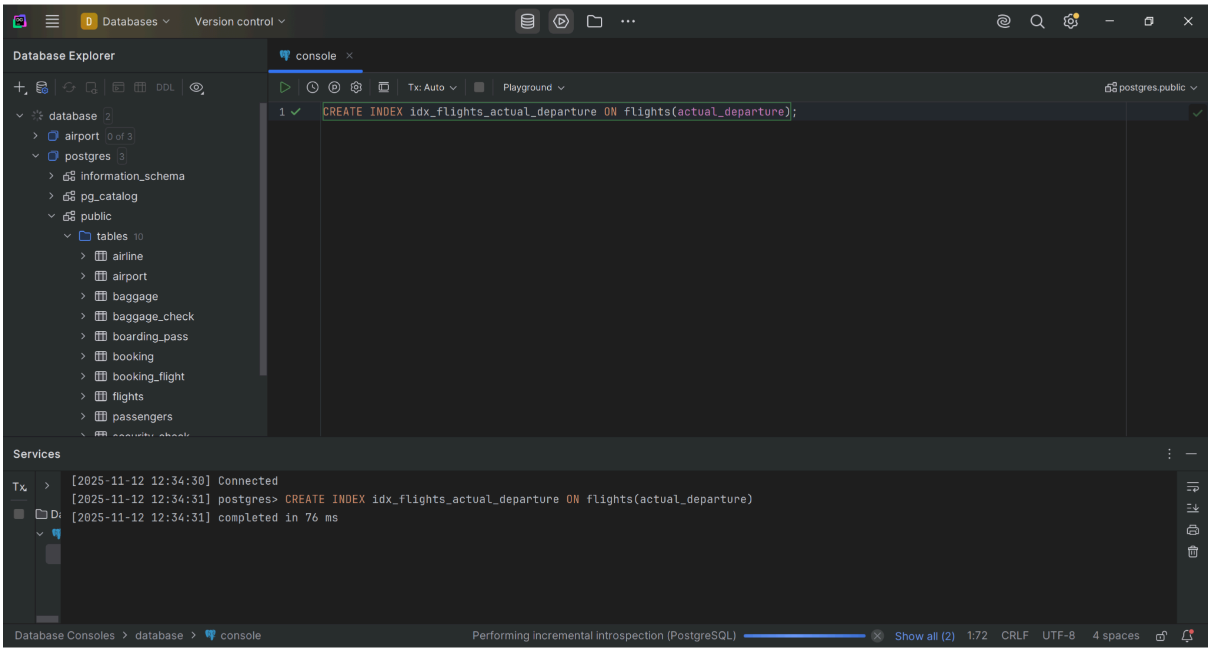
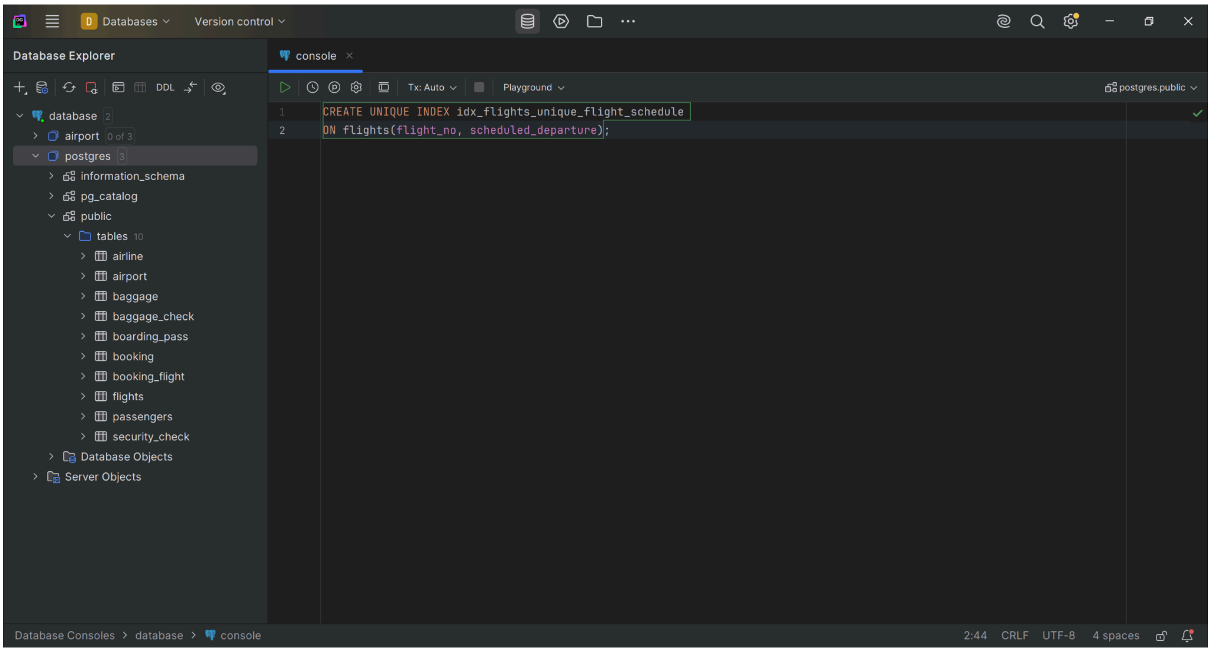
1)



```
CREATE INDEX idx_flights_actual_departure ON flights(actual_departure);
```

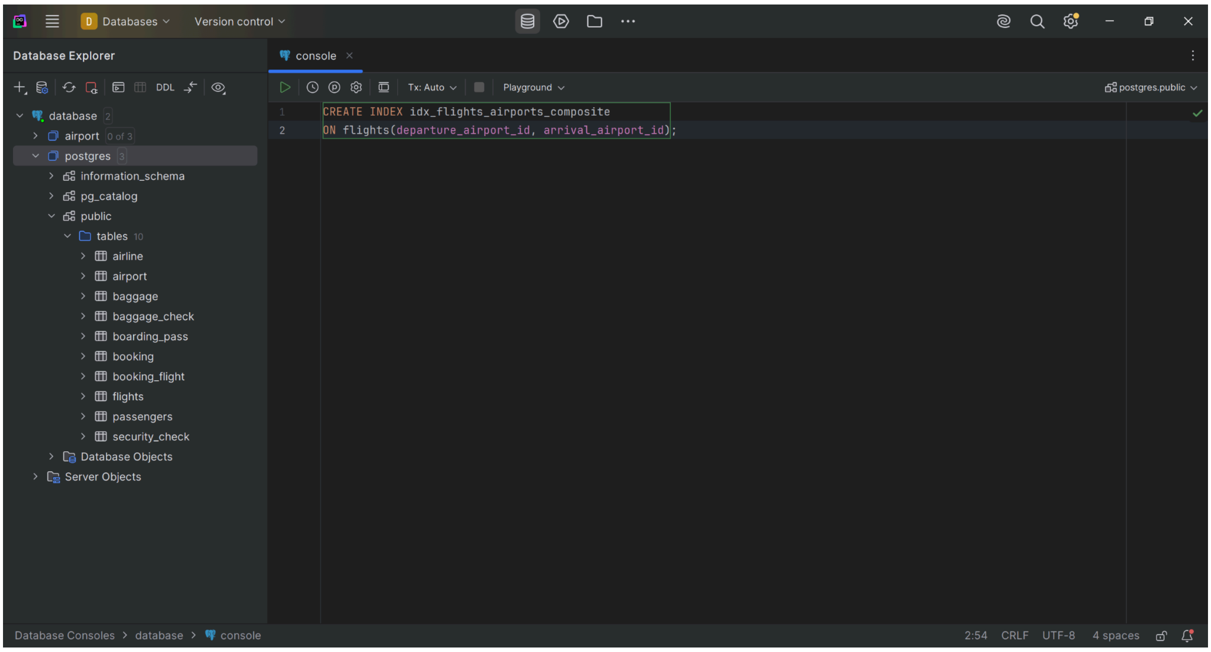
```
[2025-11-12 12:34:30] Connected
[2025-11-12 12:34:31] postgres> CREATE INDEX idx_flights_actual_departure ON flights(actual_departure)
[2025-11-12 12:34:31] completed in 76 ms
```

2)



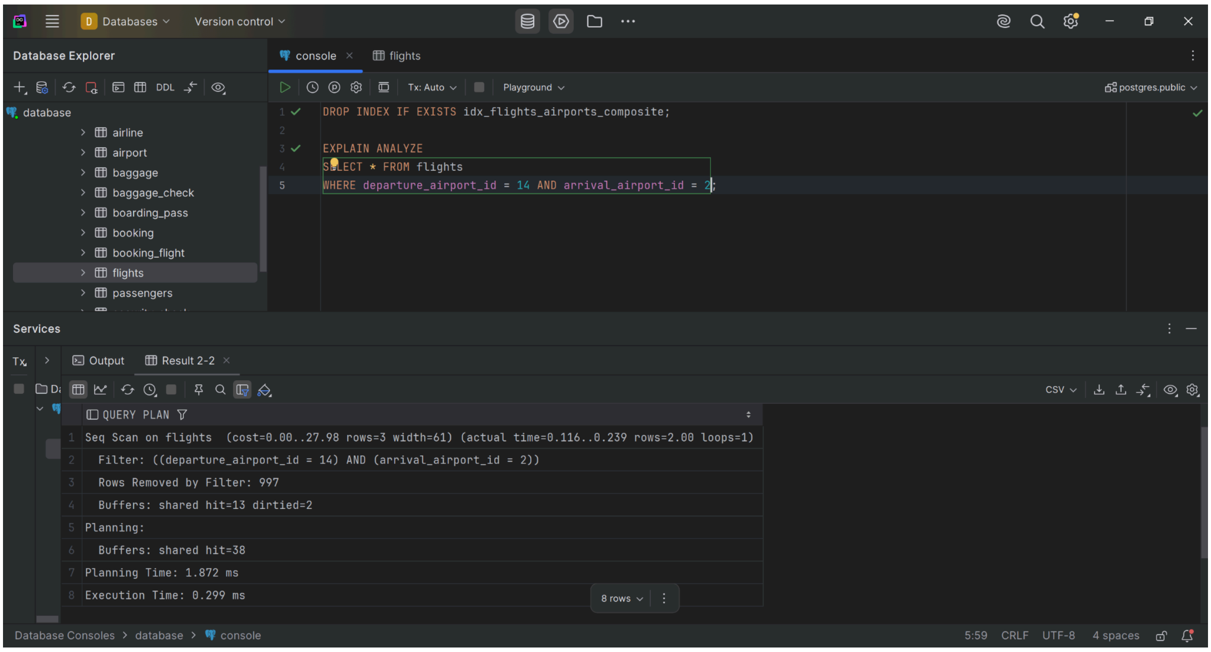
```
CREATE UNIQUE INDEX idx_flights_unique_flight_schedule
ON flights(flight_no, scheduled_departure);
```

3)



```sql
CREATE INDEX idx_flights_airports_composite
ON flights(departure_airport_id, arrival_airport_id);
```

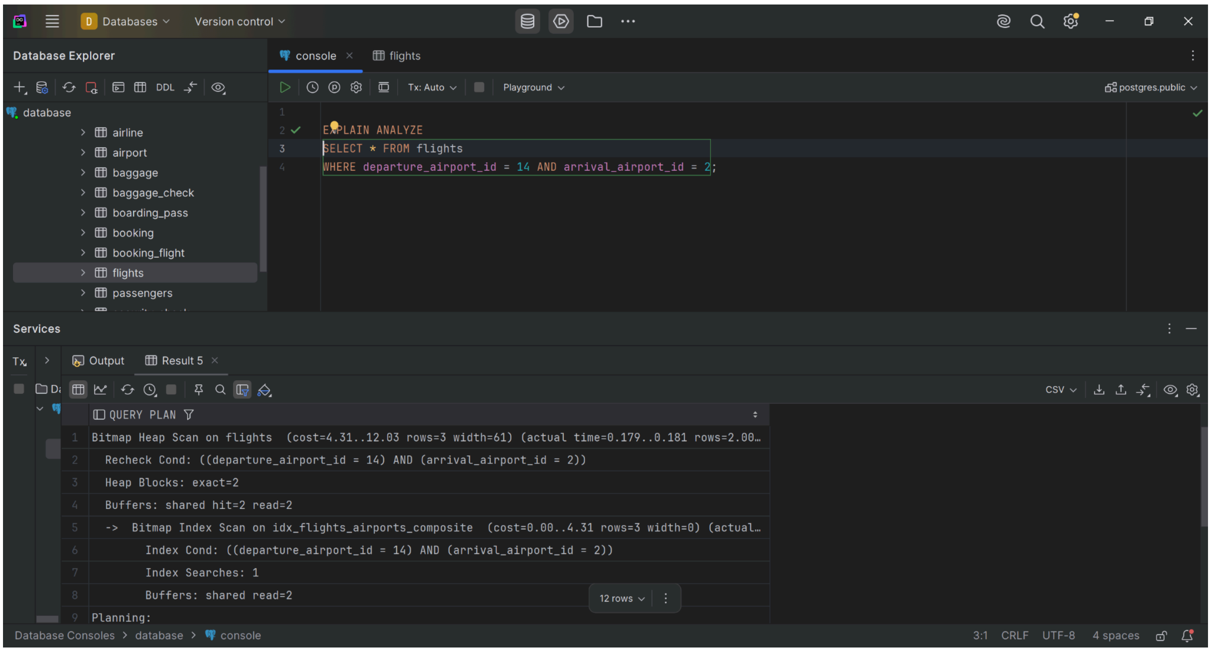
4)



```sql
DROP INDEX IF EXISTS idx_flights_airports_composite;

EXPLAIN ANALYZE
SELECT * FROM flights
WHERE departure_airport_id = 14 AND arrival_airport_id = 2;
```

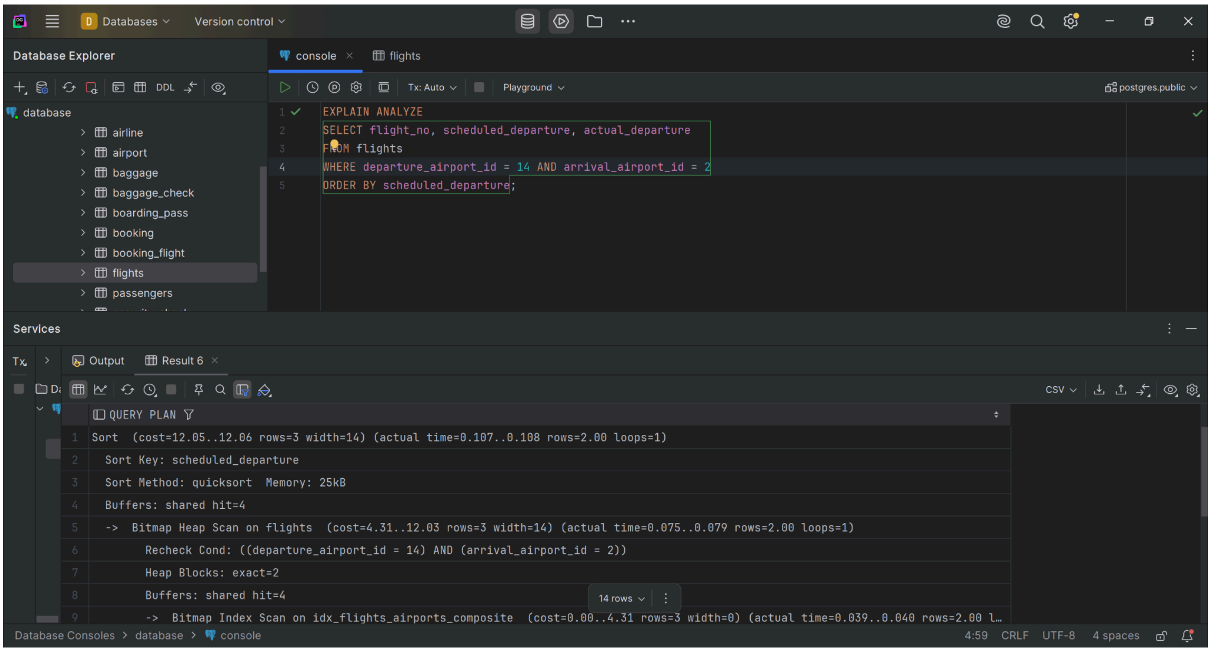
```
QUERY PLAN
1 Seq Scan on flights  (cost=0.00..27.98 rows=3 width=61) (actual time=0.116..0.239 rows=2.00 loops=1)
2   Filter: ((departure_airport_id = 14) AND (arrival_airport_id = 2))
3   Rows Removed by Filter: 997
4   Buffers: shared hit=13 dirtied=2
5 Planning:
6   Buffers: shared hit=38
7 Planning Time: 1.872 ms
8 Execution Time: 0.299 ms
```



```sql
EXPLAIN ANALYZE
SELECT * FROM flights
WHERE departure_airport_id = 14 AND arrival_airport_id = 2;
```

```
QUERY PLAN
Bitmap Heap Scan on flights  (cost=4.31..12.03 rows=3 width=61) (actual time=0.179..0.181 rows=2.00…
  Recheck Cond: ((departure_airport_id = 14) AND (arrival_airport_id = 2))
  Heap Blocks: exact=2
  Buffers: shared hit=2 read=2
  ->  Bitmap Index Scan on idx_flights_airports_composite  (cost=0.00..4.31 rows=3 width=0) (actual…
        Index Cond: ((departure_airport_id = 14) AND (arrival_airport_id = 2))
        Index Searches: 1
        Buffers: shared read=2
Planning:
```

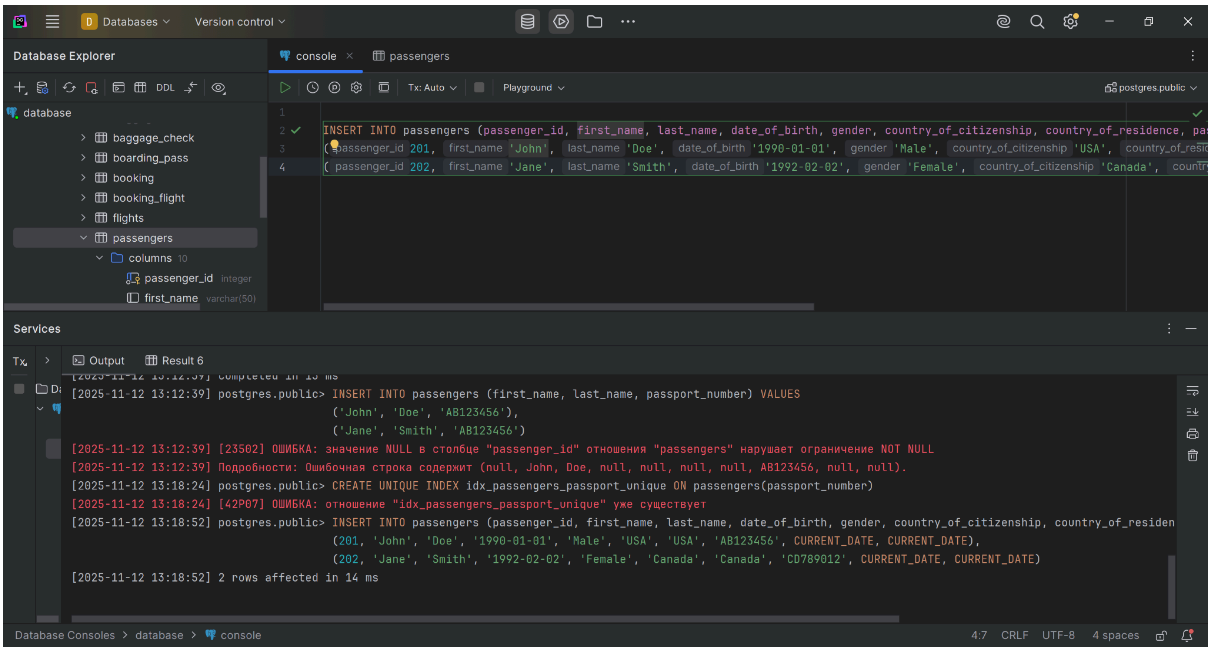
5)



```sql
EXPLAIN ANALYZE
SELECT flight_no, scheduled_departure, actual_departure
FROM flights
WHERE departure_airport_id = 14 AND arrival_airport_id = 2
ORDER BY scheduled_departure;
```

```
QUERY PLAN
Sort  (cost=12.05..12.06 rows=3 width=14) (actual time=0.107..0.108 rows=2.00 loops=1)
  Sort Key: scheduled_departure
  Sort Method: quicksort  Memory: 25kB
  Buffers: shared hit=4
  ->  Bitmap Heap Scan on flights  (cost=4.31..12.03 rows=3 width=14) (actual time=0.075..0.079 rows=2.00 loops=1)
        Recheck Cond: ((departure_airport_id = 14) AND (arrival_airport_id = 2))
        Heap Blocks: exact=2
        Buffers: shared hit=4
        ->  Bitmap Index Scan on idx_flights_airports_composite  (cost=0.00..4.31 rows=3 width=0) (actual time=0.039..0.040 rows=2.00 l…
```

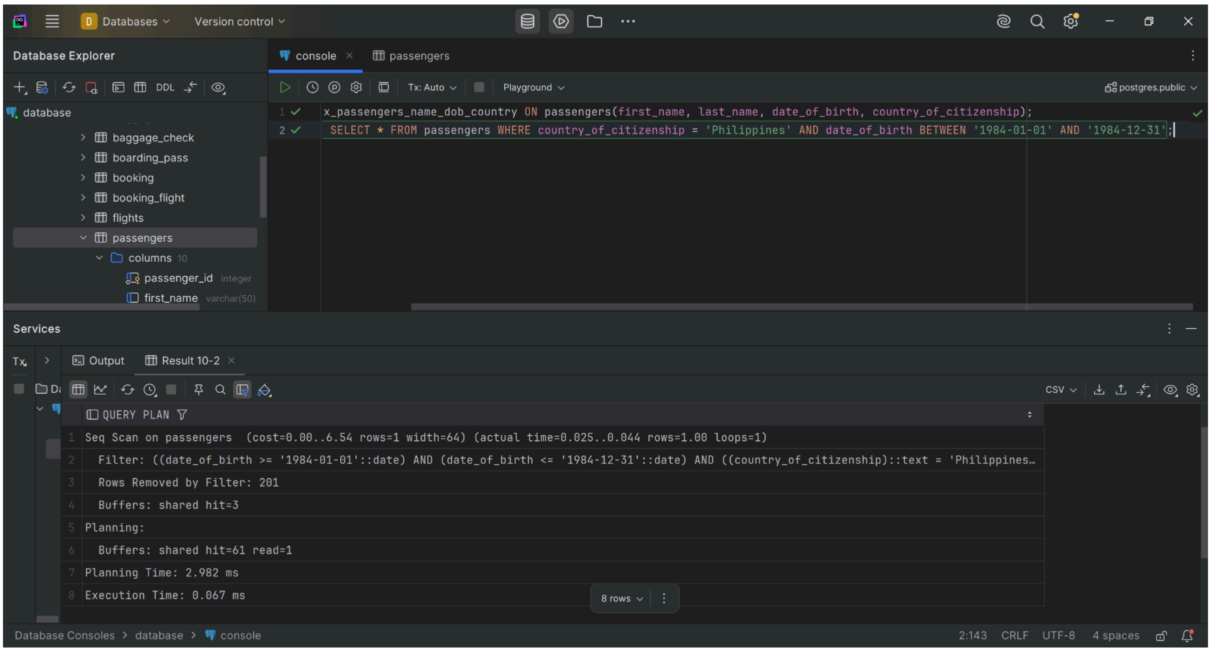
6)



```
INSERT INTO passengers (passenger_id, first_name, last_name, date_of_birth, gender, country_of_citizenship, country_of_residence, pa
( passenger_id 201,  first_name 'John',  last_name 'Doe',  date_of_birth '1990-01-01',  gender 'Male',  country_of_citizenship 'USA',  country_of_resid
( passenger_id 202,  first_name 'Jane',  last_name 'Smith',  date_of_birth '1992-02-02',  gender 'Female',  country_of_citizenship 'Canada',  countr
```

```
[2025-11-12 13:12:39] completed in 13 ms
[2025-11-12 13:12:39] postgres.public> INSERT INTO passengers (first_name, last_name, passport_number) VALUES
                                       ('John', 'Doe', 'AB123456'),
                                       ('Jane', 'Smith', 'AB123456')
[2025-11-12 13:12:39] [23502] ОШИБКА: значение NULL в столбце "passenger_id" отношения "passengers" нарушает ограничение NOT NULL
[2025-11-12 13:12:39] Подробности: Ошибочная строка содержит (null, John, Doe, null, null, null, null, AB123456, null, null).
[2025-11-12 13:18:24] postgres.public> CREATE UNIQUE INDEX idx_passengers_passport_unique ON passengers(passport_number)
[2025-11-12 13:18:24] [42P07] ОШИБКА: отношение "idx_passengers_passport_unique" уже существует
[2025-11-12 13:18:52] postgres.public> INSERT INTO passengers (passenger_id, first_name, last_name, date_of_birth, gender, country_of_citizenship, country_of_residen
                                       (201, 'John', 'Doe', '1990-01-01', 'Male', 'USA', 'USA', 'AB123456', CURRENT_DATE, CURRENT_DATE),
                                       (202, 'Jane', 'Smith', '1992-02-02', 'Female', 'Canada', 'Canada', 'CD789012', CURRENT_DATE, CURRENT_DATE)
[2025-11-12 13:18:52] 2 rows affected in 14 ms
```

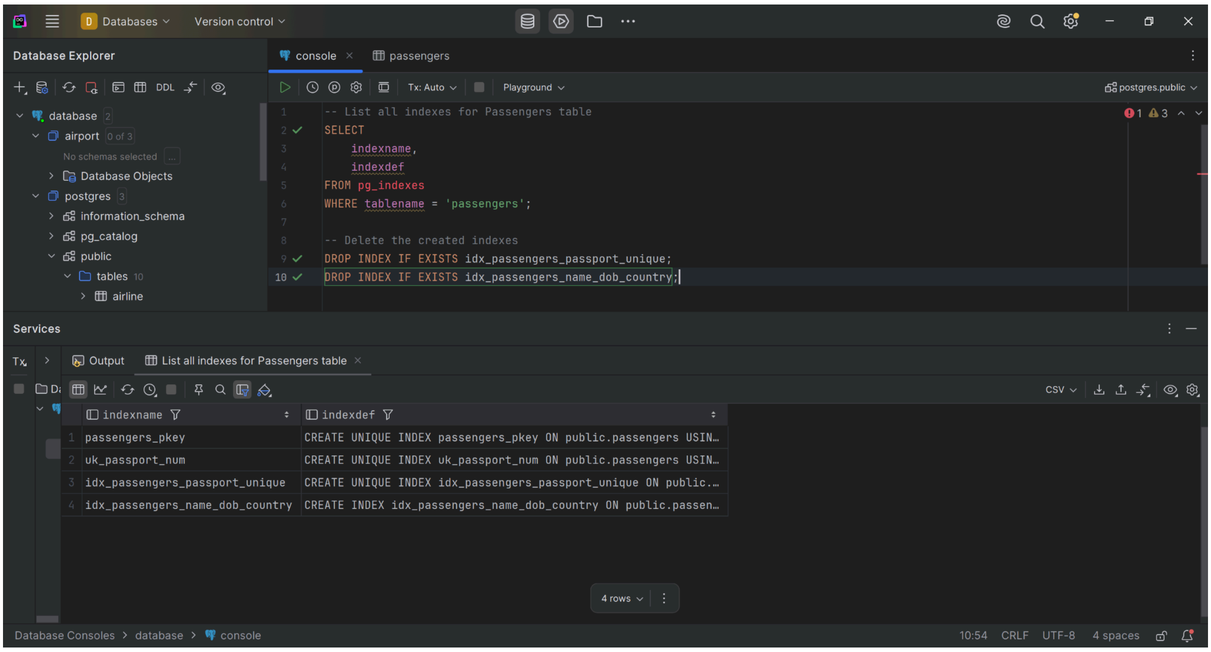
7)



```
x_passengers_name_dob_country ON passengers(first_name, last_name, date_of_birth, country_of_citizenship);
 SELECT * FROM passengers WHERE country_of_citizenship = 'Philippines' AND date_of_birth BETWEEN '1984-01-01' AND '1984-12-31';
```

```
QUERY PLAN
Seq Scan on passengers  (cost=0.00..6.54 rows=1 width=64) (actual time=0.025..0.044 rows=1.00 loops=1)
  Filter: ((date_of_birth >= '1984-01-01'::date) AND (date_of_birth <= '1984-12-31'::date) AND ((country_of_citizenship)::text = 'Philippines…
  Rows Removed by Filter: 201
  Buffers: shared hit=3
Planning:
  Buffers: shared hit=61 read=1
Planning Time: 2.982 ms
Execution Time: 0.067 ms
```

8)



```sql
-- List all indexes for Passengers table
SELECT
    indexname,
    indexdef
FROM pg_indexes
WHERE tablename = 'passengers';

-- Delete the created indexes
DROP INDEX IF EXISTS idx_passengers_passport_unique;
DROP INDEX IF EXISTS idx_passengers_name_dob_country;
```

	indexname	indexdef
1	passengers_pkey	CREATE UNIQUE INDEX passengers_pkey ON public.passengers USIN…
2	uk_passport_num	CREATE UNIQUE INDEX uk_passport_num ON public.passengers USIN…
3	idx_passengers_passport_unique	CREATE UNIQUE INDEX idx_passengers_passport_unique ON public.…
4	idx_passengers_name_dob_country	CREATE INDEX idx_passengers_name_dob_country ON public.passen…