ALTER TABLE – (PostgreSQL Version)

♦ 1. Concept

ALTER TABLE is used to modify the structure of an existing table.

For example:

Adding new columns

Modifying data types

Renaming columns

Adding or removing constraints

Renaming tables

□ 2. ALTER TABLE – Common Operations with Examples

☐ (A) Add a New Column

Syntax

ALTER TABLE table name

ADD COLUMN column_name data_type [constraint];

Example

ALTER TABLE employees

ADD COLUMN email VARCHAR(100);

Explanation:

Adds a new column named email to the employees table.

☐ (B) Add Multiple Columns at Once

ALTER TABLE employees

ADD COLUMN department VARCHAR(50),

ADD COLUMN hire_date DATE;

☐ (C) Modify Data Type of a Column

Syntax

ALTER TABLE table_name

ALTER COLUMN column_name TYPE new_data_type;

Example

ALTER TABLE employees

ALTER COLUMN salary TYPE NUMERIC(10,2);

Explanation:

Changes the data type of salary to allow decimal values.

□ (D) Rename a Column

Syntax

ALTER TABLE table_name

RENAME COLUMN old_column_name TO new_column_name;

Example

ALTER TABLE employees

RENAME COLUMN emp_name TO full_name;

Explanation:

Renames emp_name column to full_name.

□ (E) Drop a Column

Syntax

ALTER TABLE table_name

DROP COLUMN column_name;

Example

ALTER TABLE employees

DROP COLUMN temp_address;

Explanation:

Removes the temp_address column from the table.

☐ (F) Rename a Table

Syntax

ALTER TABLE old_table_name

RENAME TO new_table_name;

Example

ALTER TABLE employees

RENAME TO staff;

Explanation:

Renames the table employees to staff.

☐ (G) Add a Constraint

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Syntax

ALTER TABLE table_name

ADD CONSTRAINT constraint_name constraint_type (column_name);

♦ Example – Adding a UNIQUE constraint

ALTER TABLE employees

ADD CONSTRAINT unique_email UNIQUE (email);

Explanation:

Adds a UNIQUE constraint to prevent duplicate email values.

☐ (H) Drop a Constraint

Syntax

ALTER TABLE table_name

DROP CONSTRAINT constraint_name;

Example

ALTER TABLE employees

DROP CONSTRAINT unique_email;

Explanation:

Removes the unique_email constraint from the table.

☐ (I) Set Default Value to a Column

Syntax

ALTER TABLE table_name

ALTER COLUMN column_name SET DEFAULT default_value;

Example

ALTER TABLE employees

ALTER COLUMN salary SET DEFAULT 10000;

Explanation:

Sets a default value of 10000 for the salary column when a new record is inserted.

□ (J) Drop Default Value

ALTER TABLE employees

ALTER COLUMN salary DROP DEFAULT;

☐ (K) Set / Drop NOT NULL Constraint

To Set:

ALTER TABLE employees

ALTER COLUMN email SET NOT NULL;

♦ To Drop:

ALTER TABLE employees

ALTER COLUMN email DROP NOT NULL;

3. Real-time Company Use Cases

Database Schema Change Use Cases

| Use Case | Real-time Example | | |
|--------------------------------|---|--|--|
| Adding new feature | Company wants to store employee location → ALTER TABLE employees ADD COLUMN location VARCHAR(50); | | |
| Schema update after deployment | Adding audit fields like created_on, updated_on | | |
| Data migration | Changing data type to store larger numbers → ALTER COLUMN salary TYPE BIGINT; | | |
| Adding constraints | Enforcing data integrity after testing | | |
| Renaming fields | For consistency with backend code naming | | |
| Dropping unused columns | Removing old columns not used in the application anymore | | |

4. Important Notes

In PostgreSQL, ALTER TABLE temporarily locks the table during modification.

Always validate data before adding/removing constraints.

In production, such changes are done during maintenance windows.

| Level | 1 | - Intern | nediate | (Basic + | Logical | Questions) |
|-------|---|----------|---------|----------|-----------------------------|------------|
| | | | | | | |

☐ Level 2 – Advanced (Scenario Based)

Level 3 – Real-time Company Level Questions

□ LEVEL 1 - INTERMEDIATE QUESTIONS (Basic + Understanding)

?1. What is the purpose of the ALTER TABLE command?

✓ Answer:

ALTER TABLE is used to modify the structure of an existing table without deleting it.

It can add, rename, modify, or delete columns and constraints.

$\hfill \square$ Real-time Insight:

When a new requirement comes after the project is deployed (like adding a new column), ALTER TABLE is used.

22. Can we add multiple columns in a single ALTER TABLE command?

✓ Answer:

Yes.

ALTER TABLE employees

ADD COLUMN department VARCHAR(50),

ADD COLUMN hire date DATE;

□ Real-time Use:

Developers often add multiple audit fields (e.g., created_on, updated_on) at once.

?3. What happens internally when we rename a column using ALTER TABLE?

✓ Answer:

PostgreSQL updates the table metadata (schema) but keeps the existing data unchanged.

☐ Real-time Use:

Column renaming is done to maintain consistency with API field names or frontend variables.

✓ Answer:

Yes, using:

ALTER TABLE employees

ALTER COLUMN salary TYPE NUMERIC(10,2);

But PostgreSQL will check if existing data can be converted safely.

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☐ Real-time Use:

Used when business wants to store decimals instead of integers (e.g., salary 12345.75).

\$25. What is the difference between DROP COLUMN and DROP TABLE?

✓ Answer:

DROP COLUMN removes only a column.

DROP TABLE deletes the entire table including data.

□ Real-time Use:

Used when a feature becomes obsolete — instead of dropping whole table, just remove unwanted columns.

☐ LEVEL 2 – ADVANCED QUESTIONS (Scenario Based)

%6. Suppose you have to add a NOT NULL column to a table with existing data. How do you do it safely?

✓ Answer:

You can't directly add a NOT NULL column unless it has a default value or existing rows are updated first.

Steps:

ALTER TABLE employees ADD COLUMN location VARCHAR(50);

UPDATE employees SET location = 'Hyderabad';

ALTER TABLE employees ALTER COLUMN location SET NOT NULL;

| Real-time Explanation | | Rea | l-time | Expl | lanation | 1 |
|-----------------------|--|-----|--------|------|----------|---|
|-----------------------|--|-----|--------|------|----------|---|

In production, we first fill existing records with a default value to avoid null constraint violations.

- ②7. You added a column by mistake. How do you remove it safely?
- ✓ Answer:

ALTER TABLE employees DROP COLUMN temp_field;

□ Real-time Use:

DBAs drop unused columns after approval from the team and backup verification.

- 28. How do you rename an existing table used in an application?
- ✓ Answer:

ALTER TABLE employees RENAME TO staff;

☐ Real-time Issue:

If the table is used by backend code, API calls may fail unless developers update references.

So renaming is done carefully in coordination with developers.

- ②9. How can you add a UNIQUE constraint after data is inserted?
- ✓ Answer:

Before adding:

SELECT email, COUNT(*) FROM employees GROUP BY email HAVING COUNT(*) > 1;

| If no | dup | licates | found: |
|-------|-----|---------|--------|
|-------|-----|---------|--------|

ALTER TABLE employees ADD CONSTRAINT unique_email UNIQUE(email);

□ Real-time Use:

Used when the database initially had no constraints and later needs to enforce data integrity.

\$\gamma 10. Can we drop a constraint without knowing its name?

✓ Answer:

You can find the constraint name first:

\d employees

or use:

SELECT conname FROM pg_constraint WHERE conrelid = 'employees'::regclass;

Then:

ALTER TABLE employees DROP CONSTRAINT constraint_name;

☐ Real-time Use:

DBAs query system catalogs (pg_constraint, pg_class) to manage schema dynamically.

- LEVEL 3 REAL-TIME COMPANY / PROJECT LEVEL QUESTIONS
- \$\gamma 11\$. In production, what are the risks of using ALTER TABLE on a large table?
- ✓ Answer:

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Table locks may cause downtime

Queries may be blocked temporarily

Indexes might need rebuilding

Migration scripts may fail if not tested properly

□ Real-time Use:

DBAs schedule ALTER operations during maintenance windows (e.g., Sunday 2–4 AM).

212. What strategy do you follow before altering a table in production?

✓ Answer:

- 1. Take a full backup of the database.
- 2. Check dependent objects (views, triggers, foreign keys).
- 3. Validate data integrity.
- 4. Run ALTER on staging/test first.
- 5. Apply in production during low traffic.

☐ Real-time Use:

This is part of a Database Change Management Process (DCMP) — followed by all MNCs.

\$\gamma13\$. How do you handle ALTER TABLE in microservice-based applications?

✓ Answer:

Each service might have its own schema, so we use database migration tools like:

Flyway

Liquibase

They maintain versioned SQL scripts and apply changes automatically in CI/CD pipelines.

☐ Real-time Use:

For continuous deployment, ALTER statements are managed through migration scripts, not manual execution.

\$\foating{2}14. What's the difference between ALTER COLUMN SET DEFAULT and UPDATE command?

✓ Answer:

ALTER COLUMN SET DEFAULT \rightarrow applies only to future inserts. UPDATE \rightarrow modifies existing rows.

Example:

ALTER TABLE employees ALTER COLUMN salary SET DEFAULT 10000; UPDATE employees SET salary = 10000 WHERE salary IS NULL;

☐ Real-time Use:

Used together to maintain consistency for both old and new records.

 $\ensuremath{\mathfrak{P}}$ 15. How do you monitor changes made using ALTER TABLE in PostgreSQL?

✓ Answer:

Enable DDL logging using log_statement = 'ddl' in PostgreSQL config.

Or maintain a schema audit table using triggers or event logs.

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☐ Real-time Use:

This helps DBAs audit who changed what structure and when - especially in banking and enterprise systems.

BONUS INTERVIEW TIP

Most Asked Tricky Question:

> "What's the safest way to alter a table without affecting running transactions?"

Answer:

Create a new column or shadow table.

Copy data gradually.

Then swap or rename tables in a transaction-safe block.

This shows your real-time database engineering awareness.