21 Days to Prepare CS Core Subjects For Placements - OS, DBMS, CN & Software Engineering

Interview Preparation can be considered a complex part for a fresher. Although, Interview Preparation for a fresher can be summarised using a few CS core subjects preparing these subjects and considering the time limitation can boost the preparation.

In this article, we will focus on crucial Computer Science Subjects like Operating Systems, Database Management Systems, Computer Networks, and Software Engineering. Over the next three weeks, we will focus on Important topics of these subjects that are expected to come in Interviews.

So, let us check how to prepare CS core subjects for the Interview in 21 days.

What are CS core Subjects?

When it comes to the curriculum of any institution related to **the computer science** field, there are always some common theory subjects apart from coding and data structures i.e. **DBMS** (**Database Management System**, **OS** (**Operating Systems**), **CN** (**Computer Networks**), **COA** (**Computer Organisation Architecture**), **Software Engineering** and **System Design**. These theory subjects are considered to be equally important for a fresher to learn in terms of cracking the **interview process**. In the upcoming article, we will be discussing the importance of CS core subjects in the interview process to become an **SDE**.

Importance of CS Core Subjects in Interviews

CS core concepts such as **Operating Systems, DBMS, Computer Networking, and SQL** are considered to be equally important for clearing your **SDE interviews** and getting placed. In this article, we will be exactly providing what you need as it will help you master these topics so you are thoroughly prepared for your **dream job** in **tech giants** such as **Microsoft**, **Adobe**, **Amazon**, **Google**, and many more.

The significance of **core CS subjects** should not be underestimated, even though students often skip them. It is important to understand that these theoretical concepts, alongside **mastering DSA** (**Data Structures and Algorithms)**, are essential to prepare. Familiarizing yourself with these foundational topics will not only enhance your performance in **technical interviews** but will also provide a competitive advantage over candidates who possess similar **coding skills**. Now let's see what are the most important topics of these core subjects.

A. DBMS (Database Management System) [1st -5th Day]

A database Management system is considered the second most important subject after Data Structure and algorithms. DBMS is a software application that allows you to **manage**, **organize**, and **manipulate databases**. It provides an interface for users to interact with the database to perform various operations and ensure the efficient **storage** and **retrieval** of data. Now let's see what are the most asked topics of DBMS.

- **Basics of DBMS**
  - Introduction of DBMS (Database Management System) | Set 1
  - Introduction of 3-Tier Architecture in DBMS | Set 2
  - DBMS Architecture 1-level, 2-Level, 3-Level
  - Advantages of DBMS over the File system
  - Introduction of ER Model
- **Relational Algebra**
  - Introduction of Relational Algebra and Basic Operators
  - Types of Keys in the Relational Model (Candidate, Super, Primary, Alternate, and Foreign)
  - Inner Join vs Outer Join
  - Join operation Vs nested query
- **Normalization**
  - Introduction
  - Normal Forms
  - Lossless Join Decomposition
  - Introduction of 4th and 5th Normal form
  - Denormalization in Databases
- **Transactions and Concurrency Control**
  - Introduction
  - ACID Properties

    - Concurrency Control -Introduction
    - Implementation of Locking in DBMS
    - Types of Schedules
    - Conflict Serializability
    - View Serializability
    - Starvation in DBMS
    - Deadlock in DBMS
- **SQL Tutorial**
    - Introduction to SQL
    - SQL DataTypes
    - SQL Operators
    - SQL Clauses
    - SQL Functions
    - Aggregate Functions and Scaler Functions
    - SQL Queries
    - Quiz on SQL

Useful links:

- *DBMS Tutorial – Database Management System*
- *SQL | Tutorials*

B. Operating Systems: [6th -12th Day]

The second subject in this series is **Operating Systems**, OS is one the vastest subject among all other subjects as understanding operating systems is a must for a developer in order to know the **internal working** of the machine on which he/she is working. In some interviews it becomes the reason for the **rejection** of the candidates, not only in interviews but also in **national qualifiers** it can be the reason for the **elimination** of the candidates. So it becomes necessary to **prepare** yourself for the best, and to do the same we have curated the topics which can be asked in the interview of OS. Let's see what are those:

- **Introduction of Operating System**
    - Types of Operating Systems
        - Multiprogramming in Operating System
            - Time-Sharing Operating System
            - What is a Network Operating System?
            - Real-Time Operating System (RTOS)

        - Functions of the Operating System
- **Process Management**
    - Introduction of Process Management
    - Process Table and Process Control Block (PCB)
    - Operations on Processes
    - Context Switch in Operating System
    - Preemptive and Non-Preemptive Scheduling
- **CPU Scheduling in OS**
    - CPU Scheduling in Operating Systems
    - CPU Scheduling Criteria
    - Multiple-Processor Scheduling in Operating System
    - Thread Scheduling
- **Process Synchronization**
    - Introduction of Process Synchronization
    - Race Condition Vulnerability
    - Critical Section in Synchronization
    - Mutual Exclusion in Synchronization
- **Critical Section Problem Solution**
    - Semaphores in Process Synchronization
    - Semaphores and their types
    - Readers-Writers Problem
    - Producer Consumer Problem using Semaphores
- **Deadlocks & Deadlock Handling Methods**
    - Introduction of Deadlock in Operating System
    - Conditions for Deadlock in Operating System
    - Banker’s Algorithm in Operating System
    - Handling Deadlocks
- **Memory management**
    - Memory Management in Operating System
    - Paging in Operating System
    - Segmentation in Operating System

    - Virtual Memory in Operating System
- **Page Replacement Algorithms**
    - Page Replacement Algorithms in Operating Systems
    - Belady’s Anomaly in Page Replacement Algorithms
    - Optimal Page Replacement Algorithm

Useful links:

- *Last Minute Notes – Operating Systems*
- *Commonly Asked Operating Systems Interview Questions*

C. Computer Networks: [13th - 16th Day]

Computer Networks is not asked that much in **SDE interviews** but there is always a probability of encountering a question related to the basics of networking. Understanding computer networks is essential if you are applying for **network administrators**, **system administrators**, **network engineers**, or anyone who is going to be involved in managing or maintaining **network infrastructure**. It becomes necessary to understand this subject because it would be helping you when there would be candidates with the same knowledge as yours except for computer networks, at that time your candidature would proceed. So, without further ado let's see what the most probably asked topics related to Computer networks are:

- **Basics of Computer Networks**
    - Basics of Computer Networking
    - Network Topologies
    - Introduction to basic Networking terminology
    - Types of area networks – LAN, MAN, and WAN
    - TCP/IP Model
    - Layers of OSI Model
- **Data Link Layer**
    - Local Area Network (LAN) Technologies.
    - Introduction of MAC Address
    - Carrier sense multiple access (CSMA)
    - Basics of Wi-Fi
    - Virtual LAN (VLAN)
    - Stop and Wait for ARQ
    - Sliding Window Protocol
- **Network Layer**

  - Introduction and IPv4 Datagram Header
  - IP Addressing
  - Types of routing
  - Unicast Routing – Link State Routing
  - Wifi protected access (WPA)
  - Wifi-protected setup (WPS)
  - LiFi vs. WiFi
  - Differences between IPv4 and IPv6
- **Transport Layer**
  - TCP Connection Establishment
  - Transport Layer responsibilities
  - Multiplexing and Demultiplexing in Transport Layer
  - User Datagram Protocol (UDP)
  - P2P(Peer To Peer) File Sharing
  - Congestion Control
  - TCP Congestion Control
  - Congestion control techniques
- **Application Layer**
  - Protocols in the Application Layer
  - Simple Mail Transfer Protocol (SMTP)
  - DNS (Domain Name Server)
  - What's the difference between http:// and https://?
  - File Transfer Protocol (FTP)
  - Asynchronous Transfer Mode (ATM)
  - Dynamic Host Configuration Protocol (DHCP)

Useful Links:

- *Quiz on Data Link Layer*
- *Quiz on Network Layer*
- *Quiz on IP addressing*
- *Quiz on Transport Layer*
- *Quiz on Application Layer*

D. Software Engineering: [17th - 21st Day]

This is the last subject of our series and the subject name itself imitates the meaning Software Engineering means the practice of **designing**, **developing**, **testing**, and **maintaining software systems**. It is a multidisciplinary field that includes **technical skills**, **problem-solving abilities**, and **collaboration**. In any interview process of any organization, the interviewer expects you to have a little knowledge of **software development life cycle**, different **lifecycle models**, how the workflow is created and managed as you would be assigned the projects in the future so for that you need to a have a little knowledge of **Software Project Management** too. Learning Software engineering would prioritize you in any interview process. So, without wasting any time let's explore the most asked topics of Software Engineering:

- **Introduction**
    - Introduction to Software Engineering
    - Classification of Software
- **Software Development Life Cycle**
    - Classical Waterfall Model
    - Iterative Waterfall Model
    - Spiral Model
    - Rapid application development model(RAD)
    - RAD Model vs Traditional SDLC
    - Agile Development Models
    - Comparison of different life cycle models
    - Coupling and Cohesion
- **Software Project Management**
    - Project Management Process
    - COCOMO Model
    - Integrating Risk Management in SDLC
    - Role and Responsibilities of a Software Project Manager
- **Software Requirements**
    - Classification of Software Requirements
    - How to Write a good SRS for Your Project
    - Quality Characteristics of a Good SRS
    - Requirements Elicitation
- **Software Testing and Debugging**
    - Seven Principles of software testing

- Testing Guidelines
- Black box testing
- White box Testing
- Debugging
- Integration Testing

Conclusion

Learning **DSA** and **competitive programming** is a good practice but ignoring CS core subjects may not be a good practice for you. To clear interviews without any difficulties you have to make sure that you have prepared the above-mentioned subjects thoroughly. All the above-mentioned topics are the most asked topics of all time in **technical interviews**. So, prepare them well, and all the best for your interviews.