

OS DBMS CN

OS DBMS CN for SDE Interview Preparation



OS
DBMS
CN

Detailed
Course Syllabus

1. Operating System

Introduction to OS

- Services and Examples
- Types of OS
 - Single Tasking
 - Multiprogramming and Multitasking
 - Multithreading
 - Real-world examples
 - Disadvantages
 - Examples of Race Condition
 - Multiprocessing
 - Multi User
- Thread V/S Process
- User Threads V/S Kernel Threads

Process Management

- Introduction to Program and Process
- Process States
 - For Single Tasking Systems.
 - Multiprogramming Systems
 - 5-States Model
 - 7-States Model
- Process Control Block(PCB)
- Process Scheduler
 - Long Term Scheduler
 - Short Term Scheduler
 - Medium Term Scheduler
- Scheduling Algorithms
 - Background
 - Explaining various times in Scheduling algorithms
 - Goals of Scheduling Algorithms
- FCFS Algorithm (Non-Preemptive)
 - Understanding using a problem
 - Calculating various times

- Characteristics of FCFS Algo
- **SJFS Algorithm (Non-Preemptive)**
 - Understanding using a problem
 - Calculating various times
 - Characteristics of SJFS Algo
- **SJF or SRTF Algorithm(Pre-emptive)**
 - Understanding using a problem
 - Calculating various times
 - Characteristics of SJF or SRTF Algo
- **Priority Scheduling (Non-Preemptive)**
 - Understanding using a problem
 - Calculating various times
- **Priority Scheduling (Preemptive)**
 - Understanding using a problem
 - Calculating various times
- **Problems with Priority Scheduling**
- **Round Robin Scheduling (Pre-emptive)**
 - Characteristic
 - Calculating various times using a problem
- **Multilevel Queue Scheduling**
- **Multilevel Queue Scheduling with Feedback**

Process Synchronization

- **Introduction**
- **Consumer and Producer Problem**
- **Race Condition**
- **Goals of Synchronization Mechanism**
 - Mutual Exclusion
 - Progress
 - Bounded Waiting
 - Performance
- **Overview of Synchronization Mechanism**
 - Disabling Interrupts
 - Locks(or Mutex)
 - Semaphores
 - Monitors
 - Application of Process Synchronization
- **Locks for Synchronization**
 - Problems of Deposit and Withdrawl problem
 - TSL Lock mechanism
- **Critical Section**

- Problems of Deposit and Withdrawl problem
 - Entry Section
 - Critical Section
 - Exit Section
 - Non-Critical Section
- **Semaphores**
 - wait() and signal() function
 - Original importance by Dijkstra
- **Binary Semaphore**
 - Internal Working of Semaphore
 - Binary Semaphore
 - Wait and Signal Protocol in Binary Semaphore
- **Monitors**
 - Introduction, Syntax and Working

Deadlock

- **Introduction and Understanding**
 - Mutual Exclusion
 - Hold and Wait
 - No Preemption
 - Circular Wait
 - Resource Allocation Graph
- **Deadlock Handling Mechanism**
 - Deadlock Prevention
 - Deadlock Avoidance
 - Detection and Recovery
 - Ignoring the Deadlock
 - EDEADLK
- **Deadlock Prevention Mechanism**
 - Mutual Exclusion
 - Hold and Wait
 - No Preemption
 - Circular Wait
- **Deadlock Avoidance Mechanism**
 - Bankers Algorithm
- **Discussion on Deadlock Detection and Recovery**

Memory Management

- **Working behind the compilation and running of a program**
- **Address Binding**
 - Compile Time

- Load Time
 - Run Time
 - Problems of Runtime Binding
 - Logical and Physical Address
- **Runtime Binding**
 - Working
- **Memory Management and hierarchy**
 - Access time, capacity and cost
- **Evolution of Memory Management**
 - Single Tasking
 - Multitasking
 - Memory Allocation
- **Dynamic Partitioning**
 - Bitmap
 - Linked List
- **Virtual Memory Introduction**
 - Concept discussion
 - Performance Impact of Page Fault
- **TLB, Demand Paging, Thrashing, Page Replacement Algorithm**
- **Segmentation and Paging with Segmentation**

2. Database Management System

a. **Introduction to DBMS**

- i. Understanding DBMS
- ii. Evolution of DBMS
 - 1. File-Based
 - 2. Relational DBMS
 - 3. NoSQL

b. **ER and Relational Model**

- i. ER Model
 - 1. Understanding Entity Set, Relationship Set and Attributes.
- ii. Keys
 - 1. Candidate Key
 - 2. Super Key

- 3. Primary Key
 - 4. Problems involving identifying keys.
 - iii. **ER Diagram**
 - 1. Participation
 - 2. Weak Entity Set
 - iv. **Foreign Key**
 - 1. Introduction and Identifying foreign keys
 - 2. Understanding Referential Integrity
- c. **Database Designing**
 - i. **Normalization**
 - 1. Data Redundancy
 - 2. Data Integrity
 - 3. Objects of Good DB design
 - 4. Understanding Anomalies
 - a. Updation Anomaly
 - b. Insertion Anomaly
 - c. Deletion Anomaly
 - ii. **Functional Dependency**
 - 1. Explanation using DB tables
 - 2. Need for Functional Dependency
 - 3. Trivial and Non-trivial
 - iii. **First Normal Form**
 - iv. **Second Normal Form**
 - v. **Third Normal Form**
 - vi. **BCNF**
- d. **SQL**
 - i. **Introduction**
 - 1. DDL, DQL, DML, DCL
 - 2. Understanding the creation of tables using SQL commands
 - 3. INSERT, SELECT, FROM
 - ii. **Joins in SQL**
 - 1. Cross Product
 - 2. Inner Join - Equal and Natural Join
 - 3. Outer Join - Left, Right and Full Join
 - 4. Self Join
 - iii. **Aggregate Functions and Group By**

1. SUM, MAX, MIN, COUNT, AVG
 2. Group BY
 3. Difference b/w WHERE & HAVING
 - iv. **Subqueries**
 1. Understanding querying from the table using SQL commands
 2. Various problems in subqueries
 - v. **Correlated subqueries**
- e. **Indexing**
 - i. **Indexing in Database**
 1. Introduction to Clustered and Non clustered indexing
 - ii. **Clustered Index**
 1. Sparse and Dense Index
 - iii. **Non-clustered Index**
 - iv. **Multilevel Indexing B & B+ Trees**
- f. **Transaction and Concurrency Control**
 - i. **Introduction and ACID properties**
 - ii. **Conflict Serializability**
 1. Conflicting operators in Transactions
 2. Given and Serial Schedule
 3. Precedence Graph
 - iii. **View Serializability**
 1. Initial Read
 2. Updated Read
 3. Final Write
 - iv. **Recoverable, Cascadeless and Strict Schedule**
 - v. **Two-Phase Locking Protocol**
 1. Understanding Shared and Exclusive Locks
 2. Growing and Shrinking phase
 - vi. **Problems with basic two-phase locking**
 1. Deadlock
 2. Recoverability
 - vii. **Conservative, Strict and Rigorous 2PL**
 1. Difference between them
 - viii. **Timestamp Based Protocols**
 1. Rules to find:
 2. TS

3. RTS
4. WTS

3. Computer Networks:

a. Introduction to CN

- i. Network Criteria Discussion
- ii. OSI Model
 1. The need for such a model
 2. Various layers at Sender and Receiver side
- iii. TCP/IP Model
 1. The need for such a model
 2. Various layers at Sender and Receiver side
 3. Protocol Data Units

b. Data Link Layer

- i. Introduction
 1. Explanation using Home and Office network
 2. Functionalities
 - a. Framing
 - b. Error Detection
 - c. Error Flow Control
 - d. Multiple Access
- ii. Delays
 1. Transmission Delay
 2. Propagation Delay
 3. Queuing Delay
 4. Processing Delay
- iii. Error and Flow Control Protocols
 1. Stop and Wait
 2. Selective Repeat Protocol
 3. Sliding Window Background
 4. Go Back N

c. Network Layer

- i. Introduction
 1. Functionalities
- ii. Circuit Switching V/S Packet Switching

- 1. Difference and explanation
 - iii. **Network Address Translation**
 - 1. Identifying private and public IPs
 - iv. **Classful Addressing**
 - 1. Problems
 - v. **Subnetting**
 - 1. Subnet Mask
 - 2. The division into two or more networks
 - 3. Problems
 - vi. **Classless Addressing**
 - 1. Classless Inter-Domain Routing
 - 2. Problem with classful addressing
 - vii. **Routing Algorithms**
 - 1. Exterior Gateway Protocols
 - 2. Interior Gateway Protocols
 - 3. Static V/S Dynamic Routing Algorithms
 - 4. Unicast, Broadcast, Multicast & Anycast
 - 5. Cost of Links
 - 6. Goals of Routing Algos
 - viii. **Distance Vector Routing**
 - 1. Introduction
 - 2. Algorithm
 - 3. Problems
 - 4. Routing Information Protocols
 - ix. **Link State Routing**
 - 1. Introduction
 - 2. Algorithm
 - 3. Use
- d. **Transport Layer**
- i. **Introduction**
 - 1. Use and Examples
 - ii. **TCP V/S UDP**
 - 1. Difference and explanation
- e. **Application Layer**
- i. **Introduction**
 - 1. Working of various layers
 - ii. **Understanding and background of Domain Name System**

- iii. Address Resolution Protocol (ARP)
 - 1. Working
- iv. Dynamic Host Configuration Protocol (DHCP)
 - 1. Working at Home and Office Network

4. Most Asked Interview Questions

Theoretical Compilation of Most asked Interview Questions from:

- Computer Networks
- Operating System
- DBMS

Note: These questions are collected from over 2000 interview experiences of Amazon, Microsoft, Flipkart, Paytm, and other product-based companies.