ChatGPT

SQL Interview Questions for Experienced Candidates (3+ years)

Joins

1. What are the different types of SQL joins (INNER, LEFT, RIGHT, FULL, CROSS, etc.) and when would you use each? [1]
2. What is the difference between a CROSS JOIN and a FULL OUTER JOIN? [2]
3. Write a SQL query to retrieve the first and last names of employees along with the names of their managers (given Employees and Managers tables). [3]
4. Write a SQL query to find the average salary for each department, given tables Employees (with DepartmentID) and Departments (with DepartmentName). [4]
5. Write a SQL query to list all products that have never been ordered (products in a Product table with no matching rows in the Orders table). [5]
6. Write a SQL query to list all employees who are also managers (for example, employees who appear as managers in the same table). [6]
7. What is a self-join, and when might you use it? Provide an example scenario.
8. How would you join more than two tables in a single SQL query? What factors affect the performance when joining multiple tables?
9. Explain how an OUTER JOIN works when one side has no matching rows. How does this differ from an INNER JOIN in practice?

Indexing and Keys

1. What is a SQL index and what are different types of indexes (clustered, non-clustered, unique, etc.)? [7]
2. What is the difference between a heap (no clustered index) and a table with a clustered index, and how can you identify a heap table? [8]
3. What is the difference between a PRIMARY KEY and a UNIQUE KEY (or unique index) in SQL? [9]
4. What are index “forwarding pointers” in a heap table, and how do they affect query performance? [10]
5. What is a composite index, and how do you choose the order of columns in it for optimal performance?
6. When should you use a covering index, and how does it improve the performance of a query?
7. How does the existence of an index on a column affect INSERT, UPDATE, and DELETE performance on a table?
8. What is index selectivity, and why is it important for query optimization?
9. How many clustered indexes can a table have, and why?
10. What is index fragmentation, and how can it be resolved or mitigated in a large database?

Normalization and Schema Design

1. What is database normalization and what are the normal forms (1NF, 2NF, 3NF, BCNF)? [11]
2. Given a table with repeating groups of data (e.g. Customer and multiple phone numbers), how would you normalize the table to 3NF?

3. Explain how denormalization can be used for performance, and what the trade-offs are (e.g. redundancy vs. speed).
4. What kinds of data anomalies (insertion, update, deletion anomalies) are prevented by normalization?
5. How would you design a table schema to handle a many-to-many relationship, for example between Students and Courses? [12]
6. Explain the concept of denormalization with an example scenario in a large database.
7. What is a surrogate key vs a natural key, and when would you choose each in table design?
8. How do you implement a 1-to-1 relationship versus a 1-to-many relationship in table design?
9. How do you enforce referential integrity without foreign key constraints? (e.g. using triggers) [13]
10. How would you handle schema migrations or changes in a production database environment?

Stored Procedures and Functions

1. What is the difference between a stored procedure and a user-defined function in SQL (aside from return value)? [14]
2. What are the advantages and disadvantages of using stored procedures? [15]
3. Can you perform INSERT/UPDATE/DELETE operations inside a SQL function? Why or why not? [16]
4. What is a table-valued function and when would you use one in a query?
5. When would you use a stored procedure instead of inline SQL queries in an application?
6. How do you pass parameters to and receive results from stored procedures?
7. How would you debug or test a slow or failing stored procedure in production?
8. How do you grant a user permission to execute a specific stored procedure?

Views

1. What is a database view, and can you update data in the base tables through it? [17]
2. What is the difference between a standard view and a materialized (or indexed) view?
3. What happens if a materialized view is being refreshed (complete refresh) and a user queries it at the same time? [18]
4. When would you use a view in a database design? What benefits do views provide (e.g. security, abstraction)?
5. Can you create an index on a view? If so, what are the implications (e.g. indexed view in SQL Server)?
6. How do you modify or drop a view if the underlying table schema changes?
7. What is the difference between a view and a temporary table?

Triggers

1. What is a trigger in SQL, and when would you use one? Give an example use case. [19]
2. What is the difference between an AFTER trigger and an INSTEAD OF trigger (e.g. in SQL Server)?
3. What are the “inserted” and “deleted” magic tables in SQL Server triggers? [20]
4. How can triggers be used to enforce business rules or data integrity (e.g. auditing changes, simulating foreign keys)?
5. What are the potential drawbacks of using triggers (such as performance impact or hidden logic)?
6. How do INSTEAD OF triggers on a view work?
7. Can triggers call stored procedures, and are there any limitations to doing that?

Transactions and Concurrency

1. What are the ACID properties of a database transaction (atomicity, consistency, isolation, durability)?
2. What are the different SQL isolation levels (READ UNCOMMITTED, READ COMMITTED, REPEATABLE READ, SERIALIZABLE), and what phenomena do they prevent (dirty reads, non-repeatable reads, phantom reads)?
3. What is a deadlock in database terms, and how can you prevent or resolve deadlocks? [21]
4. How do you control transactions in SQL (BEGIN, COMMIT, ROLLBACK)? Give an example of using a transaction in a stored procedure or batch.
5. If you run a long SELECT query on a table while another transaction is updating rows in that table, will your session see the old data or new data by default? (Consider default isolation level behavior.) [22]
6. What is the difference between pessimistic and optimistic locking, and when would you use each?
7. What is a savepoint in a transaction, and how do you use it?
8. How do two-phase commit protocols work in distributed transactions?
9. How can you identify and terminate a blocking or long-running transaction in a SQL database?
10. What is deadlock detection, and how does the database engine choose a deadlock victim?

Performance Tuning and Query Optimization

1. What is a query execution plan and how do you use it to improve performance? [23]
2. How would you optimize a slow SQL query in production? (Consider adding indexes, rewriting queries, avoiding SELECT *, etc.) [24]
3. What is the difference between UNION and UNION ALL in SQL, and when would you use each? [25]
4. How can you find duplicate rows in a table using SQL? (e.g. using GROUP BY and HAVING COUNT > 1) [26]
5. Write a SQL query to find the 10th highest salary in an Employee table. (Assume there are at least 10 rows.) [27]
6. How would you retrieve the last 5 records (by date or ID) from a table? Assume you have an ordering column. [27]
7. Write a SQL query to exclude specific values. For example, select all rows from a Student table except those where ID is X or Y. [28]
8. How do you retrieve the Nth record (e.g., the 3rd record) from a table?
9. How do you obtain the CREATE TABLE DDL for an existing table in SQL? [29]
10. Explain the difference between the RANK() and DENSE_RANK() window functions. [30]
11. When would you use ROW_NUMBER(), RANK(), or DENSE_RANK() in a query? Give a use case.
12. Write a SQL query to compute the median number of searches made by users, given a summary table of search counts (Google interview example). [31]
13. Write a SQL query to calculate the sum of odd-numbered and even-numbered measurements separately for each day (Google interview example). [32]
14. Write a SQL query to get the average review rating for each product for each month (asked in an Amazon SQL interview). [33]

Database Design

1. How would you design a database schema for an e-commerce system (e.g., with users, products, orders, payments, reviews)? [34]

2. How would you scale a relational database to handle heavy read/write traffic? Discuss techniques such as sharding, replication, partitioning, and caching. [35]
3. How would you design tables to represent hierarchical data such as product categories and subcategories? [36]
4. What is database sharding and what benefits does it provide?
5. What is database partitioning, and when would you use it?
6. Explain the difference between OLTP (transactional) and OLAP (analytical) database schema design.
7. What is a surrogate key, and why might you use it instead of a natural key?
8. How do you enforce referential integrity between tables? What role do foreign keys play? [37]
9. How do you represent many-to-many, one-to-many, and one-to-one relationships in a relational schema?
10. How do you handle changes to the database schema in production (schema migration/versioning)?
11. What is the CAP theorem (consistency, availability, partition tolerance) in the context of distributed database systems?
12. When might you choose a NoSQL database over a SQL database for an application? What trade-offs are involved?

Data Types and Miscellaneous

1. What is the difference between VARCHAR and NVARCHAR (or between non-Unicode and Unicode text types)? [38]
2. How do you decide which numeric data type to use (e.g., INT vs BIGINT vs DECIMAL) for a column?
3. What are the differences between DATE, DATETIME, and TIMESTAMP data types in SQL?
4. What is the difference between CHAR and VARCHAR types? When would you use each?
5. What is a UUID/GUID data type and when might you use it as a key?
6. How do TEXT or BLOB data types differ from VARCHAR/TEXT, and when would you use them?
7. What are table constraints like NOT NULL, DEFAULT, UNIQUE, and CHECK? Give an example of each.
8. What is a DEFAULT constraint (or AUTO_INCREMENT/IDENTITY), and how do you use it?
9. What is SQL injection, and how can you prevent it (e.g. via parameterized queries or stored procedures)?
10. What are some common differences between SQL dialects (such as MySQL, PostgreSQL, SQL Server) that you should be aware of?
11. What is the difference between the DELETE, TRUNCATE, and DROP SQL statements?
12. How do you use a Common Table Expression (CTE) with WITH in SQL, and what is a recursive CTE?

Sources: Compiled from interview experiences and question banks for companies like Amazon, Google, Facebook, and others [33] [31] [27] [39] (see citations above).

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[1] [2] [7] [9] [11] [15] [16] [17] [19] [20] [38]

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