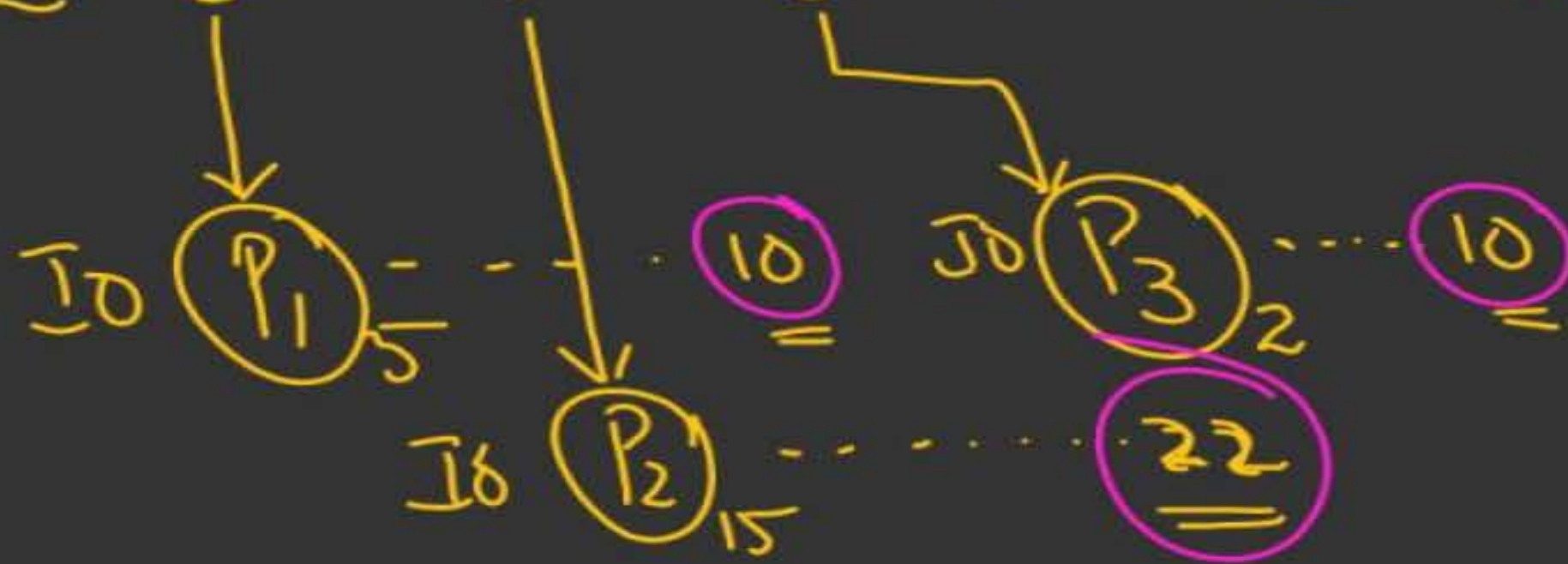
P.No	A.T	$\langle B.T; IOST; BT \rangle$	
1	2	$\langle 3; 5; 2 \rangle$	x
2	3	$\langle 2; 15; 3 \rangle$	
3	5	$\langle 1; 2; 4 \rangle$	x

$L = 23$   
 $A.TAT =$   
 $A.WT =$   
 $\% \text{cpu-idleness}$

$$TAT = CT - AT$$

$$WT = TAT - (BT + IOST)$$

R.Q:  $P_1; P_2; P_3; P_1; P_3; P_2;$





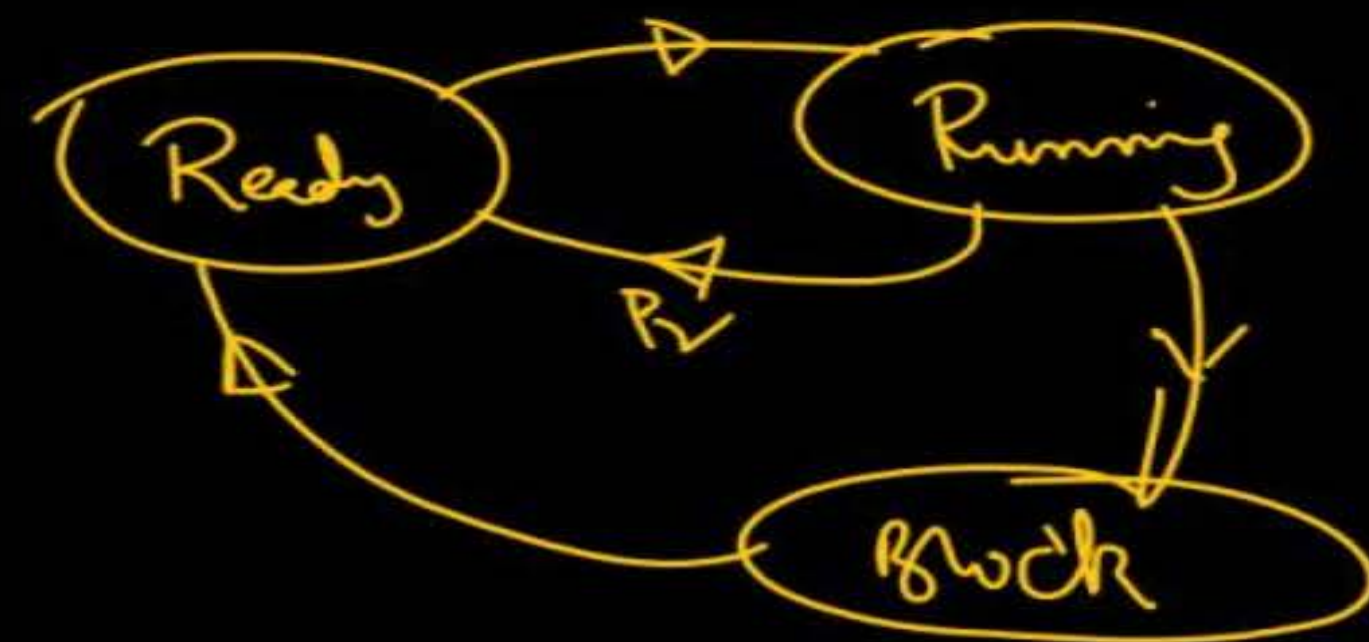
Q.1



Consider the following statements about process state transitions for a system using preemptive scheduling

- I. A running process can move to ready state ✓
  - II. A ready process can move to running state ✓
  - III. A blocked process can move to running state ✗
  - IV. A blocked process can move to ready state.
- Which of the above statements are TRUE?

- A** I, II and IV only ✓
- B** I, II, III and IV
- C** I, II and III only
- D** II and III only





Q.2



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. (RT + IORT)

Assuming Concurrent I/O and negligible Scheduling Overhead. Calculate for FCFS Scheduling

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

Home work

Solve the Question  
assuming  $\delta = 1$



$P_1 \rightarrow \underline{10}$ ;  $P_2 \rightarrow 20$ ;  $P_3 \rightarrow 30$

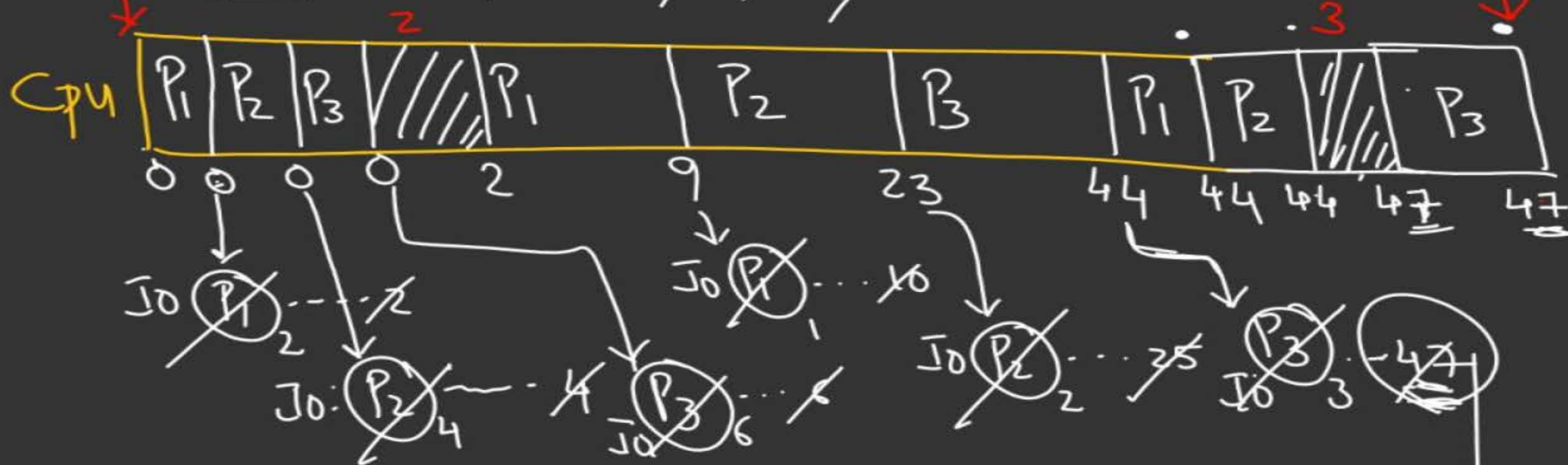
P.No	A.T	$\left\langle \overset{20\%}{I/OBT}; \overset{70\%}{B.T}; \overset{10\%}{I/OBT} \right\rangle$
1	0	$\left\langle 2; \underline{7}; 1 \right\rangle$
2	0	$\left\langle 4; \underline{14}; 2 \right\rangle$
3	0	$\left\langle 6; 21; \underline{3} \right\rangle$

$$L = 47 - 0 = 47$$

$$\text{CPU Idleness} = \frac{5}{47} = 10.63\%$$

$$AVTAT = \frac{44 + 44 + 47}{3} = 47$$

R.Q:  ~~$P_1; P_2; P_3; P_1; P_2; P_3; P_1; P_2; P_3$~~



Can Process go to IO directly from Ready &

"No"  
Running State

Terminate Block (IO)  
? running



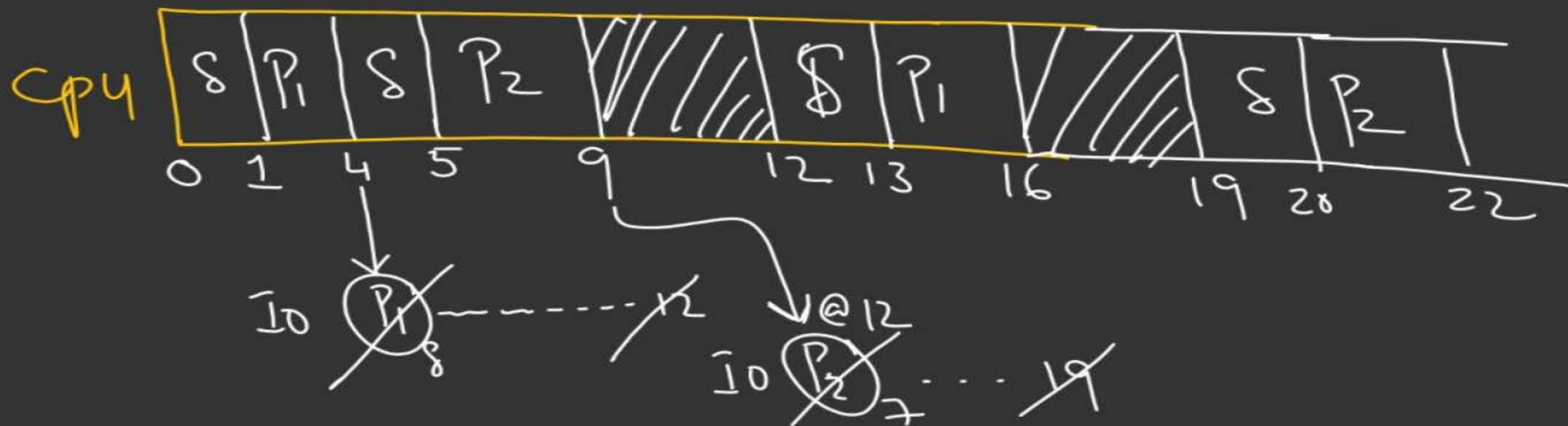
# Non-Concurrent-IO

System has only one IO-service for all Processes;

P.No	A.T	$\langle \text{BT}; \text{IOBT}; \text{RT} \rangle$
1	0	$\langle 3; 8; 3 \rangle$
2	2	$\langle 4; 7; 2 \rangle$

$S=1$

R.Q: ~~P1~~; ~~P2~~; ~~P1~~; ~~P2~~;







**THANK  
YOU!**

