PostgreSQL Lab1

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Track Python Fayoum

1. Install PostgreSQL DBMS.

The scenario is that as an instructor in ITI, you have grade-keeping responsibilities.

You want to convert the grading process from a manual operation using a gradebook to an electronic representation using database.

In this case:

- For each student, you keep track his name, contact info (email, address), and multiple phone numbers.
- Each Student belong to Track (Telecom, OpenSource, Java, Game,..), and each track have different students
- Each track have different subjects/courses such as (C, CPP, HTML, ...), and each student study subjects/courses based on the track that he belong to it
- For each subject, you need to define the name and the description and max score (total grade 100).
- The students achieve score in subject by exam result.
- For each exam which taken by student you must store Exam date, student score in exam (such as 75).

- Keep track of Students and Track which he belong to it, and subjects owned by Tack , and Subjects which will studied by each student

(Solution)

Student(#'student_id', name, email, address, *track_id)
Phones(#'phone_id', phone_number, student_id)

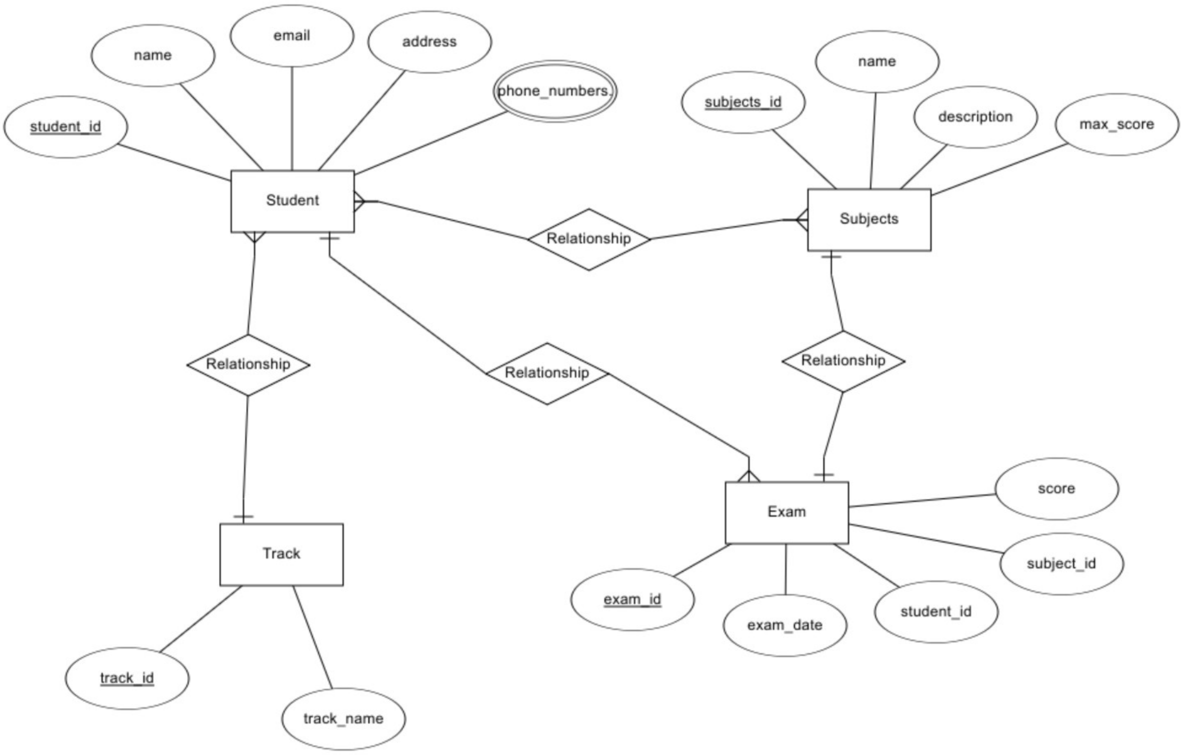
Track (#'track_id', track_name)

Subject (#'subject_id', subject_name, description, max_score, *track_id)
Student_Subjects(#'student_id', #'subject_id')

Exam (#"exam_id", exam_date, *student_id)
Exam_Results (#'exam_result_id', *student_id, *exam_id, score)

2. Design ERD and write down the mapping schema.

(solution)

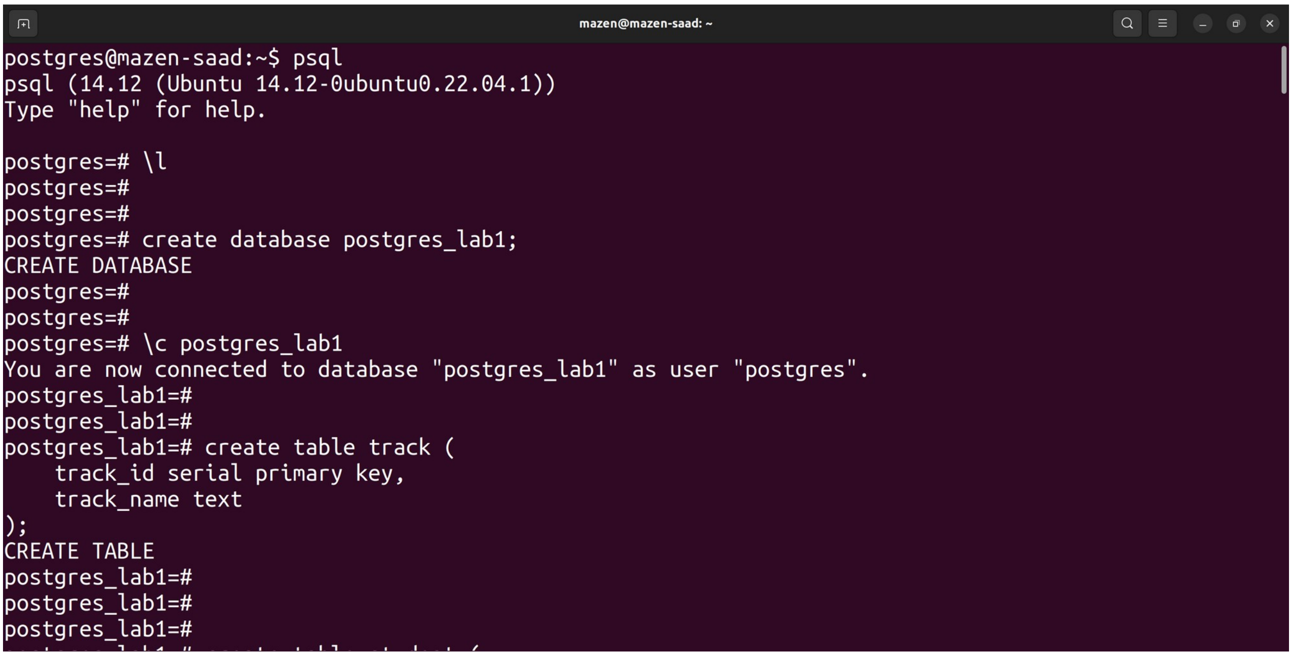


3. Create your mapped tables with their columns in PostgreSQL.

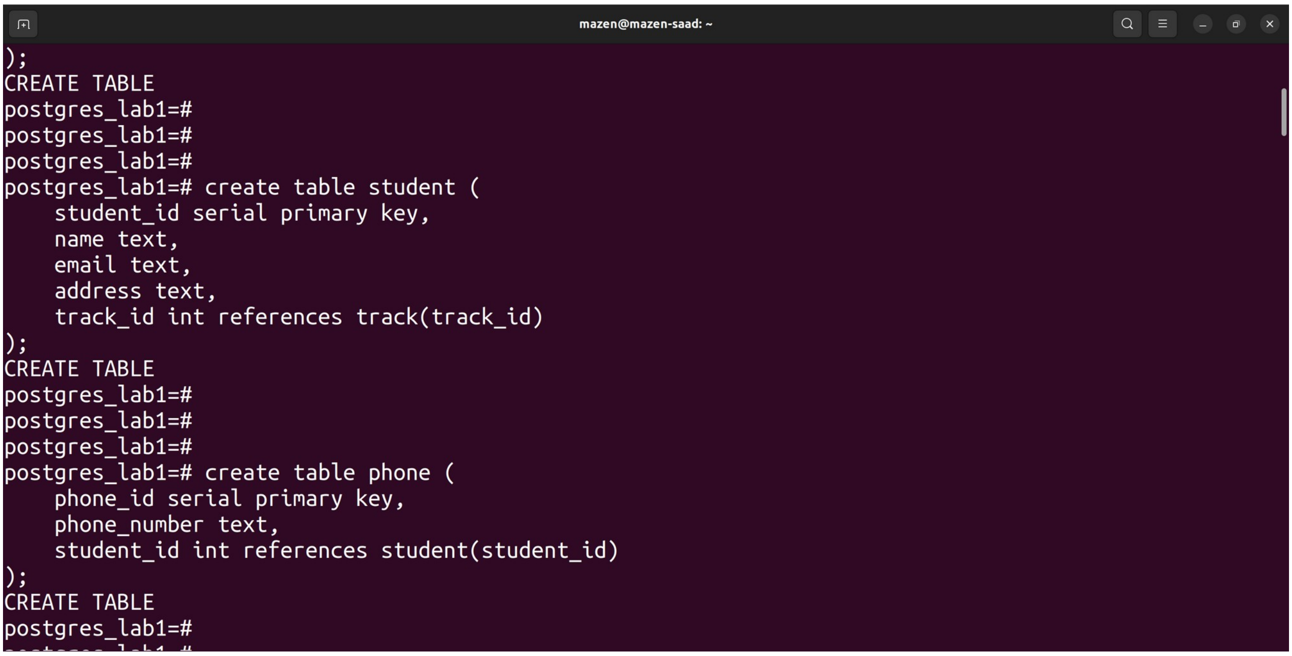
(solution)

```
su - postgres
psql
create database postgres_lab1;
\l
\c postgres_lab1


create table track (
   track_id serial primary key,
   track_name text
);

create table student (
   student_id serial primary key,
   name text,
   email text,
   address text,
   track_id int references track(track_id)
);
create table phone (
   phone_id serial primary key,
   phone_number text,
   student_id int references student(student_id)
);

create table subject (
   subject_id serial primary key,
   subject_name text,
   description text,
   max_score int,
   track_id int references track(track_id)
);
create table student_subjects (
   student_id int references student(student_id),
   subject_id int references subject(subject_id)
);
```

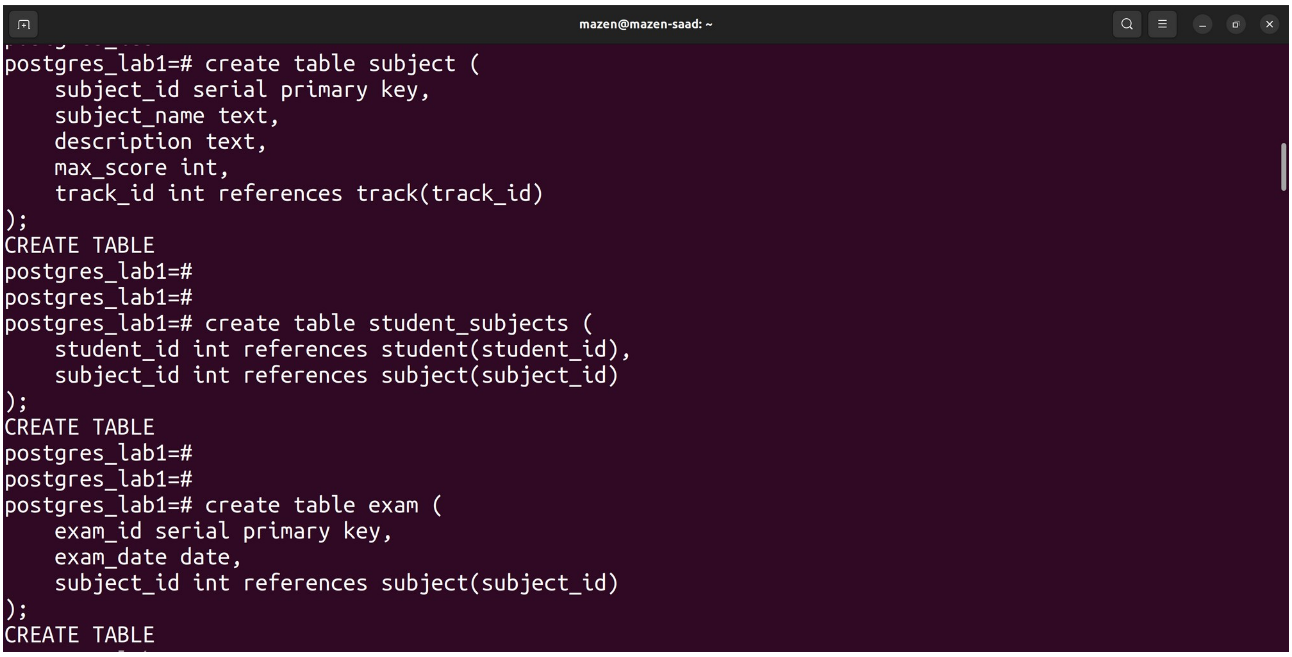
```
create table exam (
    exam_id serial primary key,
    exam_date date,
    subject_id int references subject(subject_id)
);
create table exam_results (
    exam_result_id serial primary key,
    student_id int references student(student_id),
    exam_id int references exam(exam_id),
    score int
);
```



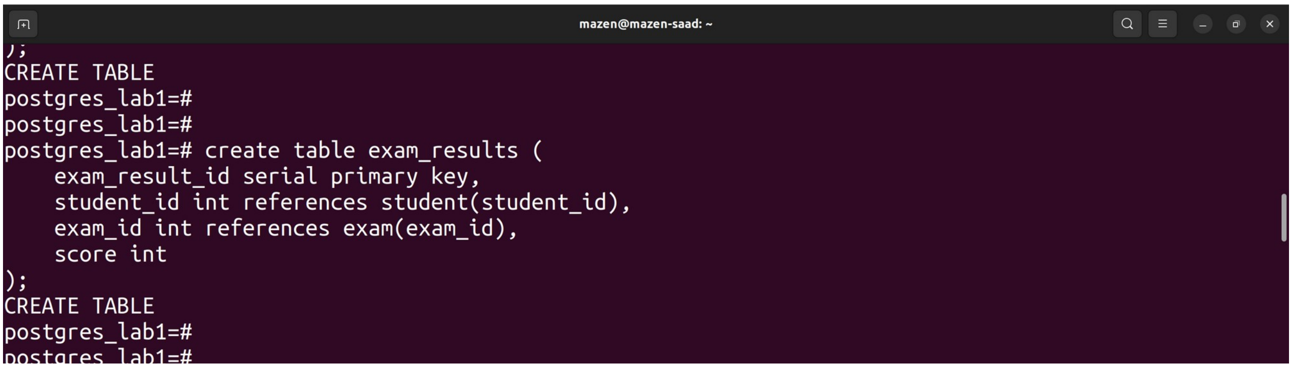
```
postgres@mazen-saad:~$ psql
psql (14.12 (Ubuntu 14.12-0ubuntu0.22.04.1))
Type "help" for help.

postgres=# \l
postgres=#
postgres=#
postgres=# create database postgres_lab1;
CREATE DATABASE
postgres=#
postgres=#
postgres=# \c postgres_lab1
You are now connected to database "postgres_lab1" as user "postgres".
postgres_lab1=#
postgres_lab1=#
postgres_lab1=# create table track (
    track_id serial primary key,
    track_name text
);
CREATE TABLE
postgres_lab1=#
postgres_lab1=#
postgres_lab1=#
```



```
);
CREATE TABLE
postgres_lab1=#
postgres_lab1=#
postgres_lab1=#
postgres_lab1=# create table student (
    student_id serial primary key,
    name text,
    email text,
    address text,
    track_id int references track(track_id)
);
CREATE TABLE
postgres_lab1=#
postgres_lab1=#
postgres_lab1=#
postgres_lab1=# create table phone (
    phone_id serial primary key,
    phone_number text,
    student_id int references student(student_id)
);
CREATE TABLE
postgres_lab1=#
```



```
postgres_lab1=# create table subject (
    subject_id serial primary key,
    subject_name text,
    description text,
    max_score int,
    track_id int references track(track_id)
);
CREATE TABLE
postgres_lab1=#
postgres_lab1=#
postgres_lab1=# create table student_subjects (
    student_id int references student(student_id),
    subject_id int references subject(subject_id)
);
CREATE TABLE
postgres_lab1=#
postgres_lab1=#
postgres_lab1=# create table exam (
    exam_id serial primary key,
    exam_date date,
    subject_id int references subject(subject_id)
);
CREATE TABLE
```



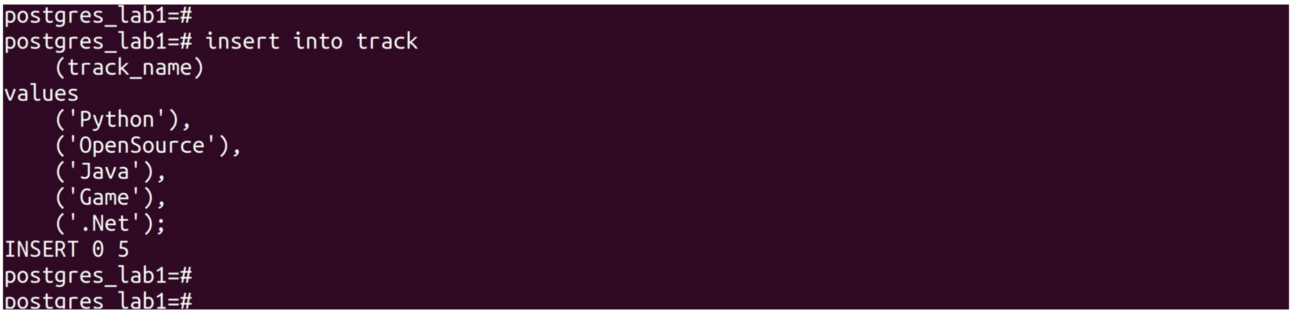
```
);
CREATE TABLE
postgres_lab1=#
postgres_lab1=#
postgres_lab1=# create table exam_results (
    exam_result_id serial primary key,
    student_id int references student(student_id),
    exam_id int references exam(exam_id),
    score int
);
CREATE TABLE
postgres_lab1=#
postgres_lab1=#
```

4. Insert at minimum 5 Rows at each table

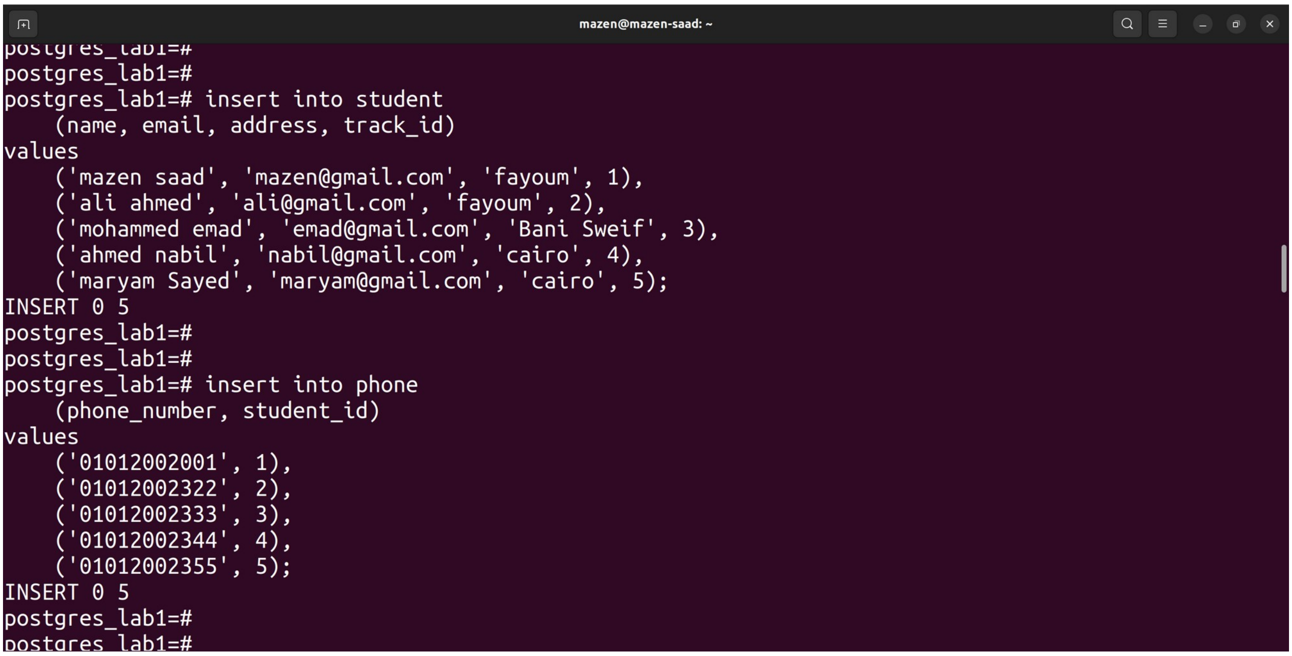
(solution)

```
insert into track
   (track_name)
values
   ('Python'),
   ('OpenSource'),
   ('Java'),
   ('Game'),
   ('.Net');

insert into student
   (name, email, address, track_id)
values
   ('mazen saad', 'mazen@gmail.com', 'fayoum', 1),
   ('ali ahmed', 'ali@gmail.com', 'fayoum', 2),
   ('mohammed emad', 'emad@gmail.com', 'Bani Sweif', 3),
   ('ahmed nabil', 'nabil@gmail.com', 'cairo', 4),
   ('maryam Sayed', 'maryam@gmail.com', 'cairo', 5);

insert into phone
   (phone_number, student_id)
values
   ('01012002001', 1),
   ('01012002322', 2),
   ('01012002333', 3),
   ('01012002344', 4),
   ('01012002355', 5);

insert into subject
   (subject_name, description, max_score, track_id)
values
   ('C Programming', 'Introduction to C programming.', 100, 1),
   ('C++ Programming', 'Advanced C++ concepts.', 100, 2),
   ('Java', 'Introduction to Java programming.', 100, 3),
   ('HTML', 'Basic HTML and web development.', 100, 4),
   ('CSS', 'Basic CSS and web development.', 100, 5);
```

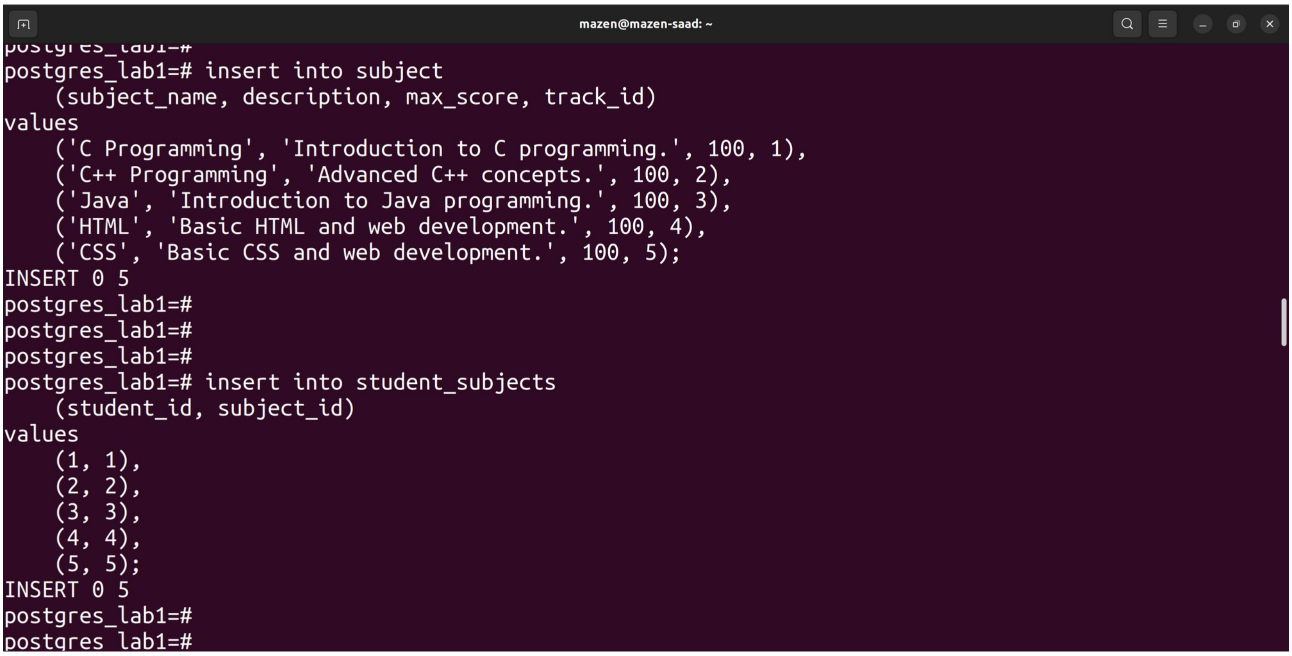
```
insert into student_subjects
   (student_id, subject_id)
values
   (1, 1),
   (2, 2),
   (3, 3),
   (4, 4),
   (5, 5);

insert into exam
   (exam_date, subject_id)
values
   ('2024-07-01', 1),
   ('2024-07-02', 2),
   ('2024-07-03', 3),
   ('2024-07-04', 4),
   ('2024-07-05', 5);

insert into exam_results
   (student_id, exam_id, score)
values
   (1, 1, 86),
   (2, 2, 77),
   (3, 3, 65),
   (4, 4, 50),
   (5, 5, 35);

\d

select * from student;
select * from phone;

select * from track;

select * from subject;
select * from student_subjects;

select * from exam;
select * from exam_results;
```



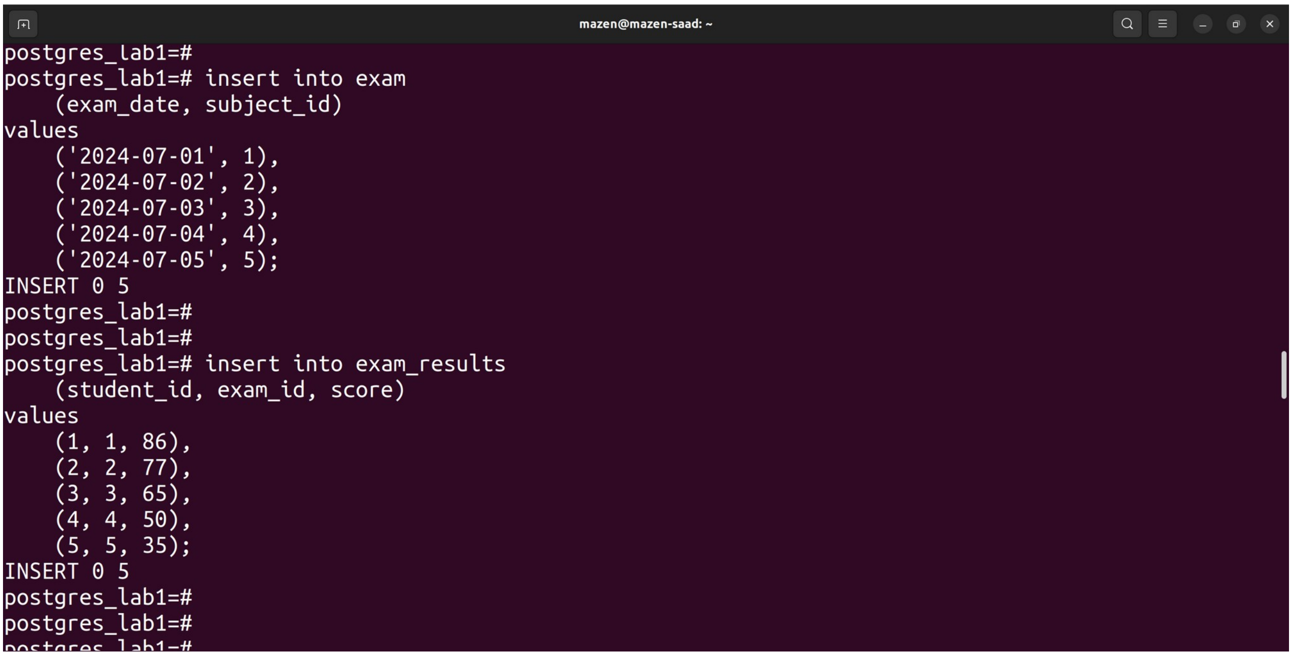
```
postgres_lab1=#
postgres_lab1=# insert into track
    (track_name)
values
    ('Python'),
    ('OpenSource'),
    ('Java'),
    ('Game'),
    ('.Net');
INSERT 0 5
postgres_lab1=#
postgres_lab1=#
```



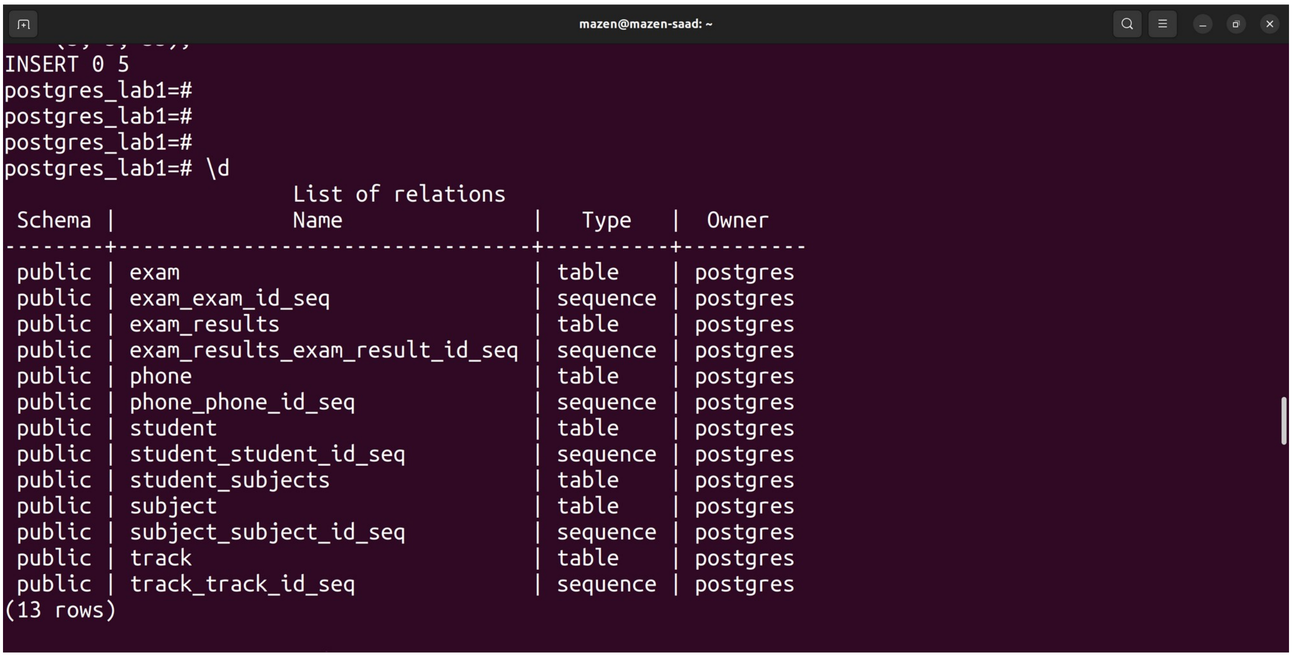
```
postgres_lab1=#
postgres_lab1=#
postgres_lab1=# insert into student
    (name, email, address, track_id)
values
    ('mazen saad', 'mazen@gmail.com', 'fayoum', 1),
    ('ali ahmed', 'ali@gmail.com', 'fayoum', 2),
    ('mohammed emad', 'emad@gmail.com', 'Bani Sweif', 3),
    ('ahmed nabil', 'nabil@gmail.com', 'cairo', 4),
    ('maryam Sayed', 'maryam@gmail.com', 'cairo', 5);
INSERT 0 5
postgres_lab1=#
postgres_lab1=#
postgres_lab1=# insert into phone
    (phone_number, student_id)
values
    ('01012002001', 1),
    ('01012002322', 2),
    ('01012002333', 3),
    ('01012002344', 4),
    ('01012002355', 5);
INSERT 0 5
postgres_lab1=#
postgres_lab1=#
```



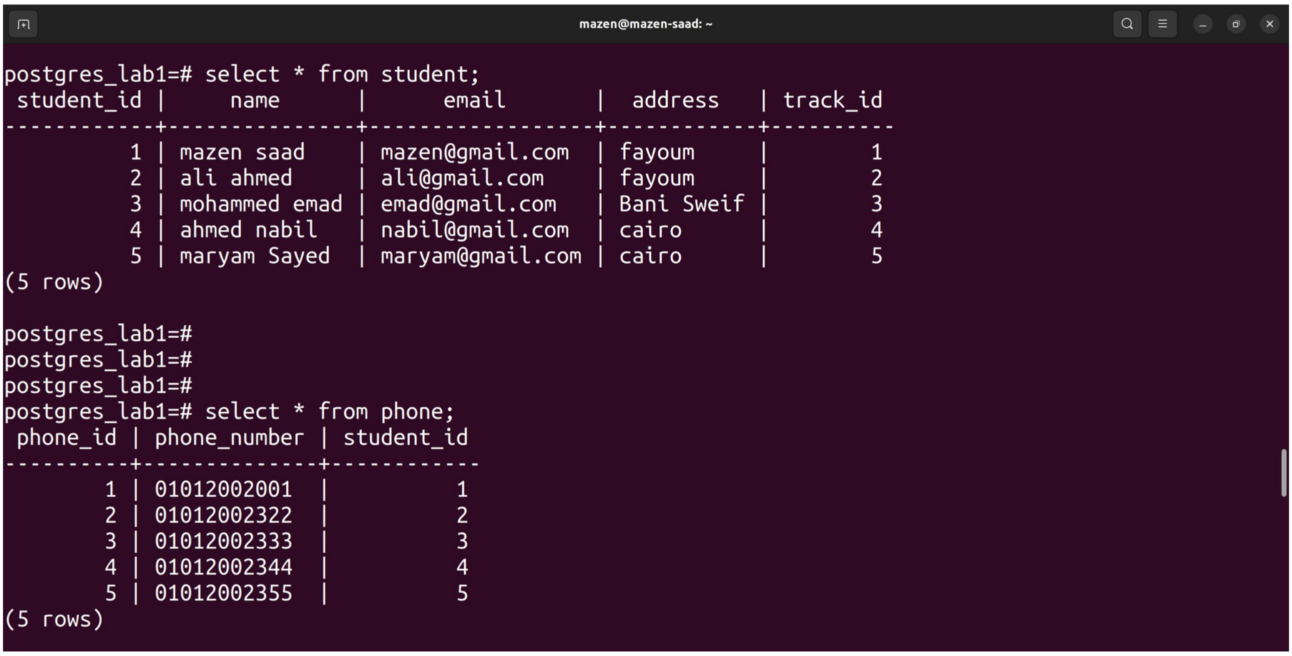
```
postgres_lab1=#
postgres_lab1=# insert into subject
    (subject_name, description, max_score, track_id)
values
    ('C Programming', 'Introduction to C programming.', 100, 1),
    ('C++ Programming', 'Advanced C++ concepts.', 100, 2),
    ('Java', 'Introduction to Java programming.', 100, 3),
    ('HTML', 'Basic HTML and web development.', 100, 4),
    ('CSS', 'Basic CSS and web development.', 100, 5);
INSERT 0 5
postgres_lab1=#
postgres_lab1=#
postgres_lab1=#
postgres_lab1=# insert into student_subjects
    (student_id, subject_id)
values
    (1, 1),
    (2, 2),
    (3, 3),
    (4, 4),
    (5, 5);
INSERT 0 5
postgres_lab1=#
postgres_lab1=#
```



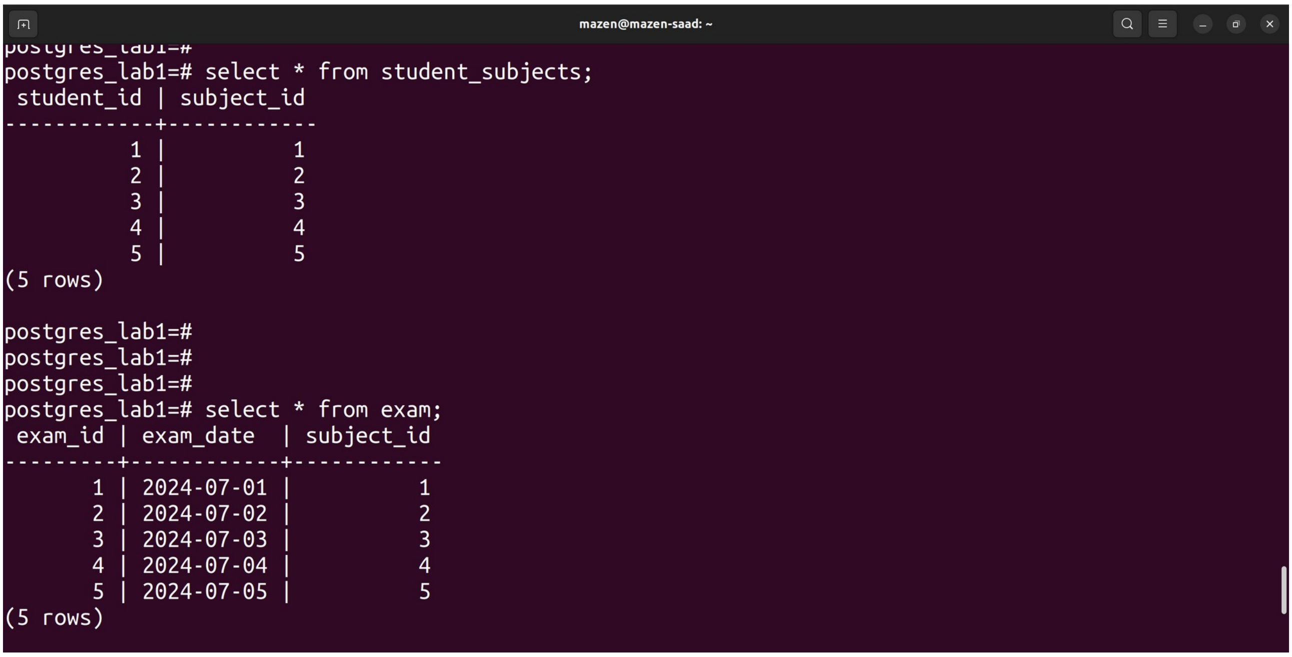
```
postgres_lab1=#
postgres_lab1=# insert into exam
    (exam_date, subject_id)
values
    ('2024-07-01', 1),
    ('2024-07-02', 2),
    ('2024-07-03', 3),
    ('2024-07-04', 4),
    ('2024-07-05', 5);
INSERT 0 5
postgres_lab1=#
postgres_lab1=#
postgres_lab1=# insert into exam_results
    (student_id, exam_id, score)
values
    (1, 1, 86),
    (2, 2, 77),
    (3, 3, 65),
    (4, 4, 50),
    (5, 5, 35);
INSERT 0 5
postgres_lab1=#
postgres_lab1=#
postgres_lab1=#
```



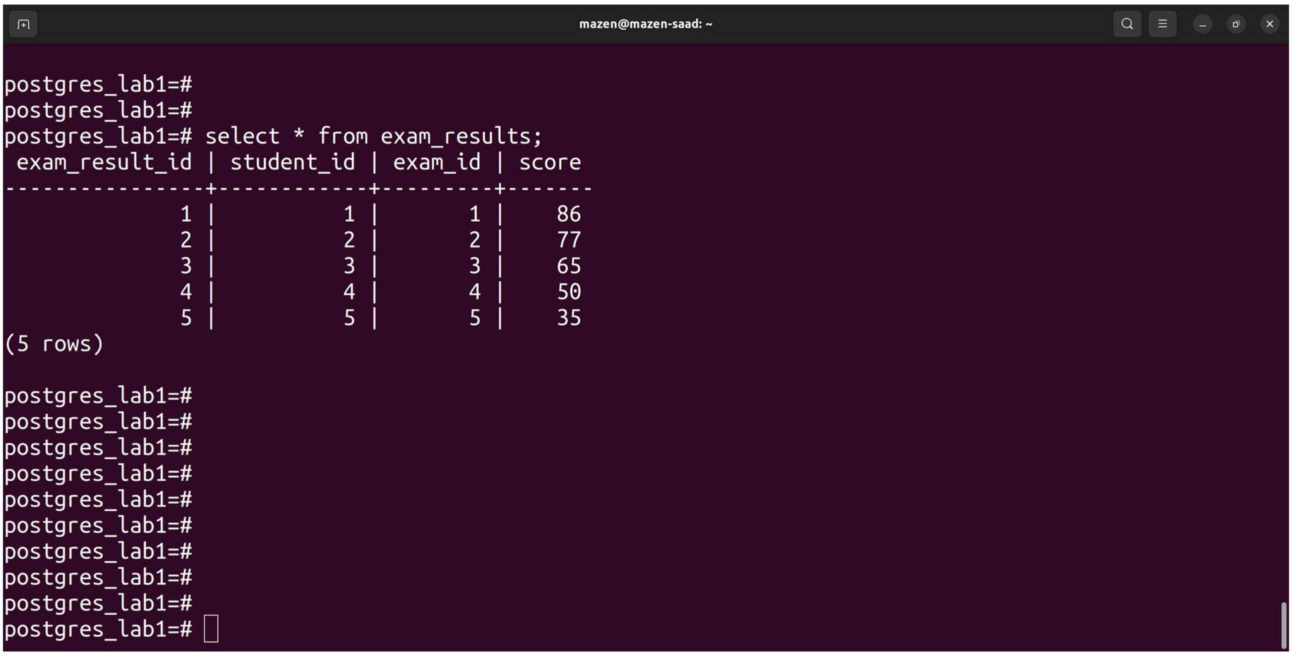
```
    (5, 5, 35);
INSERT 0 5
postgres_lab1=#
postgres_lab1=#
postgres_lab1=#
postgres_lab1=# \d
                     List of relations
 Schema |               Name                |   Type   |  Owner
--------+-----------------------------------+----------+----------
 public | exam                              | table    | postgres
 public | exam_exam_id_seq                  | sequence | postgres
 public | exam_results                      | table    | postgres
 public | exam_results_exam_result_id_seq   | sequence | postgres
 public | phone                             | table    | postgres
 public | phone_phone_id_seq                | sequence | postgres
 public | student                           | table    | postgres
 public | student_student_id_seq            | sequence | postgres
 public | student_subjects                  | table    | postgres
 public | subject                           | table    | postgres
 public | subject_subject_id_seq            | sequence | postgres
 public | track                             | table    | postgres
 public | track_track_id_seq                | sequence | postgres
(13 rows)
```



```
postgres_lab1=# select * from student;
 student_id |     name      |       email       |  address   | track_id
------------+---------------+-------------------+------------+----------
          1 | mazen saad    | mazen@gmail.com   | fayoum     |        1
          2 | ali ahmed     | ali@gmail.com     | fayoum     |        2
          3 | mohammed emad | emad@gmail.com    | Bani Sweif |        3
          4 | ahmed nabil   | nabil@gmail.com   | cairo      |        4
          5 | maryam Sayed  | maryam@gmail.com  | cairo      |        5
(5 rows)

postgres_lab1=#
postgres_lab1=#
postgres_lab1=#
postgres_lab1=# select * from phone;
 phone_id | phone_number | student_id
----------+--------------+------------
        1 | 01012002001  |          1
        2 | 01012002322  |          2
        3 | 01012002333  |          3
        4 | 01012002344  |          4
        5 | 01012002355  |          5
(5 rows)
```



```
postgres_lab1=#
postgres_lab1=# select * from student_subjects;
 student_id | subject_id
------------+------------
          1 |          1
          2 |          2
          3 |          3
          4 |          4
          5 |          5
(5 rows)

postgres_lab1=#
postgres_lab1=#
postgres_lab1=#
postgres_lab1=# select * from exam;
 exam_id | exam_date  | subject_id
---------+------------+------------
       1 | 2024-07-01 |          1
       2 | 2024-07-02 |          2
       3 | 2024-07-03 |          3
       4 | 2024-07-04 |          4
       5 | 2024-07-05 |          5
(5 rows)
```



```
postgres_lab1=#
postgres_lab1=#
postgres_lab1=# select * from exam_results;
 exam_result_id | student_id | exam_id | score
----------------+------------+---------+-------
              1 |          1 |       1 |    86
              2 |          2 |       2 |    77
              3 |          3 |       3 |    65
              4 |          4 |       4 |    50
              5 |          5 |       5 |    35
(5 rows)

postgres_lab1=#
postgres_lab1=#
postgres_lab1=#
postgres_lab1=#
postgres_lab1=#
postgres_lab1=#
postgres_lab1=#
postgres_lab1=#
postgres_lab1=#
postgres_lab1=#
```

Reports :-

1. What is NoSQL?

(solution)

NoSQL refers to a variety of database systems that are designed to handle unstructured data and provide flexible schema structures. Unlike traditional relational databases, NoSQL databases are often used for applications requiring horizontal scaling, high performance, and the ability to handle large volumes of diverse data types.

2. DBMSs Types (such as: Hierarchical,...) and brief about each type? Reports Reports

(solution)

1- Hierarchical DBMS: Data is organized in a tree-like structure (e.g., IBM's Information Management System). It's useful for applications with a clear hierarchical relationship, but lacks flexibility in querying data.

2- Network DBMS: Data is structured as a graph, with nodes and relationships (e.g., Integrated Data Store). It supports more complex relationships than hierarchical DBMS but can be harder to manage.

3- Relational DBMS (RDBMS): Data is organized in tables with rows and columns. Tables can be related to each other through foreign keys. Examples include PostgreSQL, MySQL, and Oracle. It is widely used due to its support for complex queries and data integrity.

4- Object-Oriented DBMS: Stores data as objects, similar to object-oriented programming. Examples include ObjectDB and db4o. It's used in applications requiring complex data modeling and relationships.

5- NoSQL DBMS: Designed for unstructured data and horizontal scaling, including document, key-value, column-family, and graph stores (e.g., MongoDB, Redis, Cassandra, Neo4j).