COMPUTER SCIENCE

OPERATING SYSTEM

Schedule

Lecture -1

Dr. KHALEEL KHAN SIR

Today's Goal

C.O : (CPU + Memory + IO)

(Core Course)

Operating Systems

Lecture schedule

Pre-Requisite:
1. Programming language concepts
2. Basic concepts of Computer organiz.

ABOUT ME

Hello, I'm Dr. Khaleel Ur Rahman Khan.

1. Ph.D. in Computer Science.
2. Professor in Computer Science.
3. Has more than 28 Years of Experience in Teaching at Engineering Colleges.
4. Published more than 50 journal articles in the areas of Wireless Networks.
5. Seven candidates have been awarded PH.D. under his Supervision.
6. Has more than 22 years of Educating and Mentoring the GATE Aspirants.

I. Introduction & Background

(CS & IT)

- 1.1 What is Operating System ?
- 1.2 Function & Goals of Operating System
- 1.3 Types of Operating system
- 1.4 Multiprogrammed Operating System
- 1.5 Architectural requirements for multiprogrammed OS
- 1.6 Mode Shifting in Multiprogrammed OS
- 1.7 System Calls
- 1.8 Fork System Call
- 1.9 Problem Solving

II. Process Management

30%

- 2.Process Concepts
  - 2.1 program Vs Process
  - 2.2 Process as ADT
  - 2.3 Process State Transition Diagram
  - 2.4 Schedulers & Dispatchers
  - 2.5 Problem Solving

3.CPU Scheduling

- 3.1 Need For Scheduling & Scheduling Criteria
- 3.2 Process Times
- 3.3 Scheduling Algorithms
  - 3.3.1 FCFS
  - 3.3.2 SJF
  - 3.3.3 SRTF
  - 3.3.4 LRTF
  - ~~3.3.4 LRTF~~
  - 3.3.5 Priority
  - 3.3.6 Round Robin
  - 3.3.7 Multilevel Queue Scheduling
- 3.4 Problem Solving

4. Multithreading

- 4.1 Thread Concept & Benefits
- 4.2 Types of Threads
- 4.3 Thread Issues
- 4.4 Thread Libraries
- 4.5 Problem Solving

Theoretical

5.Process Synchronization/Coordination **

- 5.1 What is IPC & Synchronization
- 5.2 Types of Synchronization
- 5.3 Critical Section Problem
- 5.4 Requirements of CS Problem

(Analysis)

5.5 Synchronization Mechanism

- 5.5.1 Lock Variables
- 5.5.2 Strict Alternation
- 5.5.3 Peterson Solution
- 5.5.4 Synchronization Hardware
- 5.5.5 Semaphores Intro

5.6 Classical IPC Problems

- 5.6.1 Producer Consumer Problem
- 5.6.2 Reader-Writer Problem
- 5.6.3 Dining Philosopher Problem

5.7 Monitors

5.8 Concurrency Mechanisms

- 5.8.1 Parallel Construct
- 5.8.2 Fork & Join Statement

5.10 Problem Solving

6. Deadlocks

- 6.1 Concepts of Deadlock
- 6.2 System Model
- 6.3 Deadlock Characterizations
  - 6.3.1 Necessary conditions
  - 6.3.2 Resource Allocation Graph
- **6.4 Deadlock Handling Strategies** **
  - 6.4.1 Prevention
  - 6.4.2 Avoidance
    - 6.4.2.1 Bankers Algorithm
  - 6.4.3 Detection & Recovery
  - 6.4.4 Deadlock Ignorance
- 6.5 Problem Solving

III Memory Management

7. **Abstract View of Memory :**
8. **Loading vs Linking**
9. **Address Binding**
10. **Memory Management Techniques**

- 10.1 Swapping
- 10.2 Partitioning
  - 10.2.1 Fixed Partitions
  - 10.2.2 Variable partitions

- Non Contiguous Allocation
  - 11.3.1 Simple Paging
  - 11.3.2 Paging With TLB
  - 11.3.3 Hashed Paging
  - 11.3.4 Multilevel Paging
  - 11.3.5 Inverted Paging
  - 11.3.6 Shared Paging
  - 11.3.7 Segmentation
  - 11.3.8 Segmented-Paging Architecture

Virtual Memory
→ Concept
→ Implementation
→ Performance Issues

13. Problem Solving

IV. File System & Device Management

14. Physical Structure of Disk

15. Logical Structure of Disk

16. File System Interface

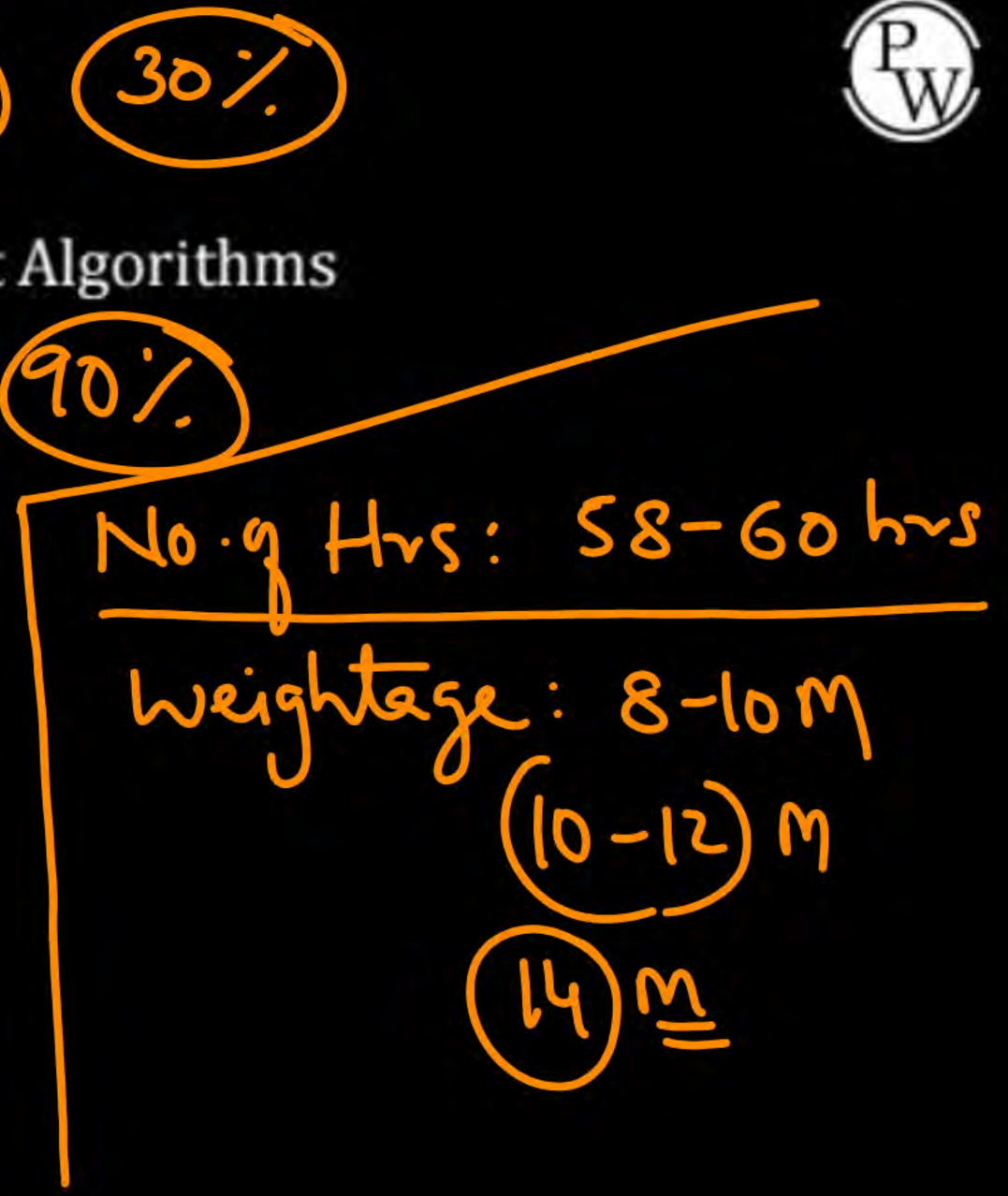
- 16.1 File & Directory Concept
- 16.2 File Attributes
- 16.3 File Operations
- 16.4 Types of Files
- 16.5 Directory Structure

17. File System Implementation

- 17.1 Allocation Methods
- 17.2 Disk Free Space Management Algorithms

19. IO Scheduling(Disk Scheduling)

- 19.1 Need for Disk Scheduling
- 19.2 Disk Scheduling Techniques
  - 19.2.1 FCFS
  - 19.2.2 SSTF
  - 19.2.3 SCAN
  - 19.2.4 LOOK
  - 19.2.5 C-SCAN
  - 19.2.6 C-LOOK
- 20. Problem Solving



Text-Books:

1) O.S Concepts – Galvin ✓
2) Modern O.S – Tanenbaum
3) O.S – W. Stallings

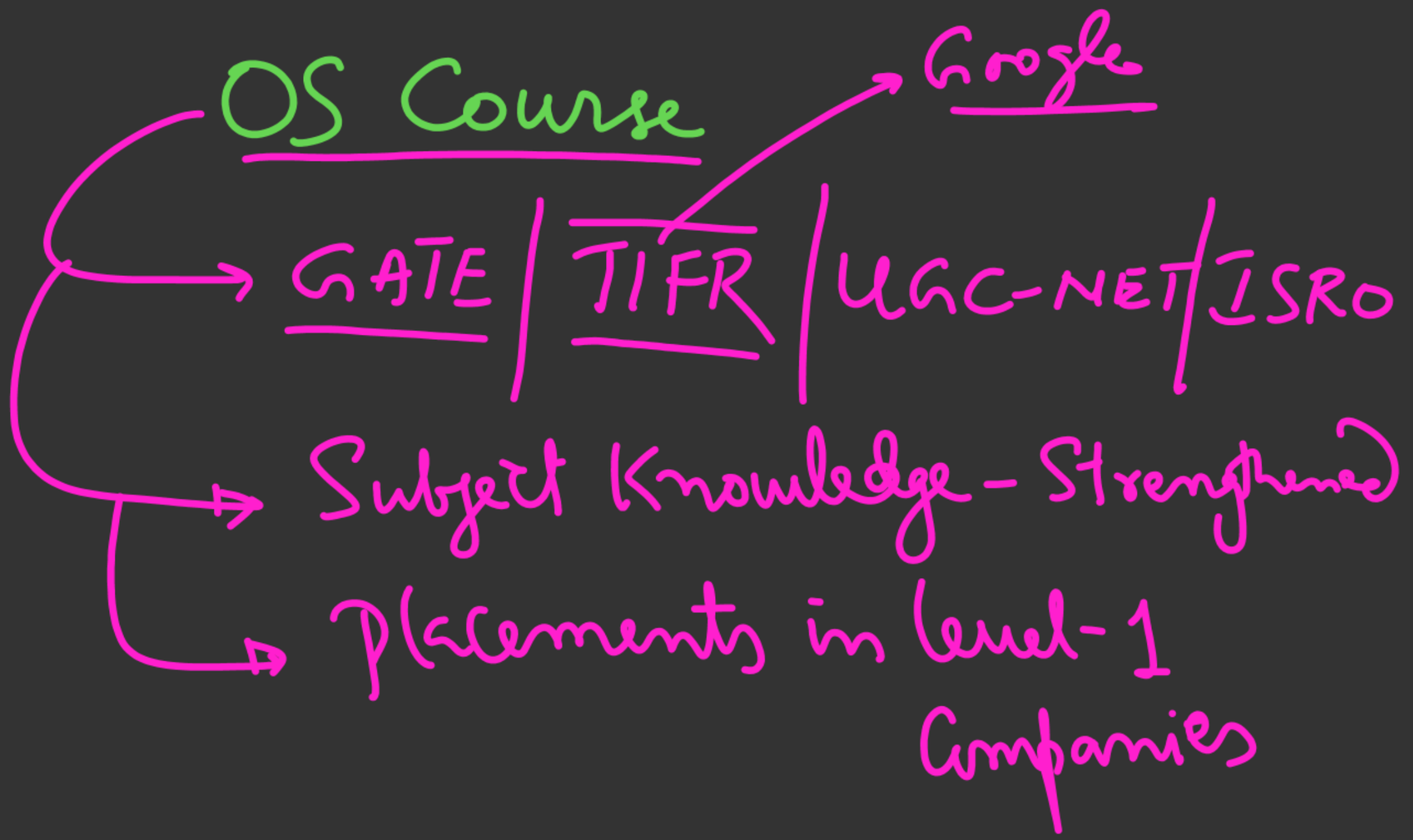
Email-ID:

KhaleelrKhan@gmail.com

(PW – GW – WKEND)

Strategy:

- → Scratch:
- → Theoretical / concepts found.
- → Necessary Numericals
- → (PYQ's)


OS Course
Google
GATE | TIFR | UGC-NET | ISRO
Subject Knowledge - Strengthened
Placements in Level-1
Companies

Tests

2-Test

- Time Management
- Preparation-level
- overcome Silly Mistakes

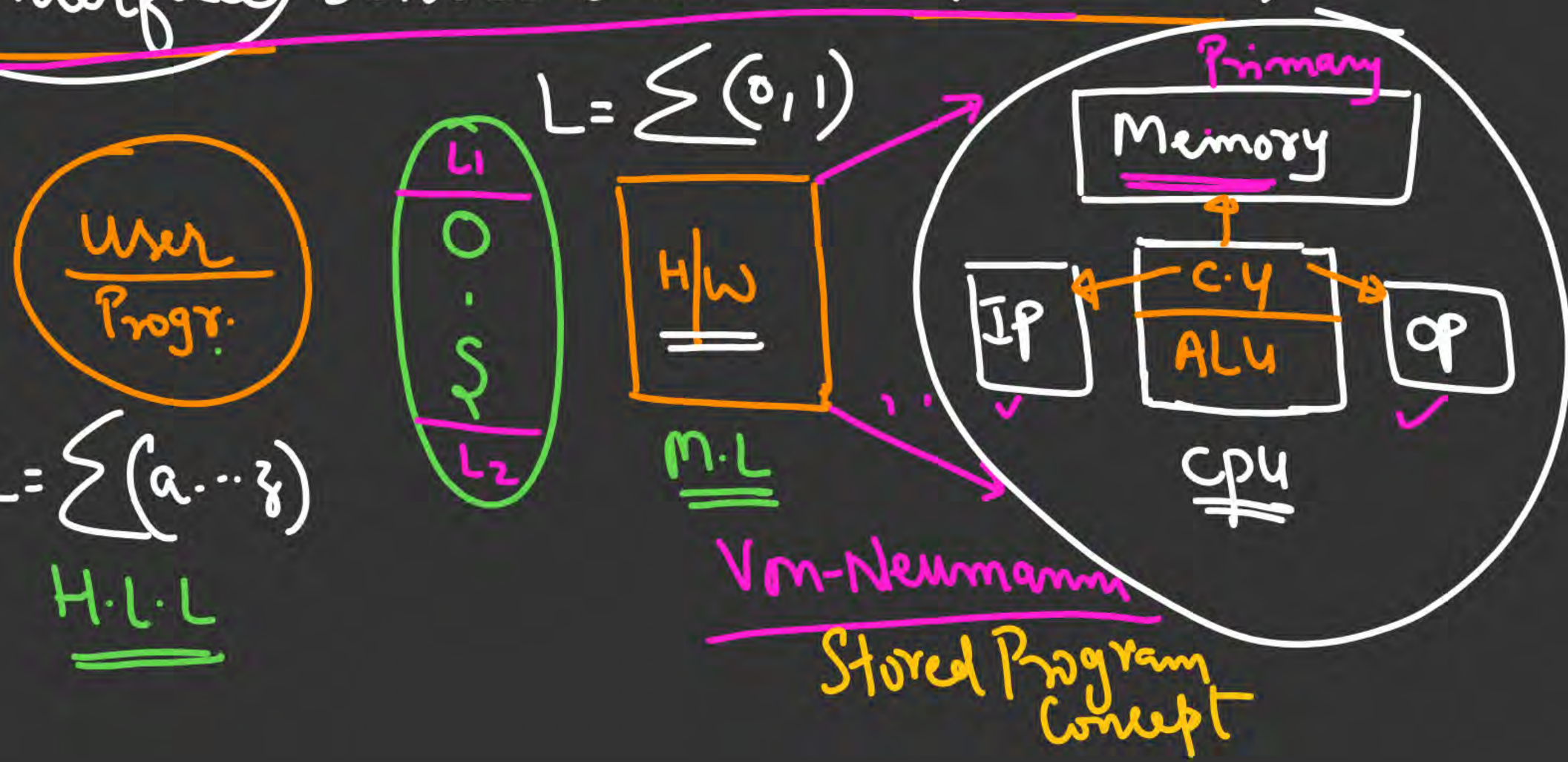
(only after Completion of the Course)

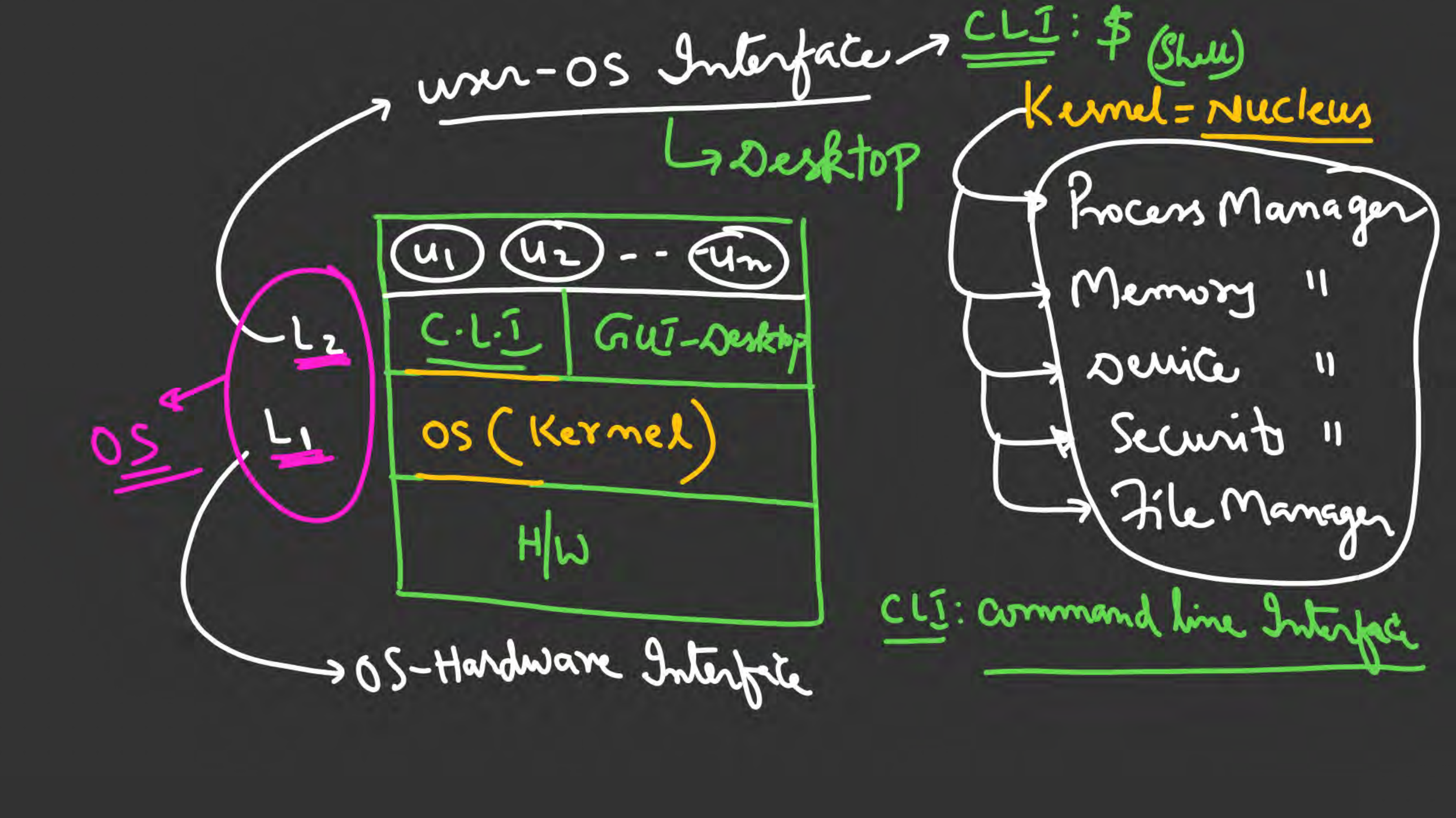
Types of Questions

- M.C.Q :
- M.S.Q :
- NAT :

What is O.S: (20 Min)

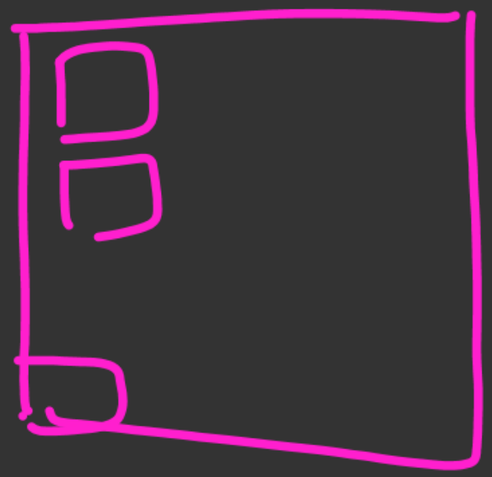
1) Interface between user & Hardware;




user-OS Interface
CLI : $ (Shell)
↳ Desktop
Kernel = Nucleus
Process Manager
Memory "
Device "
Security "
File Manager
U1 U2 - - Un
C.L.I
GUI-Desktop
OS (Kernel)
H/W
L2
L1
OS
OS-Hardware Interface
CLI: Command line Interface

WINDOWS :

L2: Desktop



UNIX | DOS: Shell

L2 { $ ....

c:> ....

Other defns of OS

→ Resource Manager

- H/W
  - CPU
  - Mem
  - IO
  - ⋮
- S/W
  - Files,
  - Device drivers,
  - Semaphores
  - Pipes

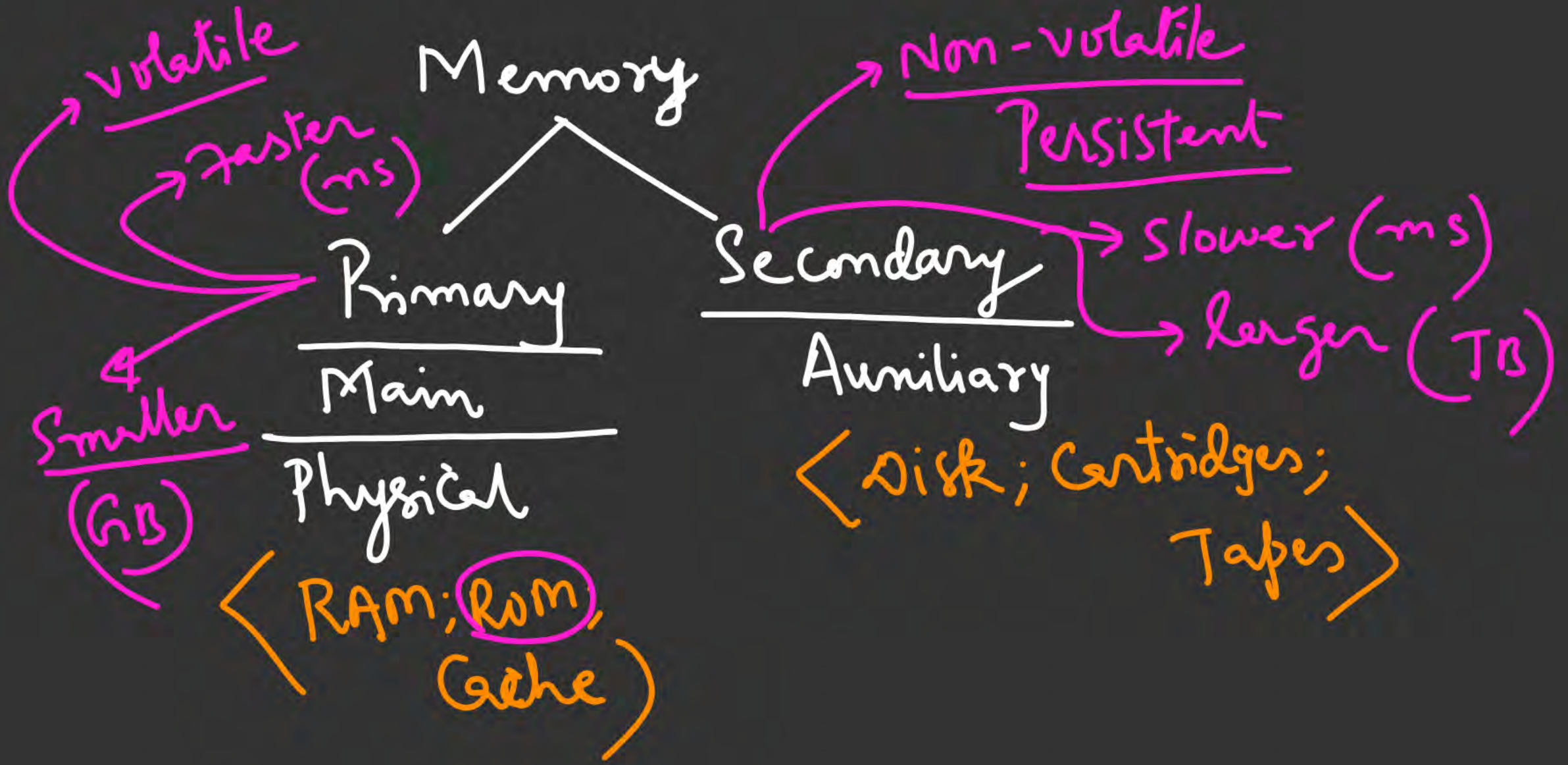
→ Control Program(s)

→ Set of utilities to simplify appl. development

(Platform/Environment)

→ Acts/Functions like a Govt

Functions & Goals

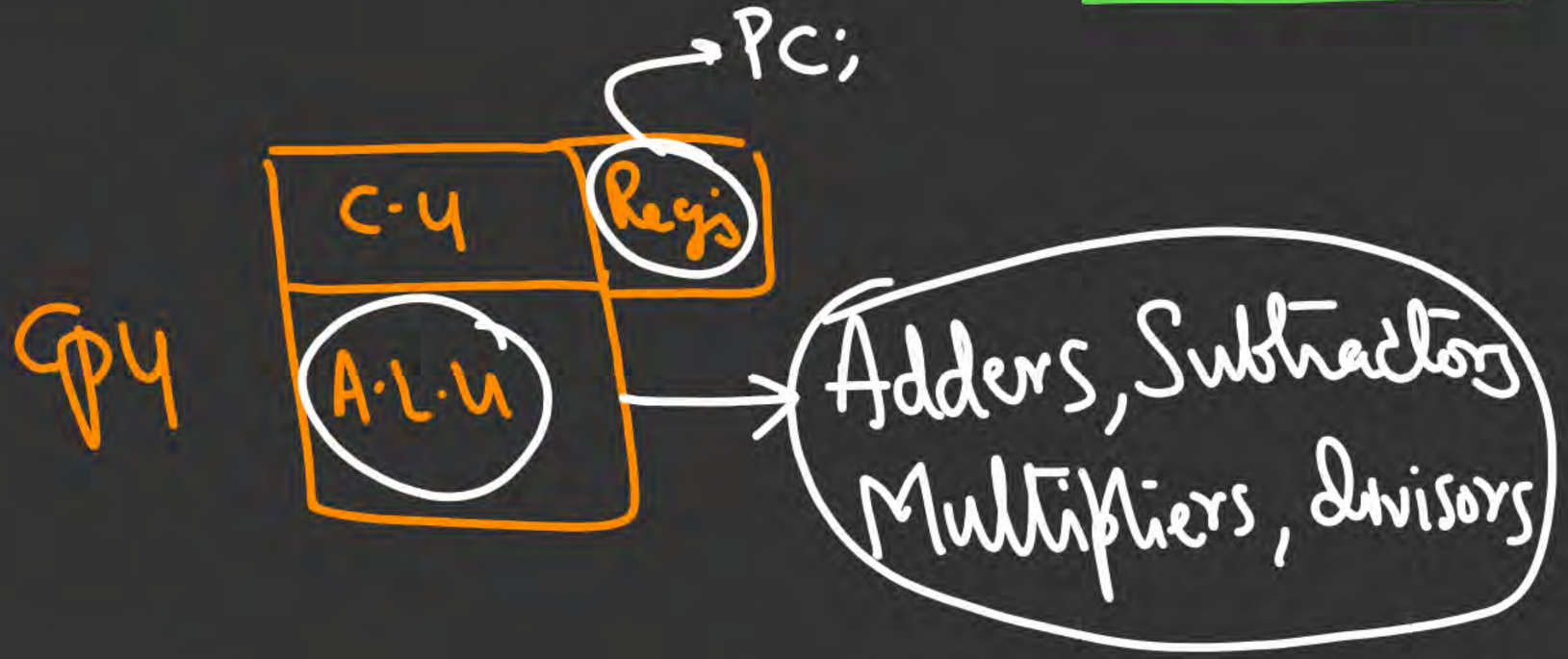

Memory
Primary
Main
Physical
RAM; ROM; Cache
Secondary
Auxiliary
Disk; Cartridges; Tapes
Volatile
Faster (ms)
Smaller (GB)
Non-volatile
Persistent
Slower (ms)
Larger (TB)

CPU

Central Processing Unit

- Control unit (CU) : Control Signals
- Arithmetic Logic Unit (ALU)
- Registers

Micro-opns



Micro-operations:

Primitive
Atomic
Fundamental

→ operations that are carried out on the Data Stored in registers during one/more Clock cycles;

$PC \rightarrow MAR$

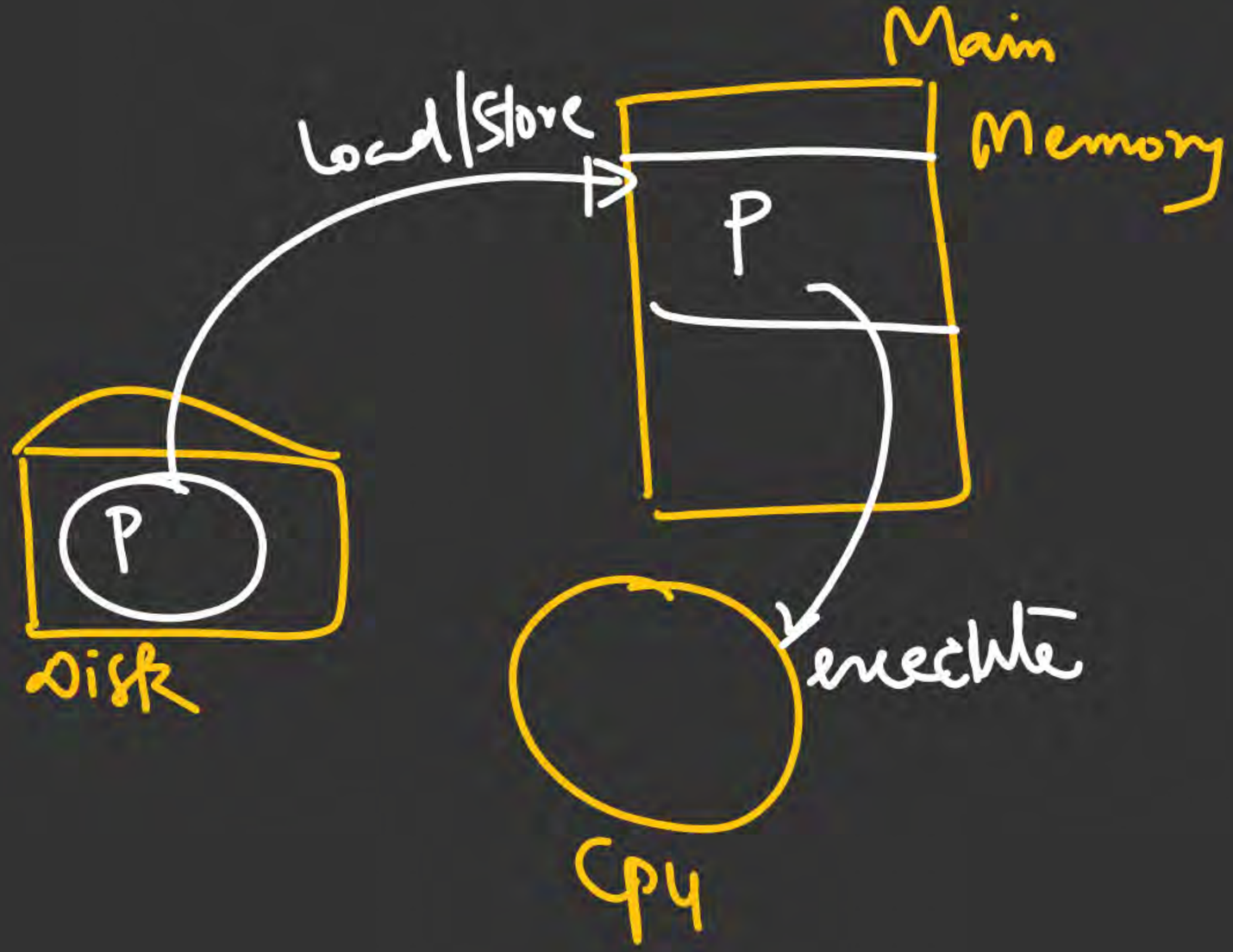
$a = b + c;$

HLL

```
Load  R1, b
Load  R2, c
Add   R1, R2
Store a,  R1
```

Instructions

- → Fetch cycle
- → decode cycle
- → execute "


Main
Memory
load/store
P
P
Disk
execute
CPU

THANK YOU!