CS & IT ENGINEERING

OPERATING SYSTEM

Process Concepts

Lecture No. 03

By- Dr. Khaleel Khan Sir

TOPICS TO BE COVERED

- Process State Transition Diag. *
- Scheduling Queues
- Dispatcher

Program vs Process

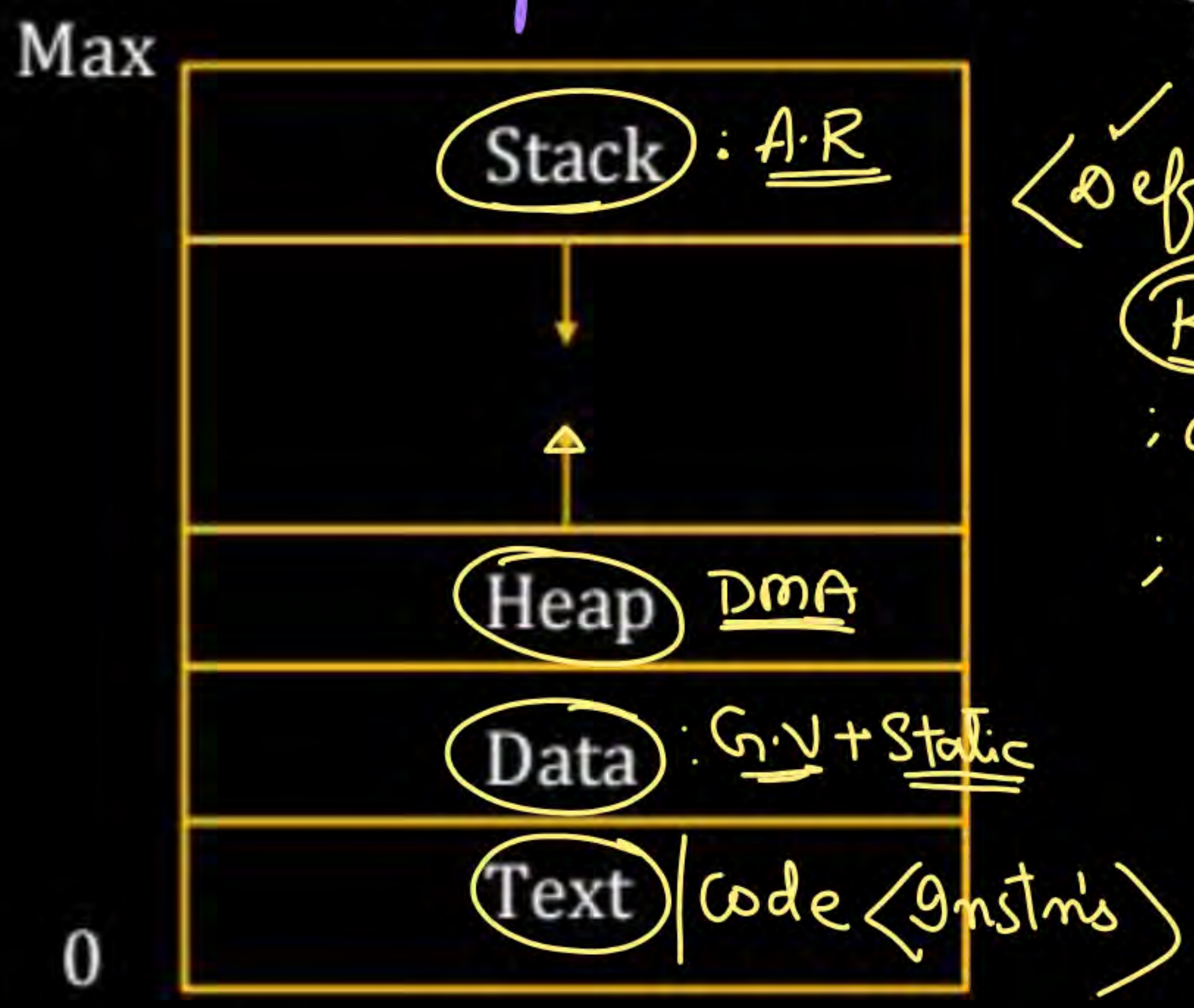
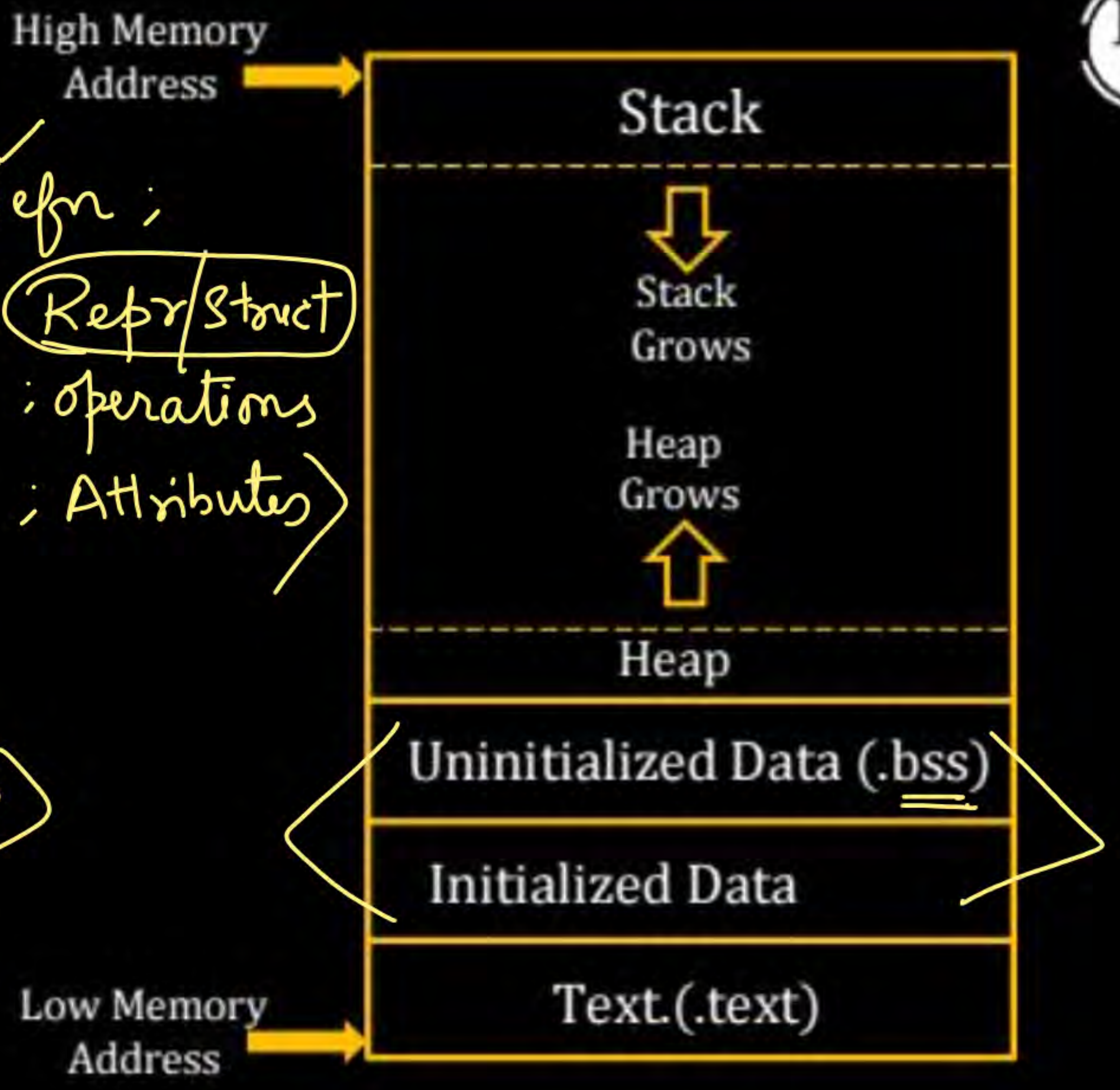


Figure: Process in the Memory

<Defn ;
Repr/Struct
; operations
; Attributes>



Attributes of Process (Characteristics) + Properties

1. Identification: Pid; PPid; gid
2. CPU related: P.C; Priority; State; Gen. Register; Type; Burst time
3. Mem " : Size; limits
4. File " : List of Files in use

⇒ PCB is Stored in Memory

⇒ All Attributes of the Process are Stored in a Table Known as P.C.B (Process control Block) <Process Descriptor>

⇒ Each Process has its own PCB <Id-Card>

Pointer | Process State
Process number (id)
~~Process~~ counter (P.C)
Registers ✓
Memory Limits ✓
List of open files ✓
...

Process Control Block (PCB)

→ Process CONTEXT <Environment>

→ Content of PCB

Process States & State-Diagram

1. New : gets created; Resource Allocation
2. Ready : Ready to run on cpu
3. <Running> : Executing Instr's on cpu
4. Block | wait : Needs to Perform IO | Sys. Call
5. Terminate : Resource deallocation

* Process State Transition Diagram

Notes :

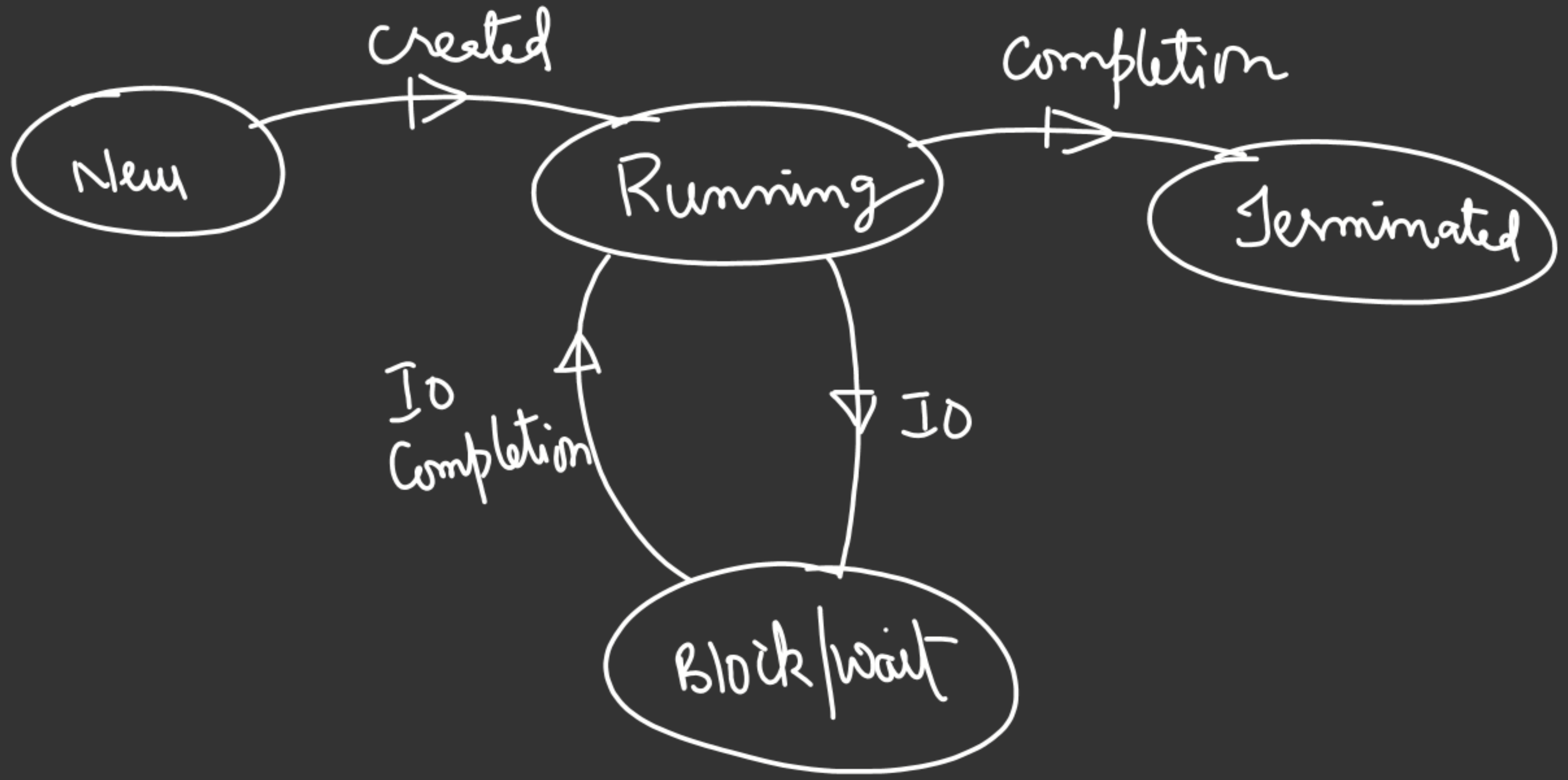
1. As long as Process is in Ready + Running + Block States, it is in Main Memory

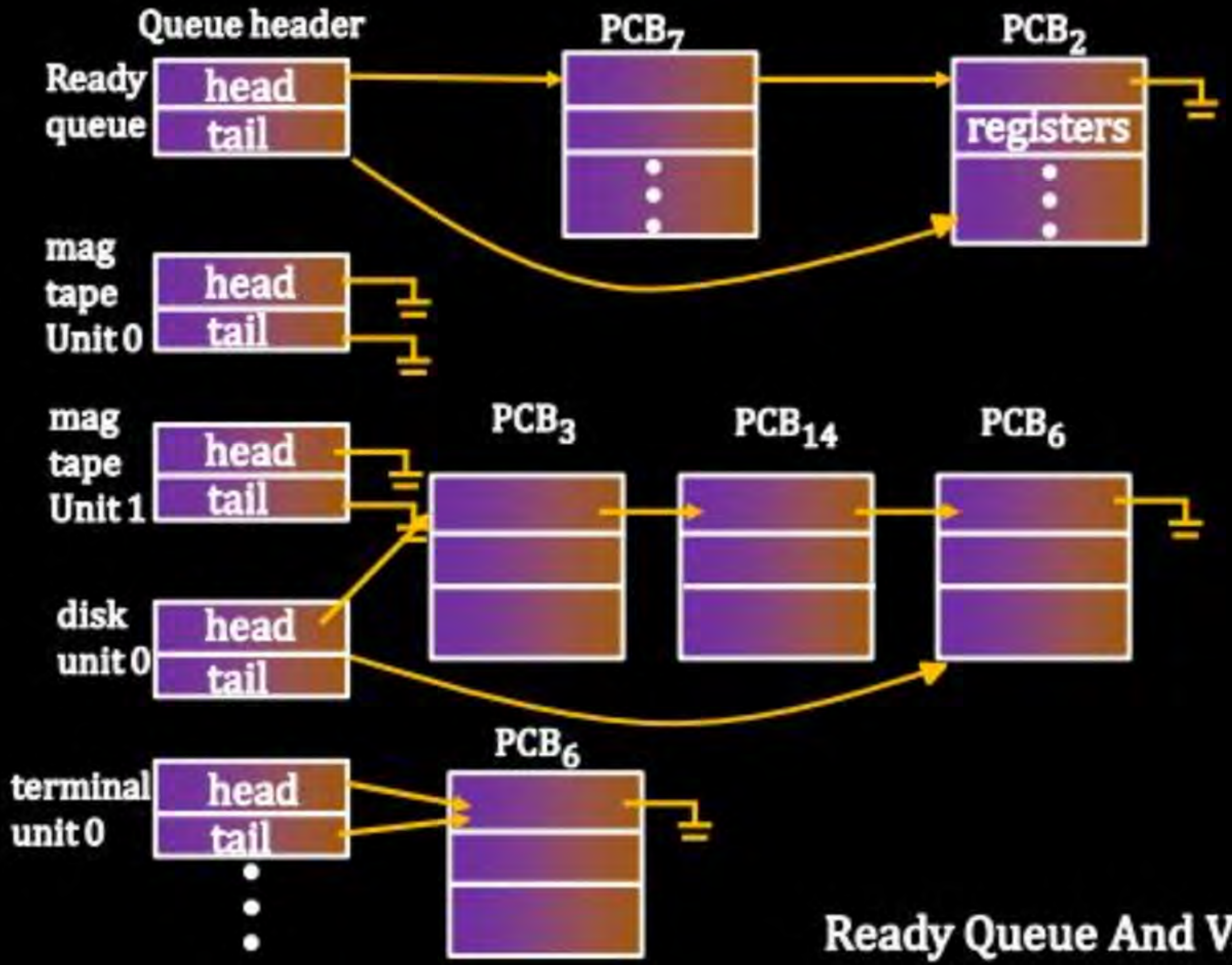
2. There can be many Ready, Block Processes;

3. Max. # of Running Processes depends on No. of CPU's ;

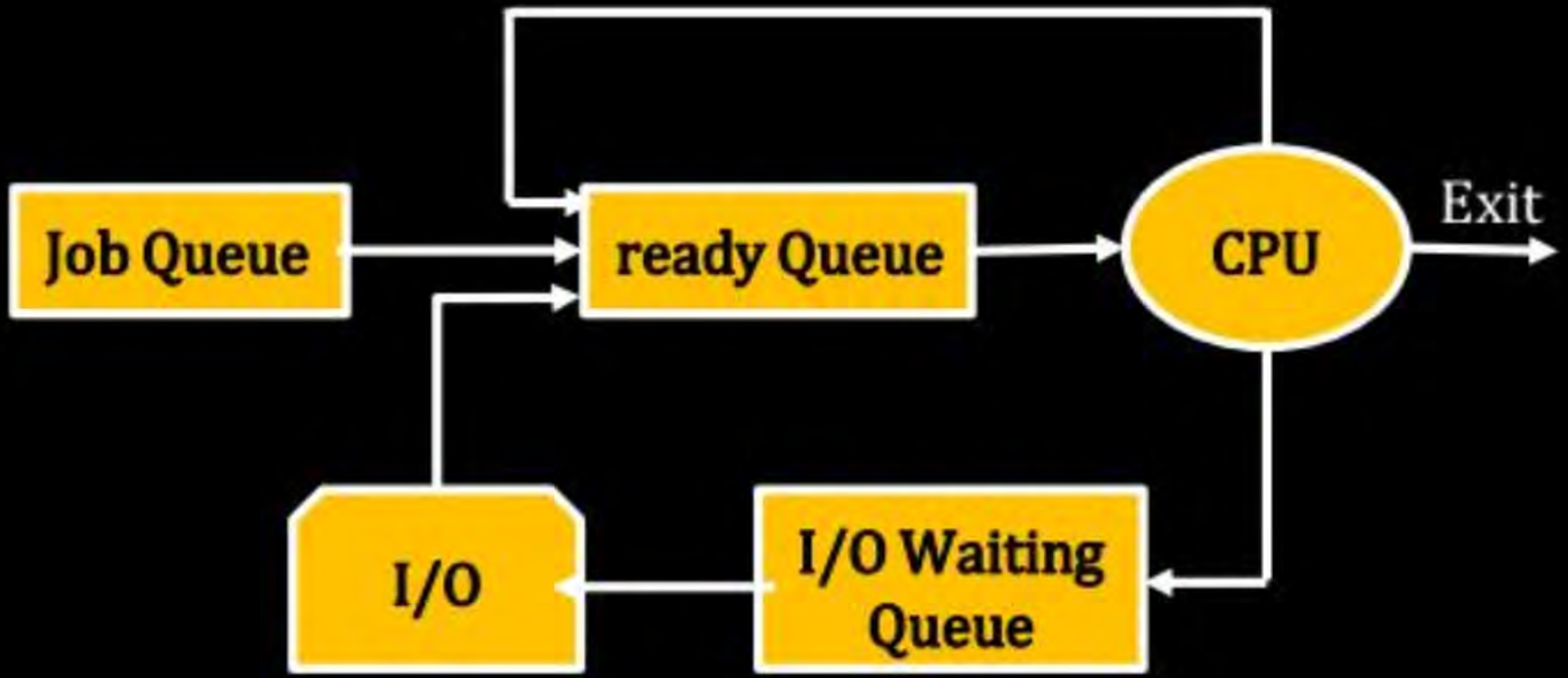
Process State Transition Diagram of UNI-PROG. O.S

<New + Running + Block + Terminate>

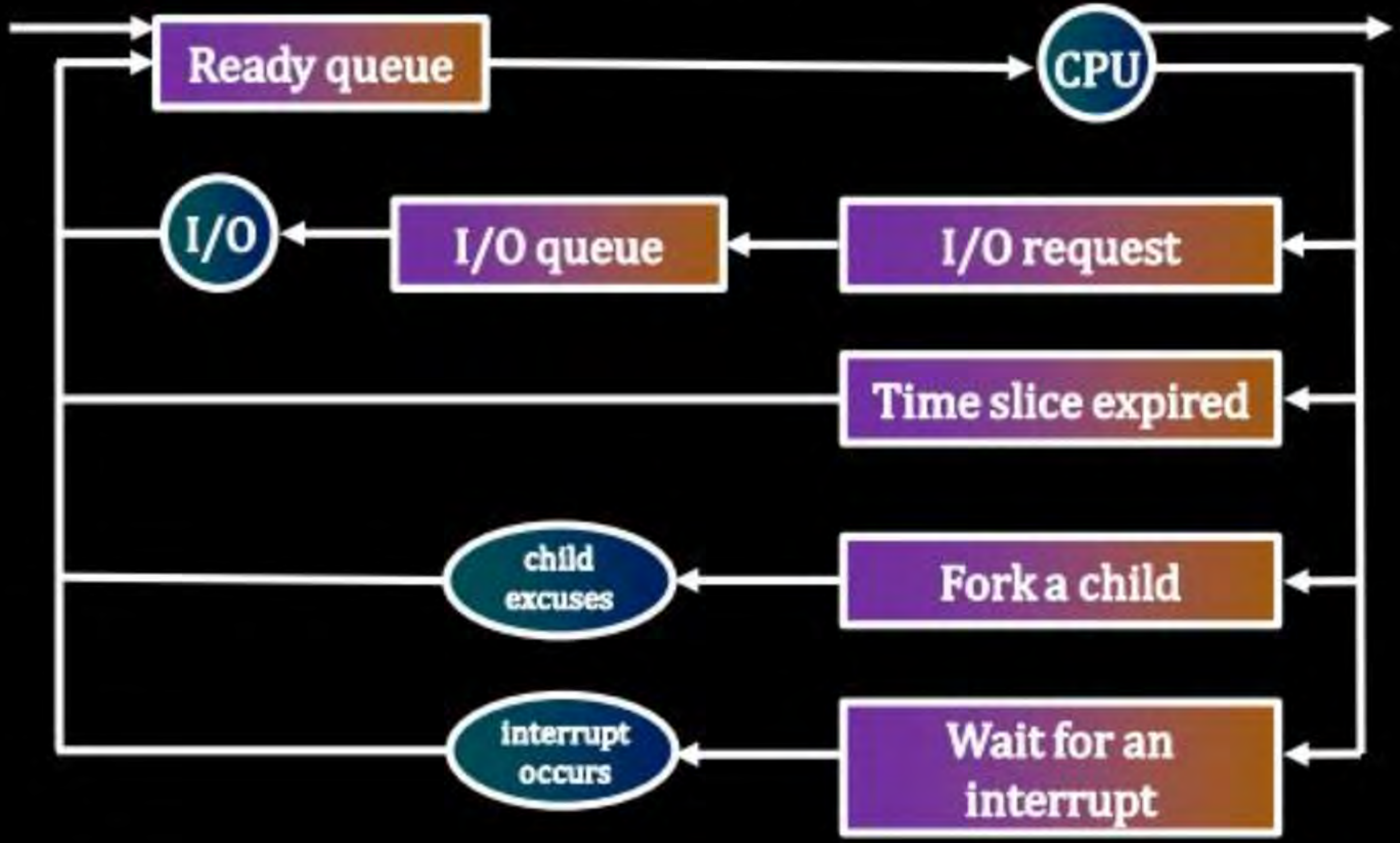


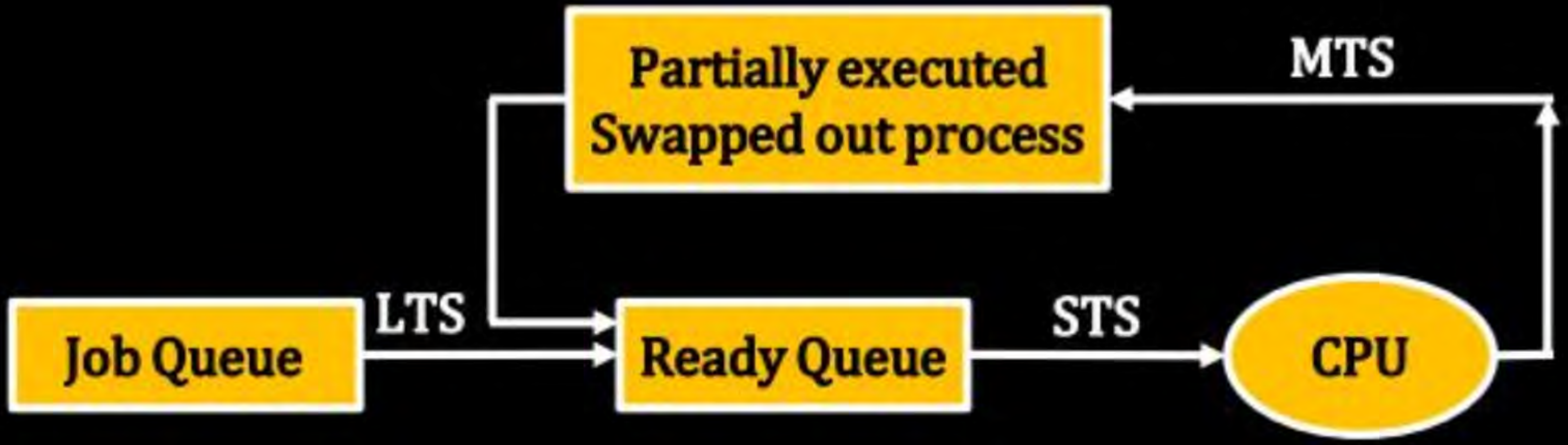


Ready Queue And Various I/O Device Queues


Job Queue
ready Queue
CPU
Exit
I/O
I/O Waiting Queue

Scheduling Queues




Partially executed
Swapped out process
MTS
LTS
STS
Job Queue
Ready Queue
CPU

Q.1

Consider a System having ‘n’ CPUs ($n \geq 1$) and ‘k’ Processes ($k > n$).

Calculate lower bound (Min) and upper bound (Max) of the number of Processes that can be in the Ready, Running and Block states

	Min L.B	Max U.B
Ready	0	K
Running	0	n
Block	0	K

n = No. of cpu's ($n \geq 1$)

K = No. of Processes ($K > n$)

$n = 1$ $K = 3$

$\boxed{\cancel{P_1}\ \cancel{P_2}\ \cancel{P_3}}$ Ready

$\boxed{\text{cpu } \cancel{P_2} \ \cancel{P_1}\ \cancel{P_3}}$

$\boxed{P_1\ P_2\ P_3}$ Block

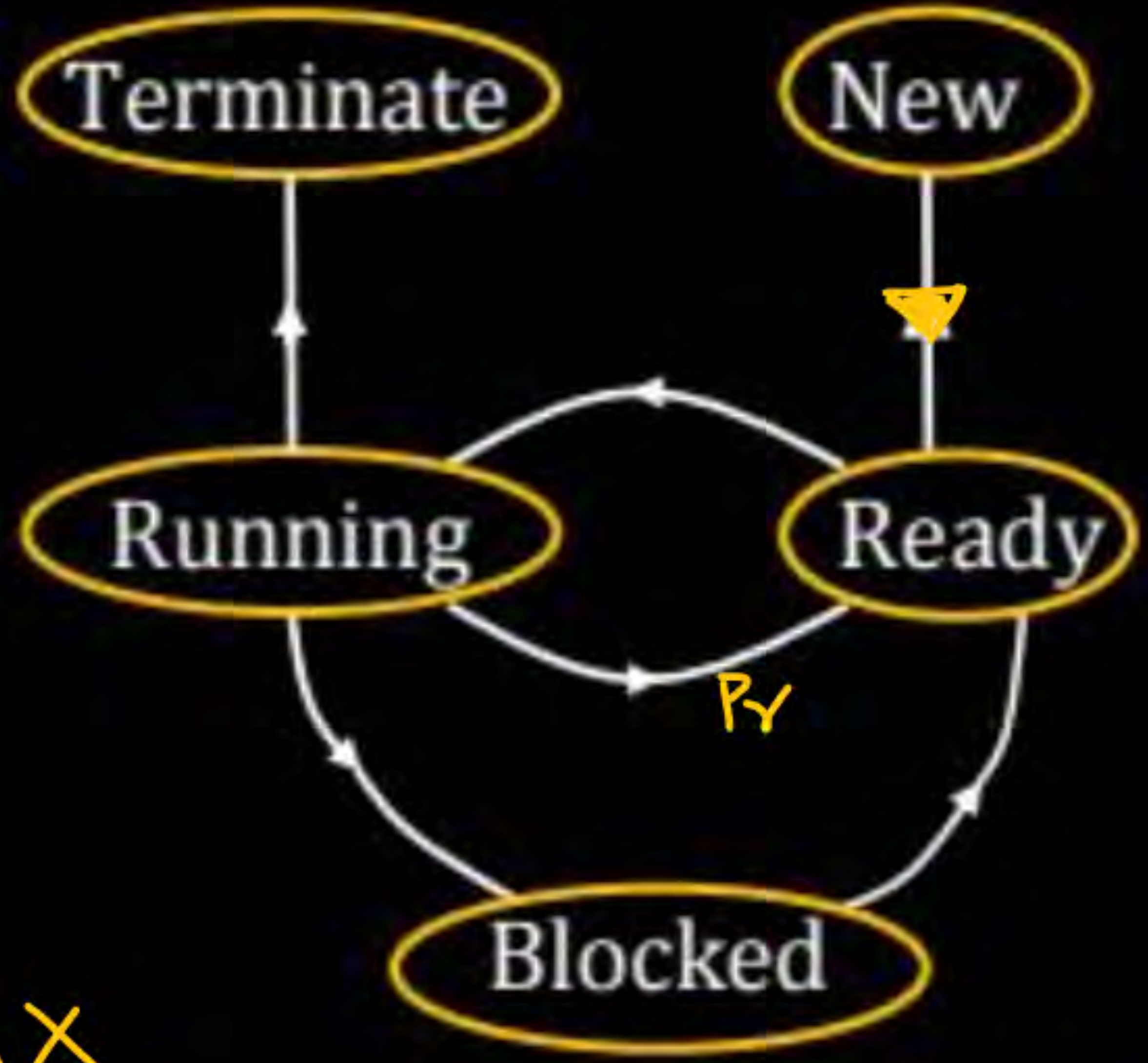
n = No. of cpu's $(n > 1)$

K = No. of Processes $(\underline{\underline{K}} < \underline{\underline{n}})$

	L.B	U.B
Ready	0	K
Running	0	K
Block	0	K

Q.3 The Process state Transition diagram given below is representative of

$\frac{\sqrt{M.Pr}}{U.Pr}$



A. A Batch O.S. ⟨UNI⟩ ✗

B. An O.S. with a preemptive scheduler ✓

C. An O.S with a non-preemptive scheduler

D. A Uniprogrammed O.S. ✗

Q.4 In the following process state transition diagram for a uniprocessor system, assume that there are always some processes in the ready state:
Now consider the following statements:

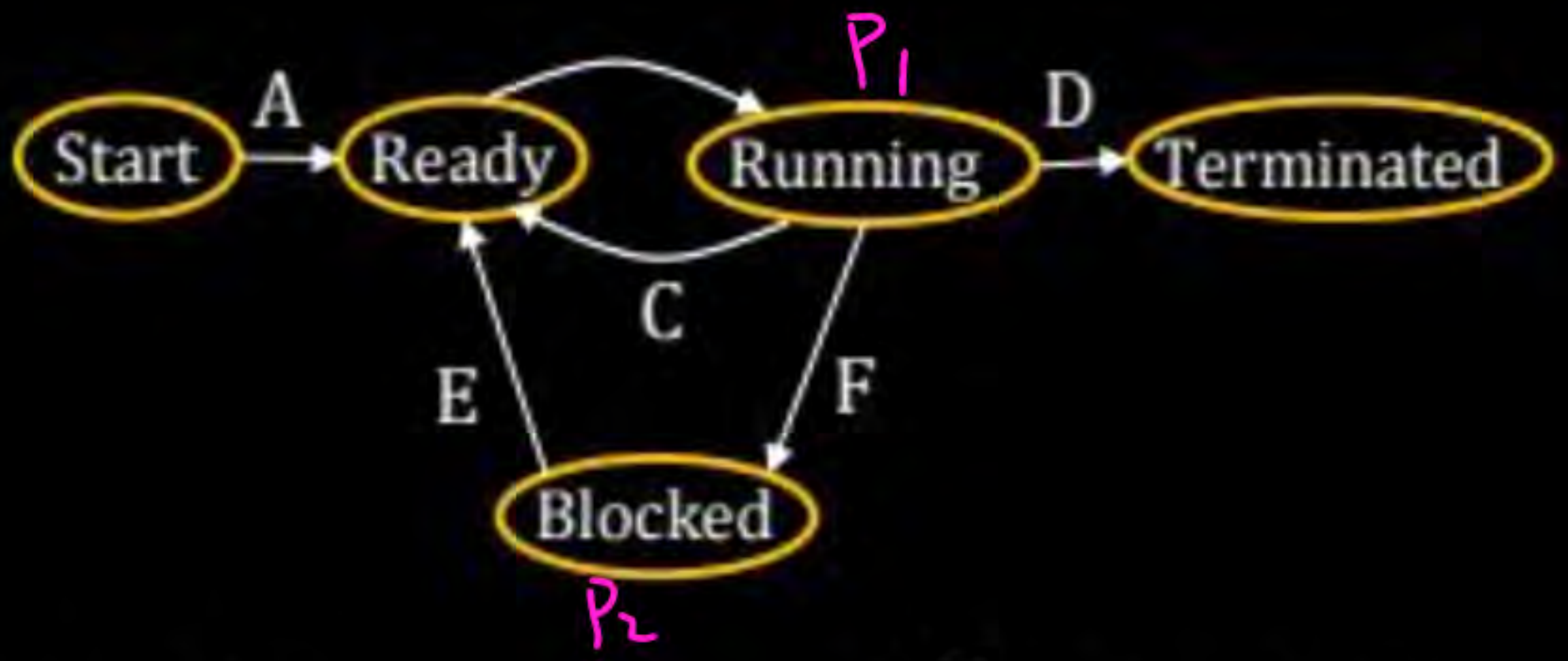
(I) If a process makes a transition D, it would result in another process making transition A immediately. ×

✓ (II) A process P2 in blocked state can make transition E while another process P1 is in running state. ✓

✓ (III) The OS uses preemptive scheduling. ✓

(IV) The OS uses non-preemptive scheduling. ×

Which of the above statements are TRUE?



(A) I and II

(B) I and III

(C) II and III ✓

(D) II and IV

Q.5 Which combination of the following feature will suffice to characterize an OS as a multi-programmed OS?

(a) More than one program may be loaded into main memory at the same time for execution.

(b) If a program waits for certain events such as I/O, another program is immediately scheduled for execution,

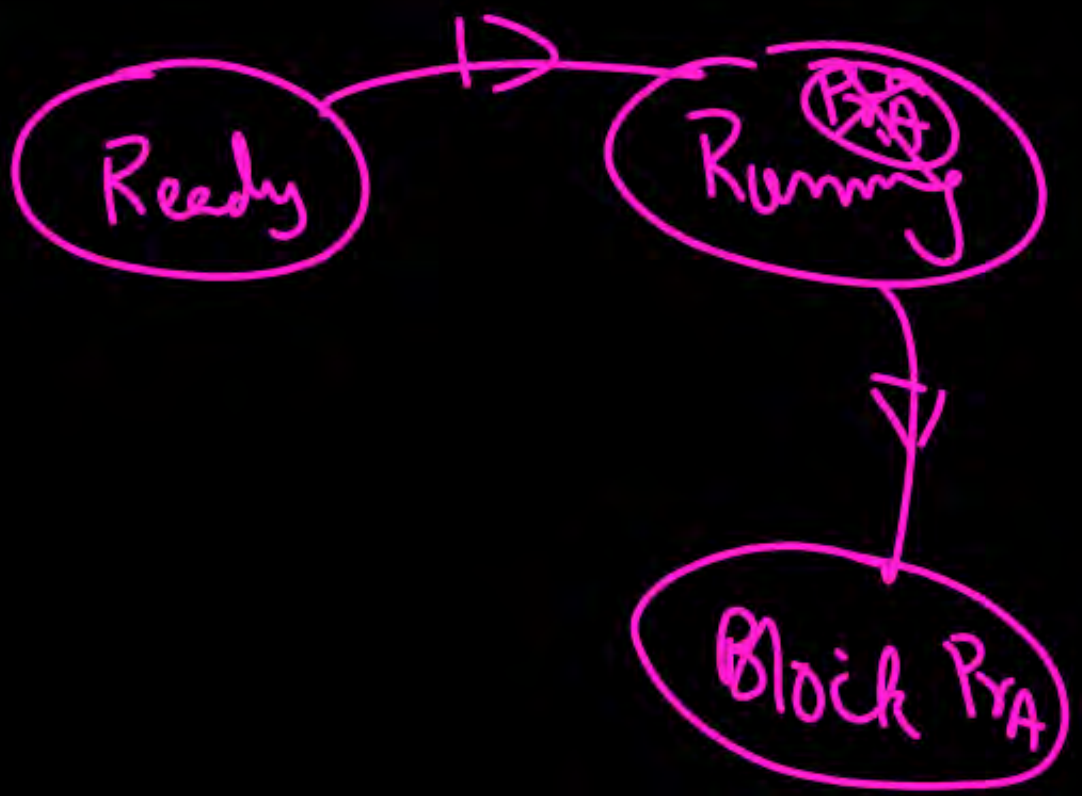
(c) If the execution of program terminates, another program is immediately scheduled for execution

(A) a

(B) a and b

(C) a and c

(D) a, b and c



Q.7

The maximum number of processes that can be in ~~Ready~~ Running state for a computer system with n CPUs is :

Block

A) n → <Running>

B) n^2

C) 2

D) Independent of n ✓ <Ready + Block>

Ready

$\boxed{\text{5 Process}}$

n = 1

$\boxed{\text{CPU}}$

Q.8

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 III only

(B) II, and III only

(C) I, II, and IV only

(D) I, II, III and IV


THANK YOU
GW
SOLDIERS !