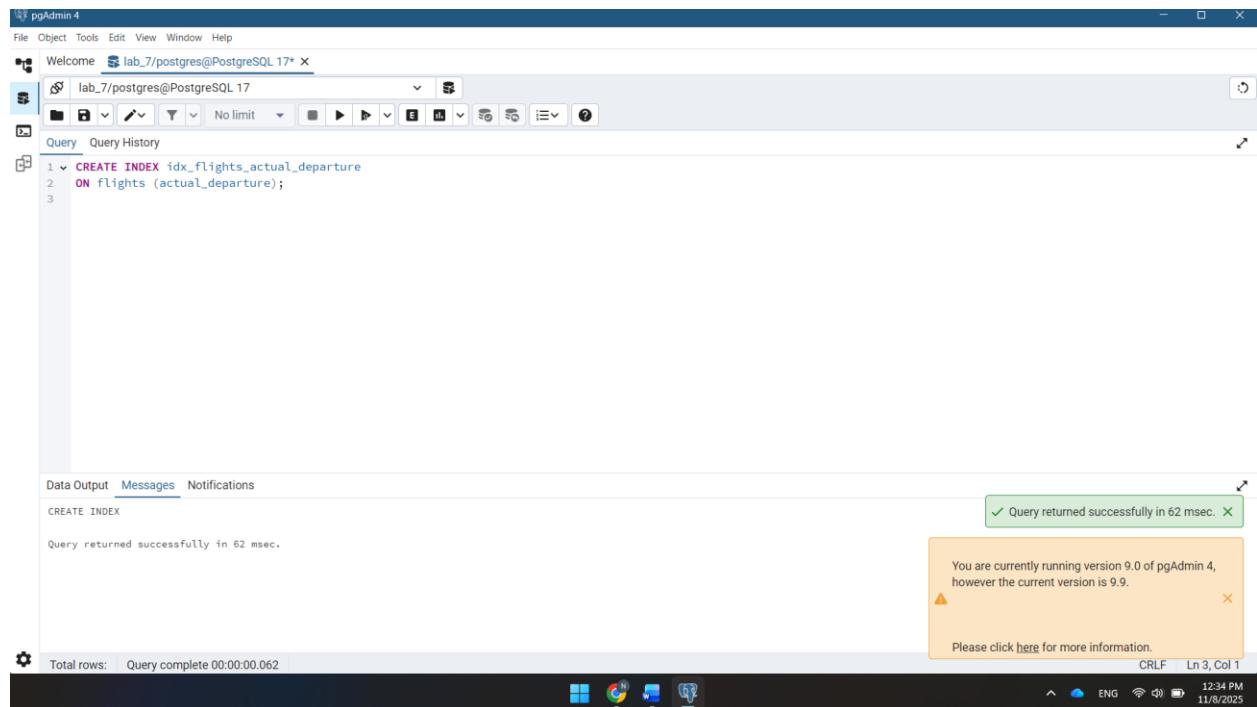


Lab-7



The screenshot shows the pgAdmin 4 interface. In the top-left corner, it says "pgAdmin 4". The menu bar includes "File", "Object", "Tools", "Edit", "View", "Window", and "Help". Below the menu is a toolbar with various icons. The main window has a title bar "Welcome lab_7/postgres@PostgreSQL 17*". The left sidebar shows a tree structure with "Query History" expanded, containing the following SQL code:

```
1 v CREATE INDEX idx_flights_actual_departure
2 ON flights (actual_departure);
3
```

The "Data Output" tab is selected, showing the message "Query returned successfully in 62 msec." Below this, there's a green success message: "✓ Query returned successfully in 62 msec." A yellow warning message box states: "You are currently running version 9.0 of pgAdmin 4, however the current version is 9.9." It also includes a link "Please click here for more information." At the bottom of the pgAdmin window, it says "Total rows: Query complete 00:00:00.062" and shows system status icons like battery level, signal strength, and network connection.

1

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

The screenshot shows the pgAdmin 4 interface. In the top-left corner, it says "pgAdmin 4". The menu bar includes "File", "Object", "Tools", "Edit", "View", "Window", and "Help". The title bar says "Welcome lab_7/postgres@PostgreSQL 17* X". Below the title bar is a toolbar with various icons. The main area has a "Query" tab selected, showing the following SQL code:

```
1 v CREATE UNIQUE INDEX idx_flights_flight_no_scheduled_departure
2 ON flights (flight_no, scheduled_departure);
```

Below the query window, there are tabs for "Data Output", "Messages", and "Notifications". The "Messages" tab is active, displaying the message "CREATE INDEX". To the right of the messages, a green box indicates "Query returned successfully in 66 msec.".

A yellow warning box in the bottom right corner states: "You are currently running version 9.0 of pgAdmin 4, however the current version is 9.9." It also contains a link "Please click here for more information.".

At the bottom of the pgAdmin window, it says "Total rows: Query complete 00:00:00.066" and "CRLF Ln 2, Col 45". The system tray at the bottom of the screen shows icons for the taskbar, including the Windows logo, a browser, and other system icons.

2

**CREATE UNIQUE INDEX idx_flights_flight_no_scheduled_departure
ON flights (flight_no, scheduled_departure);**

The screenshot shows the pgAdmin 4 interface. In the top-left corner, it says "pgAdmin 4". The menu bar includes "File", "Object", "Tools", "Edit", "View", "Window", and "Help". The title bar says "Welcome lab_7/postgres@PostgreSQL 17* X". Below the title bar is a toolbar with various icons. The main area has a "Query" tab selected, showing the following SQL code:

```
1 v CREATE INDEX idx_flights_departure_arrival
2 ON flights (departure_airport_id, arrival_airport_id);
3
```

Below the query window, there are tabs for "Data Output", "Messages", and "Notifications". The "Messages" tab is active, displaying the message "CREATE INDEX". To the right of the messages, a green box indicates "Query returned successfully in 61 msec.".

A yellow warning box in the bottom right corner states: "You are currently running version 9.0 of pgAdmin 4, however the current version is 9.9." It also contains a link "Please click here for more information.".

At the bottom of the pgAdmin window, it says "Total rows: Query complete 00:00:00.061" and "CRLF Ln 3, Col 1". The system tray at the bottom of the screen shows icons for the taskbar, including the Windows logo, a browser, and other system icons.

3

```
CREATE INDEX idx_flights_departure_arrival
ON flights (departure_airport_id, arrival_airport_id);
```

4

Queries without indexes

```
pgAdmin 4
File Object Tools Edit View Window Help
Welcome lab_7/postgres@PostgreSQL 17*
Query Query History
1 -- Query by actual_departure
2 v EXPLAIN ANALYZE
3 SELECT *
4 FROM flights
5 WHERE actual_departure = '2024-01-01';
6
7 -- Query by flight_no and scheduled_departure
8 v EXPLAIN ANALYZE
9 SELECT *
10 FROM flights
11 WHERE flight_no = 'KC123'
12 AND scheduled_departure = '2024-02-10';
13
14 -- Query by departure_airport_id and arrival_airport_id
15 v EXPLAIN ANALYZE
16 SELECT *
17 FROM flights
18 WHERE departure_airport_id = 1
19 AND arrival_airport_id = 2;
20

Data Output Messages Notifications
QUERY PLAN text
1 Index Scan using idx_flights_departure_arrival on flights (cost=0.14..8.16 rows=1 width=512) (actual time=0.001..0.001 rows=0 loops=...)
2   Index Cond: ((departure_airport_id = 1) AND (arrival_airport_id = 2))
3 Planning Time: 0.016 ms
4 Execution Time: 0.003 ms

Total rows: 4  Query complete 00:00:00.063
SQL
Sh ✓ Successfully run. Total query runtime: 63 msec. 4 rows affected. X

You are currently running version 9.0 of pgAdmin 4,
however the current version is 9.9.
⚠ Please click here for more information.

CRLF Ln 20, Col 1
12:49 PM ENG 11/8/2025
```

-- Query by actual_departure

EXPLAIN ANALYZE

SELECT *

FROM flights

WHERE actual_departure = '2024-01-01';

-- Query by flight_no and scheduled_departure

EXPLAIN ANALYZE

SELECT *

FROM flights

WHERE flight_no = 'KC123'

AND scheduled_departure = '2024-02-10';

-- Query by departure_airport_id and arrival_airport_id

EXPLAIN ANALYZE

SELECT *

FROM flights

WHERE departure_airport_id = 1

AND arrival_airport_id = 2;

Queries with indexes

The screenshot shows the pgAdmin 4 interface with a query editor window. The code area contains several SQL statements:

```
1 CREATE INDEX IF NOT EXISTS idx_flights_actual_departure
2 ON flights(actual_departure);
3
4 CREATE UNIQUE INDEX IF NOT EXISTS idx_unique_flight_no_scheduled_departure
5 ON flights(flight_no, scheduled_departure);
6
7 CREATE INDEX IF NOT EXISTS idx_flights_departure_arrival
8 ON flights(departure_airport_id, arrival_airport_id);
9
10
11 -- Query by actual_departure
12 EXPLAIN ANALYZE
13 SELECT *
14 FROM flights
15 WHERE actual_departure = '2024-01-01';
16
17 -- Query by flight_no and scheduled_departure
18 EXPLAIN ANALYZE
19 SELECT *
20 FROM flights
21 WHERE flight_no = 'KC123' AND scheduled_departure = '2024-02-10';
```

The status bar at the bottom indicates "Total rows: 4" and "Query complete 00:00:00.075". A message box in the bottom right corner says: "You are currently running version 9.0 of pgAdmin 4, however the current version is 9.9." and "Please click [here](#) for more information."

CREATE INDEX IF NOT EXISTS idx_flights_actual_departure

ON flights(actual_departure);

```
CREATE UNIQUE INDEX IF NOT EXISTS
idx_unique_flight_no_scheduled_departure
ON flights(flight_no, scheduled_departure);
```

```
CREATE INDEX IF NOT EXISTS idx_flights_departure_arrival
ON flights(departure_airport_id, arrival_airport_id);
```

```
-- Query by actual_departure
```

```
EXPLAIN ANALYZE
```

```
SELECT *
```

```
FROM flights
```

```
WHERE actual_departure = '2024-01-01';
```

```
-- Query by flight_no and scheduled_departure
```

```
EXPLAIN ANALYZE
```

```
SELECT *
```

```
FROM flights
```

```
WHERE flight_no = 'KC123'
```

```
AND scheduled_departure = '2024-02-10';
```

```
-- Query by departure_airport_id and arrival_airport_id
```

```
EXPLAIN ANALYZE
```

```
SELECT *
```

FROM flights

WHERE departure_airport_id = 1

AND arrival_airport_id = 2;

The screenshot shows the pgAdmin 4 interface with a query editor window. The query is:

```
1 v EXPLAIN ANALYZE
2 SELECT *
3 FROM flights
4 WHERE departure_airport_id = 1
5   AND arrival_airport_id = 2;
6
```

The results pane displays the query plan:

text
1 Index Scan using idx_flights_departure_arrival on flights (cost=0.14.8.16 rows=1 width=512) (actual time=0.004..0.004 rows=0 loops=0)
2 Index Cond: ((departure_airport_id = 1) AND (arrival_airport_id = 2))
3 Planning Time: 2.219 ms
4 Execution Time: 0.034 ms

A success message is shown in the status bar: "Successfully run. Total query runtime: 41 msec. 4 rows affected." A warning message in a yellow box states: "You are currently running version 9.0 of pgAdmin 4, however the current version is 9.9." The bottom status bar shows: "Total rows: 4 Query complete 00:00:00.041" and "CRLF Ln 6, Col 1".

5

EXPLAIN ANALYZE

SELECT *

FROM flights

WHERE departure_airport_id = 1

AND arrival_airport_id = 2;

The screenshot shows the pgAdmin 4 interface. In the top navigation bar, 'File', 'Object', 'Tools', 'Edit', 'View', 'Window', and 'Help' are visible. The main window has a title bar 'Welcome lab_7/postgres@PostgreSQL 17*' and a toolbar with various icons. Below the toolbar is a 'Query History' section containing the following SQL code:

```
1 ✓ CREATE UNIQUE INDEX idx_passengers_passport_number
2   ON passengers (passport_number);
3   --checking
4 ✓ SELECT indexname, indexdef
5   FROM pg_indexes
6   WHERE tablename = 'passengers'
7     AND indexname = 'idx_passengers_passport_number';
8
```

Below the code, there's a 'Data Output' tab with a table showing the results of the query. The table has columns 'indexname' and 'indexdef'. One row is present:

indexname	indexdef
idx_passenger_passport_number	CREATE UNIQUE INDEX idx_passenger_passport_number ON public.passenger USING btree (passport_number)

A green success message at the top right says 'Successfully run. Total query runtime: 187 msec. 1 rows affected.' A yellow warning message in the center right says 'You are currently running version 9.0 of pgAdmin 4, however the current version is 9.9.' Below it is a link 'Please click here for more information.' At the bottom of the interface, status icons for Windows, Google Chrome, Microsoft Edge, and File Explorer are shown, along with system information like 'CRLF', 'Ln 3, Col 11', '12:42 PM', '11/8/2025', and network connectivity.

6

CREATE UNIQUE INDEX idx_passenger_passport_number

ON passenger (passport_number);

--checking

SELECT indexname, indexdef

FROM pg_indexes

WHERE tablename = 'passenger'

AND indexname = 'idx_passenger_passport_number';

The screenshot shows the pgAdmin 4 interface. In the top-left corner, there's a message: "You are currently running version 9.0 of pgAdmin 4, however the current version is 9.9." Below the message, a green status bar indicates: "Successfully run. Total query runtime: 92 msec. 4 rows affected." The main area contains a SQL query window with the following code:

```

1 ✓ CREATE INDEX idx_passengers_name_dob_citizenship
2   ON passengers (first_name, last_name, date_of_birth, country_of_citizenship);
3   ---analyze
4 ✓ EXPLAIN ANALYZE
5   SELECT passenger_id, first_name, last_name, date_of_birth, country_of_citizenship
6     FROM passengers
7    WHERE country_of_citizenship = 'Philippines'
8      AND date_of_birth BETWEEN '1984-01-01' AND '1984-12-31';

```

Below the code, the "Data Output" tab is selected, showing the query plan and execution details:

```

QUERY PLAN
text
1 Index Scan using idx_passengers_name_dob_citizenship on passengers (cost=0.14..9.40 rows=1 width=362) (actual time=0.001..0.001 rows=0)
2   Index Cond: ((date_of_birth >= '1984-01-01'::date) AND (date_of_birth <= '1984-12-31'::date) AND ((country_of_citizenship)::text = 'Philippines'::text))
3 Planning Time: 1.643 ms
4 Execution Time: 0.014 ms

```

The status bar at the bottom shows: "Total rows: 4 Query complete 00:00:00.092".

7

CREATE INDEX idx_passengers_name_dob_citizenship

**ON passengers (first_name, last_name, date_of_birth,
country_of_citizenship);**

---analyze

EXPLAIN ANALYZE

**SELECT passenger_id, first_name, last_name, date_of_birth,
country_of_citizenship**

FROM passengers

WHERE country_of_citizenship = 'Philippines'

AND date_of_birth BETWEEN '1984-01-01' AND '1984-12-31';

```
1 ✓ SELECT indexname, indexdef
2   FROM pg_indexes
3  WHERE tablename = 'passengers';
4
5 DROP INDEX IF EXISTS idx_passengers_passport_number;
6 DROP INDEX IF EXISTS idx_passengers_name_dob_country;
7
```

Data Output Messages Notifications

NOTICE: index "idx_passengers_passport_number" does not exist, skipping
NOTICE: index "idx_passengers_name_dob_country" does not exist, skipping
DROP INDEX

Query returned successfully in 50 msec.

✓ Query returned successfully in 50 msec. X

You are currently running version 9.0 of pgAdmin 4,
however the current version is 9.9.
Please click [here](#) for more information.

Total rows: Query complete 00:00:00.050 CRLF Ln 7, Col 1

8 12:46 PM 11/8/2025

8

```
SELECT indexname, indexdef
FROM pg_indexes
WHERE tablename = 'passengers';
```

```
DROP INDEX IF EXISTS idx_passengers_passport_number;
DROP INDEX IF EXISTS idx_passengers_name_dob_country;
```