

Lab 07

pgAdmin 4

File Object Tools Edit View Window Help

Object Explorer Servers

Processes X suppliers/postgres@PostgreSQL 17* X public.booking/su... X

Query Query History Scratch Pad X

```
1 SELECT * FROM flights;
2
3
4
5 CREATE INDEX task1 ON flights(actual_departure);
6
7
8 CREATE UNIQUE INDEX task2 ON flights(flight_no, scheduled_departure);
9
10
11 CREATE INDEX task3 ON flights(departure_airport_id, arrival_airport_id);
12
13
14
15 CREATE INDEX task4 ON flights(arriving_gate);
16 SELECT * FROM flights WHERE arriving_gate = '649';
17
```

Data Output Messages Notifications

CREATE INDEX

Query returned successfully in 58 msec.

Total rows: Query complete 00:00:00.058

✓ Query returned successfully in 58 msec. X

CRLF Ln 6, Col 1

12:10 09.11.2025

pgAdmin 4

File Object Tools Edit View Window Help

Object Explorer Servers

Processes X suppliers/postgres@PostgreSQL 17* X public.booking/su... X

Query Query History Scratch Pad X

```
8 -- CREATE UNIQUE INDEX, выходит ошибка из за связей
9 CREATE INDEX task2 ON flights(flight_no, scheduled_departure);
10
11
12 CREATE INDEX task3 ON flights(departure_airport_id, arrival_airport_id);
13
14
15
16 CREATE INDEX task4 ON flights(arriving_gate);
17 SELECT * FROM flights WHERE arriving_gate = '649';
18
19
20
21
22
23
24
```

Data Output Messages Notifications

CREATE INDEX

Query returned successfully in 61 msec.

Total rows: Query complete 00:00:00.061

✓ Query returned successfully in 61 msec. X

CRLF Ln 9, Col 1

13:52 09.11.2025

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File Object Tools Edit View Window Help

Object Explorer Servers

Processes X suppliers/postgres@PostgreSQL 17* X public.booking/su... X

suppliers/postgres@PostgreSQL 17

Query Query History Scratch Pad X

```
1 SELECT * FROM flights;
2
3
4
5 CREATE INDEX task1 ON flights(actual_departure);
6
7
8
9
10 CREATE UNIQUE INDEX task2 ON flights(flight_no, scheduled_departure);
11
12
13 CREATE INDEX task3 ON flights(departure_airport_id, arrival_airport_id);
14
15
16
17 CREATE INDEX task4 ON flights(arriving_gate);
```

Data Output Messages Notifications

CREATE INDEX

Query returned successfully in 50 msec.

Total rows: Query complete 00:00:00.050

✓ Query returned successfully in 50 msec. X

CRLF Ln 13, Col 1

13:46 09.11.2025

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File Object Tools Edit View Window Help

Object Explorer Servers

Processes X suppliers/postgres@PostgreSQL 17* X public.booking/su... X

suppliers/postgres@PostgreSQL 17

Query Query History Scratch Pad X

```
1 SELECT * FROM flights;
2
3
4
5 CREATE INDEX task1 ON flights(actual_departure);
6
7
8 CREATE UNIQUE INDEX task2 ON flights(flight_no, scheduled_departure);
9
10
11 CREATE INDEX task3 ON flights(departure_airport_id, arrival_airport_id);
12
13
14 SELECT * FROM flights WHERE arriving_gate = '649';
15
16
17
```

Data Output Messages Notifications

Showing rows: 1 to 1 Page No: 1 of 1

flight_id	flight_no	scheduled_departure	scheduled_arrival	departure_airport_id	arrival_airport_id	departing_gate	arriving_gate	airline_id
[PK] integer	character varying (50)	date	date	integer	integer	character varying (50)	character varying (50)	integer
1	1	US-CT	2024-01-22	2023-09-08	12	15	9	649

Total rows: 1 Query complete 00:00:00.149

✓ Successfully run. Total query runtime: 149 msec. 1 rows affected. X

CRLF Ln 15, Col 1

12:07 09.11.2025

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File Object Tools Edit View Window Help

Object Explorer Servers

Processes X suppliers/postgres@PostgreSQL 17* X public.booking/su...

suppliers/postgres@PostgreSQL 17

Query Query History Scratch Pad X

```

4
5 CREATE INDEX task1 ON flights(actual_departure);
6
7
8 CREATE UNIQUE INDEX task2 ON flights(flight_no, scheduled_departure);
9
10
11 CREATE INDEX task3 ON flights(departure_airport_id, arrival_airport_id);
12
13
14
15 CREATE INDEX task4 ON flights(arriving_gate);
16 SELECT * FROM flights WHERE arriving_gate = '649';
17
18
19
20

```

Data Output Messages Notifications

Showing rows: 1 to 1 Page No: 1 of 1

flight_id [PK] integer	flight_no character varying (50)	scheduled_departure date	scheduled_arrival date	departure_airport_id integer	arrival_airport_id integer	departing_gate character varying (50)	arriving_gate character varying (50)	airline_id integer
1	US-CT	2024-01-22	2023-09-08	12	15	9	649	39

Total rows: 1 Query complete 00:00:00.061

Successfully run. Total query runtime: 61 msec. 1 rows affected. X

CRLF Ln 16, Col 1

12:08 09.11.2025

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File Object Tools Edit View Window Help

Object Explorer Servers

Processes X suppliers/postgres@PostgreSQL 17* X public.booking/su...

suppliers/postgres@PostgreSQL 17

Query Query History Scratch Pad X

```

11
12 CREATE INDEX task3 ON flights(departure_airport_id, arrival_airport_id);
13
14
15
16 CREATE INDEX task4 ON flights(arriving_gate);
17 SELECT * FROM flights WHERE arriving_gate = '649';
18
19
20 DROP INDEX task3;
21 EXPLAIN ANALYZE
22 SELECT * FROM flights
23 WHERE departure_airport_id = 12 AND arrival_airport_id = 15;
24
25
26 SELECT * FROM flights;
27

```

Data Output Messages Notifications

Showing rows: 1 to 5 Page No: 1 of 1

QUERY PLAN
Seq Scan on flights (cost=0.00..27.95 rows=3 width=61) (actual time=0.009..0.118 rows=2 loops=...)
Filter: ((departure_airport_id = 12) AND (arrival_airport_id = 15))
Rows Removed by Filter: 995
Planning Time: 0.777 ms
Execution Time: 0.131 ms

Total rows: 5 Query complete 00:00:00.052

Successfully run. Total query runtime: 52 msec. 5 rows affected. X

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Without index:

Query time = 61 ms

With index:

Query time = 52 ms

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File Object Tools Edit View Window Help

Object Explorer Servers

Processes X suppliers/postgres@PostgreSQL 17 X public.booking/su...

suppliers/postgres@PostgreSQL 17

Query Query History Scratch Pad X

```

9 CREATE INDEX task2 ON flights(flight_no, scheduled_departure);
10
11
12 CREATE INDEX task3 ON flights(departure_airport_id, arrival_airport_id);
13
14
15
16 CREATE INDEX task4 ON flights(arriving_gate);
17 SELECT * FROM flights WHERE arriving_gate = '649';
18
19
20
21 EXPLAIN ANALYZE
22 SELECT * FROM flights
23 WHERE departure_airport_id = 12 AND arrival_airport_id = 15;
24
25

```

Data Output Messages Notifications

Showing rows: 1 to 7 Page No: 1 of 1

QUERY PLAN
text
1 Bitmap Heap Scan on flights (cost=4.31..12.03 rows=3 width=61) (actual time=0.383..0.386 rows=2 loops=1)
2 Recheck Cond: ((departure_airport_id = 12) AND (arrival_airport_id = 15))
3 Heap Blocks: exact=1
4 -> Bitmap Index Scan on task3 (cost=0.00..4.31 rows=3 width=0) (actual time=0.071..0.071 rows=2 loops=1)
5 Index Cond: ((departure_airport_id = 12) AND (arrival_airport_id = 15))
6 Planning Time: 0.152 ms
7 Execution Time: 0.604 ms

Successfully run. Total query runtime: 70 msec. 7 rows affected.

Total rows: 7 Query complete 00:00:00.070

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Index Scan using task3 — means PostgreSQL uses index Index Cond: — shows the conditions under which the index operates Execution Time: — total execution time

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File Object Tools Edit View Window Help

Object Explorer Servers

Processes X suppliers/postgres@PostgreSQL 17 X public.booking/su...

suppliers/postgres@PostgreSQL 17

Query Query History Scratch Pad X

```

1 CREATE UNIQUE INDEX task6 ON passengers(passport_number);
2
3 SELECT indexname, indexdef
4 FROM pg_indexes
5 WHERE tablename = 'passengers';
6

```

Data Output Messages Notifications

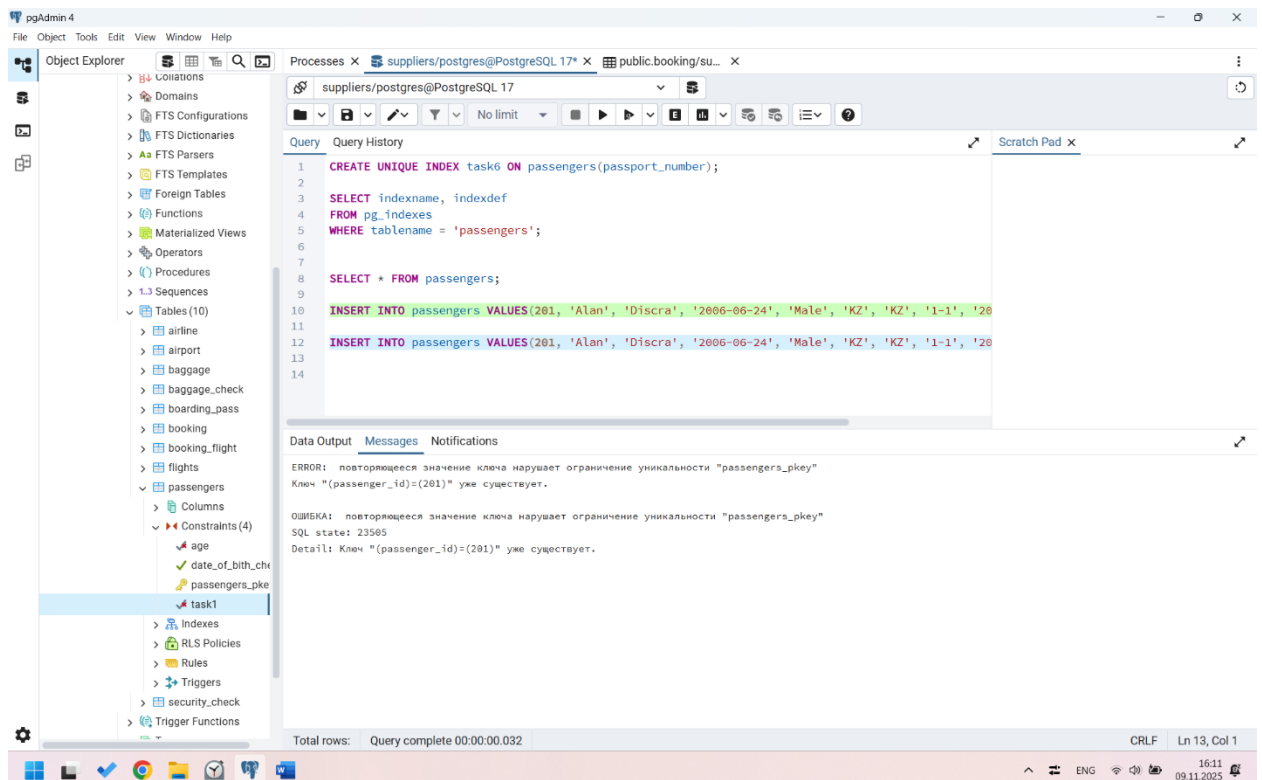
Showing rows: 1 to 2 Page No: 1 of 1

indexname	indexdef
passengers_pkey	CREATE UNIQUE INDEX passengers_pkey ON public.passengers USING btree (passenger_id)
task6	CREATE UNIQUE INDEX task6 ON public.passengers USING btree (passport_number)

Total rows: 2 Query complete 00:00:00.067

CRLF Ln 6, Col 1

16:04 09.11.2025

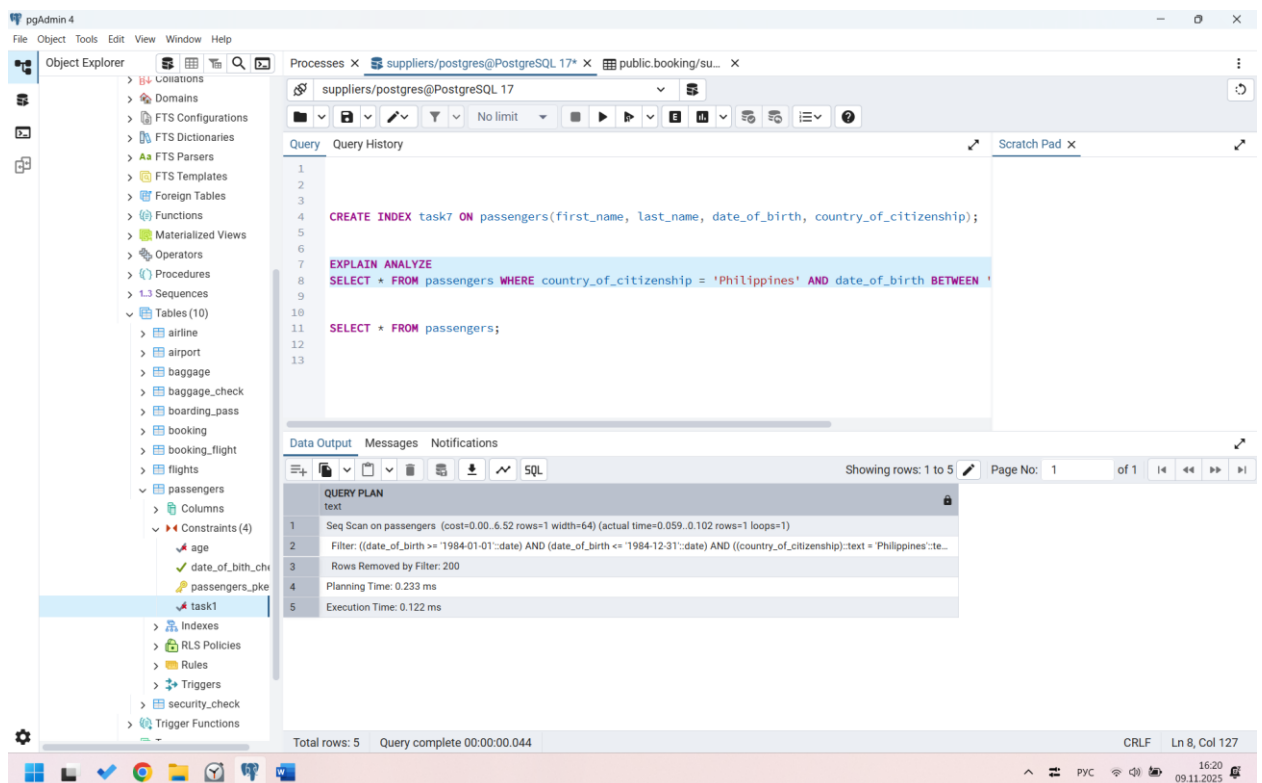
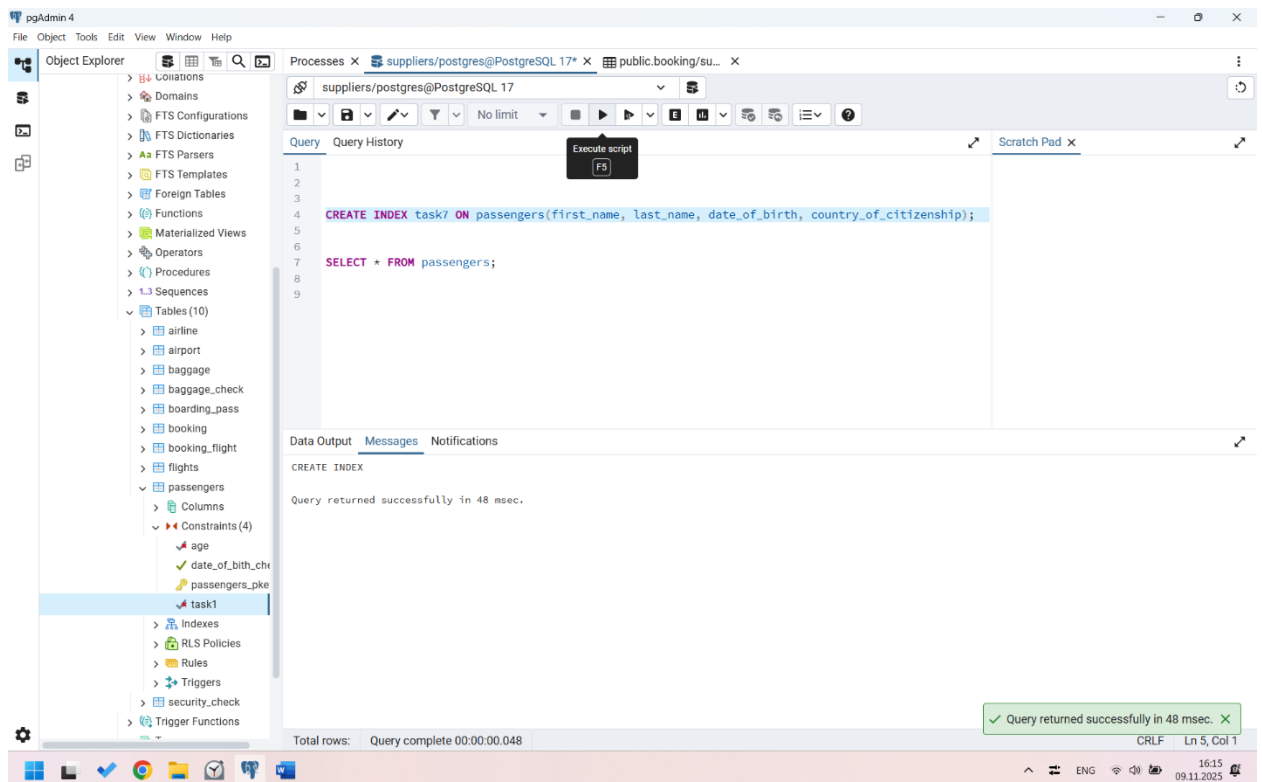


When I created the **unique index** on `passport_number`, PostgreSQL started enforcing the rule that every value in that column must be unique.

The first passenger inserted successfully because the passport number was new.

The second insert failed with an error, because the same `passport_number` already existed in the table.

This confirms that the **unique index works correctly** — it prevents duplicate passport numbers from being added.



Although I created a composite index on (first_name, last_name, date_of_birth, country_of_citizenship), PostgreSQL did not use it because my query filters only on the last two columns. For composite indexes, PostgreSQL can only use them effectively if the filtering starts with the leftmost

columns.

The screenshot shows the pgAdmin 4 interface. The left sidebar displays the database structure, with the 'passengers' table selected under the 'public' schema. The main query editor contains the following SQL:

```
1 SELECT
2     indexname AS index_name,
3     indexdef AS definition
4 FROM
5     pg_indexes
6 WHERE
7     tablename = 'passengers';
8
```

The 'Data Output' tab shows the results of the query:

index_name	definition
passengers_pkey	CREATE UNIQUE INDEX passengers_pkey ON public.passengers USING btree (passenger_id)
task6	CREATE UNIQUE INDEX task6 ON public.passengers USING btree (passport_number)
task7	CREATE INDEX task7 ON public.passengers USING btree (first_name, last_name, date_of_birth, country_of_citizenship)

The status bar at the bottom indicates 'Total rows: 3' and 'Query complete 00:00:00.066'.

The screenshot shows the pgAdmin 4 interface after executing a query to drop indexes. The main query editor contains the following SQL:

```
1 DROP INDEX task6;
2
3 DROP INDEX task7;
4
5
6 SELECT
7     indexname AS index_name,
8     indexdef AS definition
9 FROM
10    pg_indexes
11 WHERE
12    tablename = 'passengers';
13
```

The 'Data Output' tab shows the results of the query:

index_name	definition
passengers_pkey	CREATE UNIQUE INDEX passengers_pkey ON public.passengers USING btree (passenger_id)

The status bar at the bottom indicates 'Total rows: 1' and 'Query complete 00:00:00.107'. A green notification box at the bottom right states: 'Successfully run. Total query runtime: 107 msec. 1 rows affected.'