

1. Operating System

- Process vs Thread
- Process Scheduling (FCFS, SJF, Round Robin, Priority Scheduling)
- CPU Scheduling Concepts (Preemptive vs Non-preemptive)
- Deadlock (conditions, detection, prevention, avoidance – Banker's Algorithm)
- Synchronization (Semaphore, Mutex, Critical Section problem, Producer-Consumer)
- Paging & Segmentation (Memory management)
- Virtual Memory & Demand Paging
- Page Replacement Algorithms (FIFO, LRU, Optimal)
- File Systems (allocation methods, directory structure)
- Difference between Kernel/User Mode, Monolithic vs Microkernel

2. DBMS

- DBMS vs RDBMS
- Keys (Primary, Candidate, Super, Foreign, Composite)
- Normalization (1NF, 2NF, 3NF, BCNF)
- Transactions (ACID properties)
- Concurrency Control (2PL, locking protocols)
- Schedules (Serial, Conflict Serializable, Cascadeless)
- Indexing (B-Tree, B+ Tree)
- Joins (Inner, Outer, Left, Right, Natural, Self)
- Difference: SQL vs NoSQL
- ER Diagrams (Mapping ER → Tables)

3. SQL

- Basic Queries (SELECT, WHERE, ORDER BY, GROUP BY, HAVING)
- Joins (Inner, Left, Right, Full, Self)
- Subqueries (nested queries, correlated queries)
- Aggregate Functions (COUNT, SUM, AVG, MIN, MAX)
- DISTINCT, LIMIT, TOP, BETWEEN, IN, LIKE
- Set Operations (UNION, INTERSECT, EXCEPT)
- Views (creation & use)
- Indexing & Performance
- Stored Procedures & Triggers (basic understanding)
- Window Functions (ROW_NUMBER, RANK, DENSE_RANK)

4. OOPS (Object-Oriented Programming)

- 4 Pillars: Abstraction, Encapsulation, Inheritance, Polymorphism
- Constructor & Destructor
- Overloading vs Overriding
- Static vs Dynamic Binding
- Interfaces vs Abstract Classes
- Access Modifiers (public, private, protected, default)
- Multiple Inheritance (issues & solutions, e.g., Diamond Problem)
- Virtual Functions & Vtables
- Exception Handling
- Object Class Methods (toString(), equals(), hashCode() in Java / similar in C++)



5. Computer Networks

- OSI Model (7 layers – functions & examples)
- TCP/IP Model (differences from OSI)
- IP Addressing (IPv4, IPv6, Subnetting basics)
- TCP vs UDP (connection-oriented vs connectionless)
- DNS, DHCP, ARP, HTTP/HTTPS, FTP, SMTP
- Switching & Routing (circuit vs packet switching)
- Congestion Control & Flow Control
- Error Detection & Correction (Parity, Checksum, CRC)
- Socket Programming basics
- Differences: Hub vs Switch vs Router

