**SQL Interview Questions and Answers**

**1. How do you optimize SQL queries for performance?**

* Use **indexes** on frequently queried columns.
* Avoid SELECT \*, fetch only necessary columns.
* Use **JOINs** efficiently instead of subqueries.
* Optimize WHERE clauses by using indexed columns.
* Use **EXPLAIN PLAN** to analyze query performance.
* Avoid unnecessary calculations and data type conversions.
* Use **partitioning** and **sharding** for large datasets.
* Implement **connection pooling** for better resource utilization.

**2. What is indexing in SQL, and how does it improve performance?**

* Indexing is a technique that improves query speed by allowing faster lookups.
* Works like a book index, reducing full-table scans.
* Types:
  + **Clustered Index**: Physically sorts the table data.
  + **Non-Clustered Index**: Stores pointers to actual data.
* Helps with WHERE, JOIN, ORDER BY, and GROUP BY queries.

**3. Explain the difference between clustered and non-clustered indexes.**

| **Feature** | **Clustered Index** | **Non-Clustered Index** |
| --- | --- | --- |
| **Storage** | Data is physically sorted | Stores pointers to actual data |
| **Number** | One per table | Multiple allowed |
| **Performance** | Faster for range queries | Slower but improves searches |
| **Usage** | Used on primary keys | Used on frequently searched columns |

**4. How do you handle NULL values in SQL queries?**

* Use IS NULL or IS NOT NULL for filtering.
* Replace NULLs with COALESCE(column, default\_value) or IFNULL(column, default\_value).
* Use NULLIF to return NULL when two values match.

**5. What is the difference between a primary key and a foreign key?**

* **Primary Key**: Uniquely identifies a row in a table, cannot be NULL.
* **Foreign Key**: Refers to a primary key in another table, maintains relationships.

**6. Explain the difference between OLTP and OLAP databases.**

* **OLTP (Online Transaction Processing)**: Handles real-time transactions, optimized for insert/update.
* **OLAP (Online Analytical Processing)**: Used for reporting and analytics, optimized for complex queries.

**7. How do you write a recursive CTE in SQL?**

WITH RecursiveCTE AS (

SELECT id, name, parent\_id FROM Employees WHERE parent\_id IS NULL

UNION ALL

SELECT e.id, e.name, e.parent\_id FROM Employees e

JOIN RecursiveCTE r ON e.parent\_id = r.id

)

SELECT \* FROM RecursiveCTE;

**8. What are window functions in SQL? Provide examples.**

* Perform calculations across a set of table rows.
* Examples:

SELECT employee\_id, department, salary,

RANK() OVER(PARTITION BY department ORDER BY salary DESC) AS rank

FROM Employees;

**9. How do you implement stored procedures and triggers in SQL?**

* **Stored Procedure:** Precompiled SQL that runs multiple statements.

CREATE PROCEDURE GetEmployees() AS BEGIN

SELECT \* FROM Employees;

END;

* **Trigger:** Executes automatically on an event.

CREATE TRIGGER UpdateSalary AFTER UPDATE ON Employees

FOR EACH ROW BEGIN

INSERT INTO SalaryLog(employee\_id, old\_salary, new\_salary)

VALUES (OLD.id, OLD.salary, NEW.salary);

END;

**Python Interview Questions and Answers**

**1. What are the differences between lists, tuples, and dictionaries in Python?**

| **Feature** | **List** | **Tuple** | **Dictionary** |
| --- | --- | --- | --- |
| **Mutable** | Yes | No | Yes |
| **Ordered** | Yes | Yes | No (Python 3.6+ maintains order) |
| **Indexed** | Yes | Yes | No (Key-based access) |
| **Usage** | Stores multiple items | Immutable sequences | Key-value pairs |

**2. How does Python handle memory management?**

* Uses **Garbage Collection (GC)** to free unused memory.
* Objects are managed via **reference counting**.
* gc module controls garbage collection manually.

**3. What are lambda functions, and where would you use them?**

* Anonymous functions using lambda keyword.
* Used in map(), filter(), and sorted().

add = lambda x, y: x + y

print(add(3, 5)) # Output: 8

**4. Explain the difference between deep copy and shallow copy.**

* **Shallow Copy (copy.copy())**: Copies only references, changes affect original.
* **Deep Copy (copy.deepcopy())**: Creates a new independent object.

**5. How do you handle exceptions in Python?**

* Use try-except-finally blocks.

try:

x = 1 / 0

except ZeroDivisionError:

print("Cannot divide by zero")

finally:

print("Execution complete")

**6. What are Python generators, and how do they work?**

* Use yield instead of return to create iterators.
* Save memory as values are generated on demand.

def count\_up(n):

for i in range(n):

yield i

**7. Explain multithreading vs multiprocessing in Python.**

| **Feature** | **Multithreading** | **Multiprocessing** |
| --- | --- | --- |
| **Execution** | Multiple threads | Multiple processes |
| **Use Case** | I/O-bound tasks | CPU-bound tasks |
| **Concurrency** | Yes, but affected by GIL | True parallelism |

**8. What is the difference between a Python module and a package?**

* **Module**: A single Python file (.py).
* **Package**: A collection of modules inside a directory with \_\_init\_\_.py.

**9. How do you work with pandas and NumPy for data manipulation?**

* pandas.DataFrame for structured data handling.
* numpy for numerical operations.

import pandas as pd

import numpy as np

df = pd.DataFrame(np.random.rand(5, 3), columns=['A', 'B', 'C'])

print(df.describe())

**10. How do you optimize Python scripts for better performance?**

* Use list comprehensions instead of loops.
* Utilize built-in functions (map(), filter()).
* Use multiprocessing for parallel execution.
* Optimize data structures (e.g., set for lookups).

**Power BI Interview Questions and Answers**

**1. What are the different types of visualizations in Power BI?**

* Common visualizations include bar charts, line charts, pie charts, tables, matrix, maps, and custom visuals from AppSource.

**2. How does Power BI handle data refresh?**

* Power BI refreshes data using **scheduled refresh**, **manual refresh**, or **live connection** for real-time updates.

**3. What is the difference between calculated columns and measures in Power BI?**

* **Calculated Columns**: Computed at row level, stored in the table.
* **Measures**: Computed at query time, optimized for aggregation.

**4. What are the different types of filters in Power BI?**

* **Report-level filters**
* **Page-level filters**
* **Visual-level filters**
* **Drill-through filters**

**5. Explain row-level security (RLS) in Power BI.**

* RLS restricts data visibility based on user roles.
* Implemented using **DAX filters** in Power BI models.

**6. How do you optimize Power BI reports for performance?**

* Reduce dataset size by **removing unnecessary columns**.
* Use **aggregations** and **measures instead of calculated columns**.
* Optimize DAX expressions and use **DirectQuery** for large datasets.

**7. What are Power BI’s different data connectivity modes?**

* **Import Mode**: Loads data into Power BI.
* **DirectQuery**: Connects to live data sources.
* **Composite Mode**: Mix of Import and DirectQuery.

**8. How do you create a drill-through report in Power BI?**

* Enable **drill-through** on a target page.
* Add relevant fields in the **Drill-through filter** area.

**9. What is a Power BI gateway, and when is it used?**

* A **gateway** connects Power BI to on-premises data sources.
* Required for scheduled refresh and DirectQuery connections.

**10. How would you troubleshoot slow Power BI dashboards?**

* Use **Performance Analyzer** to identify slow visuals.
* Optimize **DAX queries** and **data model relationships**.
* Reduce the number of visuals per page.

**Tableau Interview Questions and Answers**

**1. What are the different types of filters in Tableau?**

* Extract filters, data source filters, context filters, dimension filters, measure filters.

**2. How does Tableau connect to different data sources?**

* Using **Live connection**, **Extracts**, or **ODBC/JDBC connectors**.

**3. What is the difference between live and extract data connections in Tableau?**

* **Live connection**: Direct connection to the source.
* **Extract**: Snapshot of data stored in Tableau for better performance.

**4. How do you implement row-level security in Tableau?**

* Use **User Filters** or **Data Source Filters** to limit access.

**5. What are dimensions and measures in Tableau?**

* **Dimensions**: Categorical data (e.g., names, dates).
* **Measures**: Numeric data used for aggregation (e.g., sales, profit).

**6. How do you create a calculated field in Tableau?**

* Go to **Data Pane → Create Calculated Field** and write an expression.

**7. What are Level of Detail (LOD) expressions in Tableau?**

* LOD expressions allow control over aggregation levels.
* Types: **FIXED, INCLUDE, EXCLUDE**.

**8. How do you optimize Tableau dashboards for performance?**

* Reduce the number of worksheets.
* Use **extracts** instead of live connections for large datasets.
* Optimize calculations and filters.

**9. Explain how Tableau Server differs from Tableau Desktop.**

* **Tableau Desktop**: Used for report creation.
* **Tableau Server**: Used for sharing and collaboration.

**10. How would you create a forecast visualization in Tableau?**

* Use the **Analytics Pane → Drag Forecast onto the View**.
* Choose **forecast length and model** settings.