SOUTHEAST UNIVERSITY

Department of Computer Science and Engineering

Database Design Project

Course Name:Database Design Lab
Course Code :CSE384.6
Section : 06

SUBMITTED TO:

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SUBMITTED BY:

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● INTRODUCTION

◆ Overview of the System

The **Shuttle Management System** is a database-based system designed to manage shuttle transportation services in an organization or university. The system helps in maintaining information about shuttles, drivers, routes, schedules, and passengers in an organized and efficient manner.

This system reduces manual work, improves data accuracy, and ensures smooth transportation management.

◆ Objectives of the Project

The main objectives of this project are:

1. To store and manage shuttle, driver, and route information efficiently
2. To keep track of passenger details and shuttle schedules
3. To reduce manual record keeping
4. To provide easy access to transportation data
5. To improve overall transportation management efficiency

◆ Scope of the Project

The scope of this project includes:

1) Managing shuttle details such as shuttle number, capacity, and type
2) Managing driver information
3) Managing routes and timings
4) Tracking passenger usage
5) Generating useful reports using SQL queries

● REQUIREMENTS DESCRIPTION

◆ System Description

The **Shuttle Management System** is designed to manage the transportation services of a university. It helps in organizing shuttle vehicles, drivers, routes, schedules, and passenger details in a structured database. The system reduces manual record keeping and makes shuttle operations more efficient and reliable.

The system stores all necessary information digitally so that administrators can easily manage shuttle operations and retrieve information when needed.

◆ Entities Involved

The main entities involved in the system are:

1. **Shuttle**
   Stores information about each shuttle such as shuttle ID, registration number, capacity, and type.
2. **Driver**
   Stores driver details like driver ID, name, contact number, and license number.
3. **Route**
   Contains route information including route ID, starting point, destination, and distance.
4. **Schedule**
   Stores shuttle timing details such as departure time, arrival time, and assigned route.
5. **Passenger**
   Stores passenger details like passenger ID, name, department, and contact number.

◆ System Users

The system can be accessed by the following users:

1)Administrator

->Manages shuttles, drivers, routes, and schedules.

->Updates and maintains the database.

2)Passengers (Students/Staff)

->Use shuttle services and are registered in the system.

◆ Functional Requirements

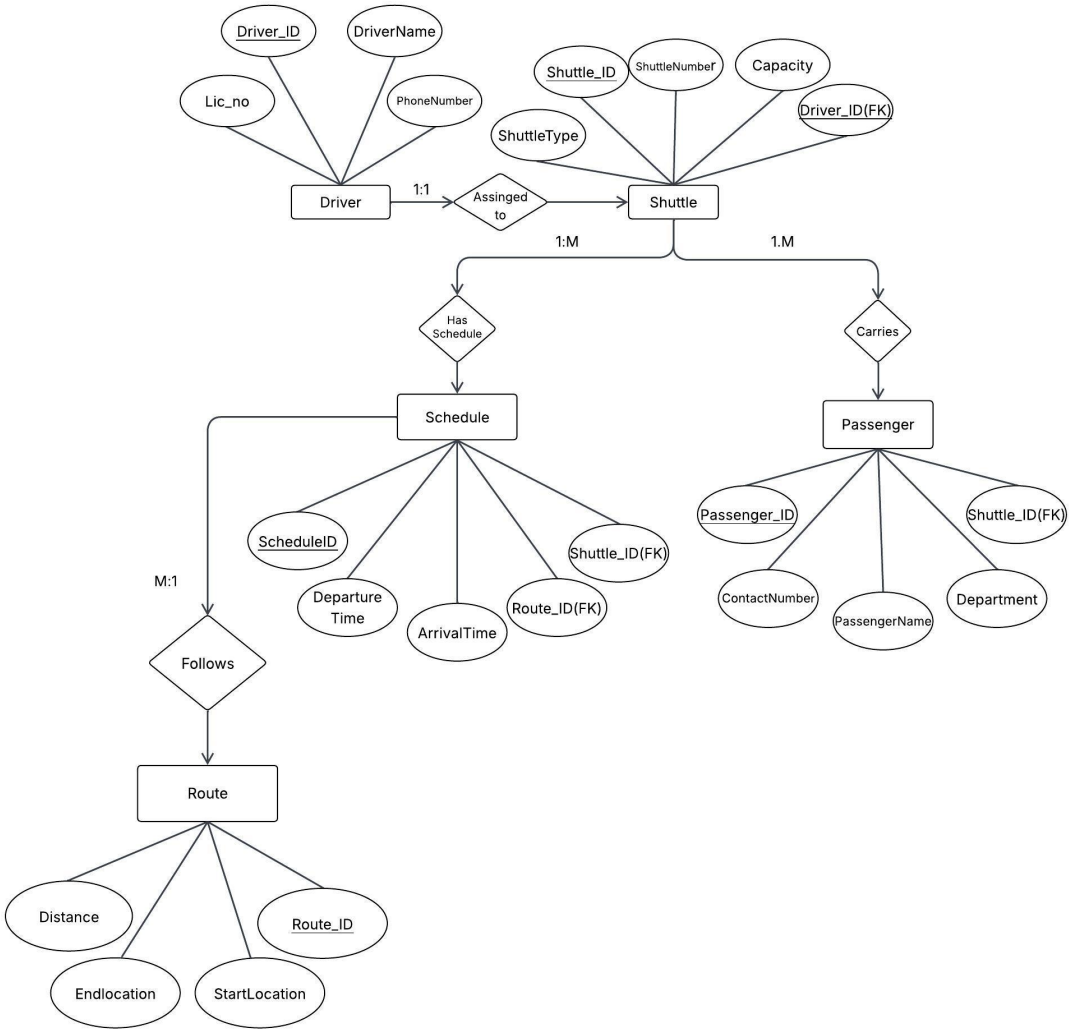
The system should be able to:

1. Add, update, and delete shuttle information
2. Maintain driver and passenger records

3. Assign drivers to shuttles
4. Assign routes and schedules to shuttles
5. Store and retrieve passenger travel data
6. Generate reports related to shuttles, routes, and passengers

● E-R Diagram:

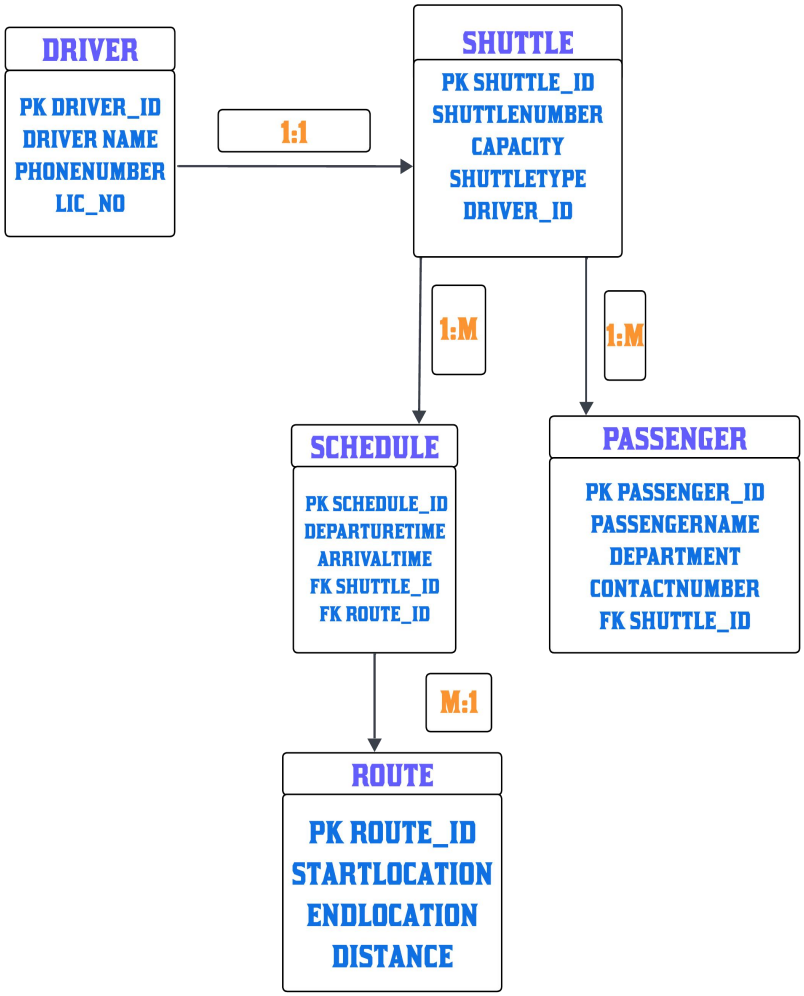
The ER diagram shows the overall structure of the Shuttle Management System by representing entities, attributes, and relationships. It provides a clear conceptual view of the database design.Tool used:**Lucidchart**



● Relational Schema:

Based on the ER diagram, the relational schema is developed by transforming entities into relations and relationships into foreign key constraints. The relational schema clearly represents table structures,

primary keys, and foreign key relationships of the Shuttle Management System.



● Normalization and Final Relational Schema:

Normalization is the process of organizing data in a database to reduce redundancy and improve data integrity. In this project, the database is normalized up to Third Normal Form (3NF).

◆ First Normal Form (1NF):

Definition:
A relation is in First Normal Form (1NF) if:

1. All attributes contain atomic values.
2. There are no repeating groups.

3. Each table has a primary key.

Application in Shuttle Management System:

All tables in this project contain atomic values and have defined primary keys. No multi-valued or repeating attributes exist.
The Conclusion is all relations satisfy **1NF**.

◆ Second Normal Form (2NF):

Definition:
A relation is in Second Normal Form (2NF) if:

1. It is already in 1NF.
2. There is no partial dependency on a composite primary key.

Application in Shuttle Management System:

All relations use single-attribute primary keys. Therefore, no partial dependency exists.
The Conclusion is all relations satisfy **2NF**.

◆ Third Normal Form (3NF):

Definition:
A relation is in Third Normal Form (3NF) if:

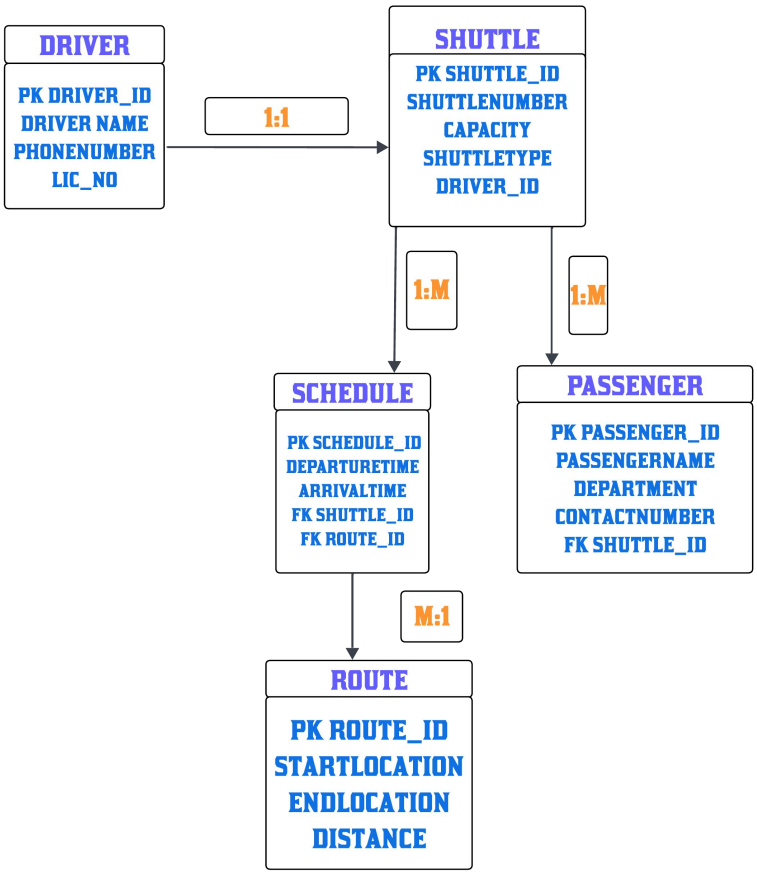
1. It is already in 2NF.
2. There is no transitive dependency among non-key attributes.

Application in Shuttle Management System:

All non-key attributes in each table depend only on their respective primary keys. No transitive dependency is found.
The Conclusion is all relations satisfy **3NF**.

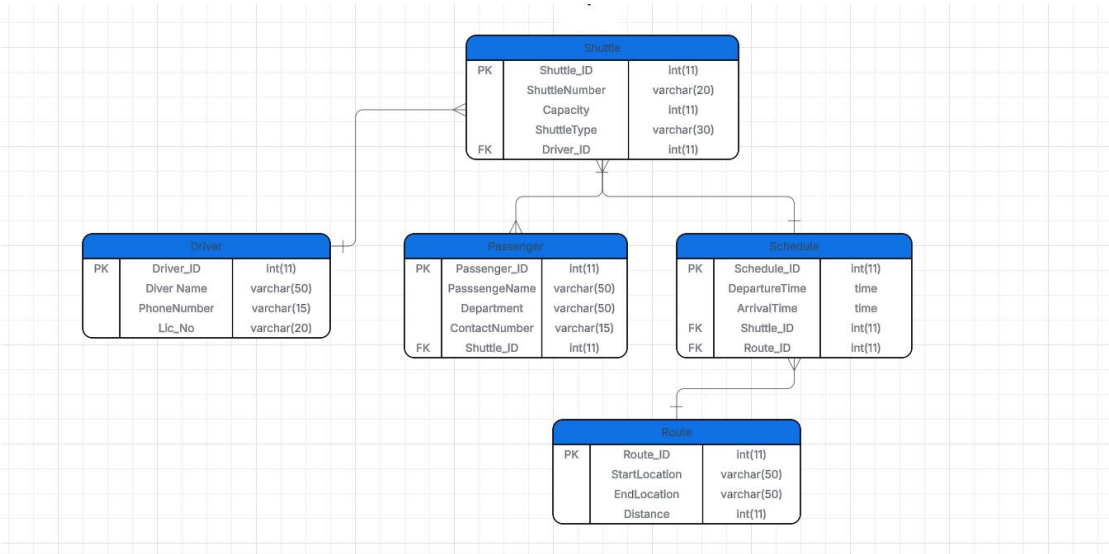
◆ Final Relational Schema:

So the Relational Schema remain same after Normalization.



- **Database Schema**

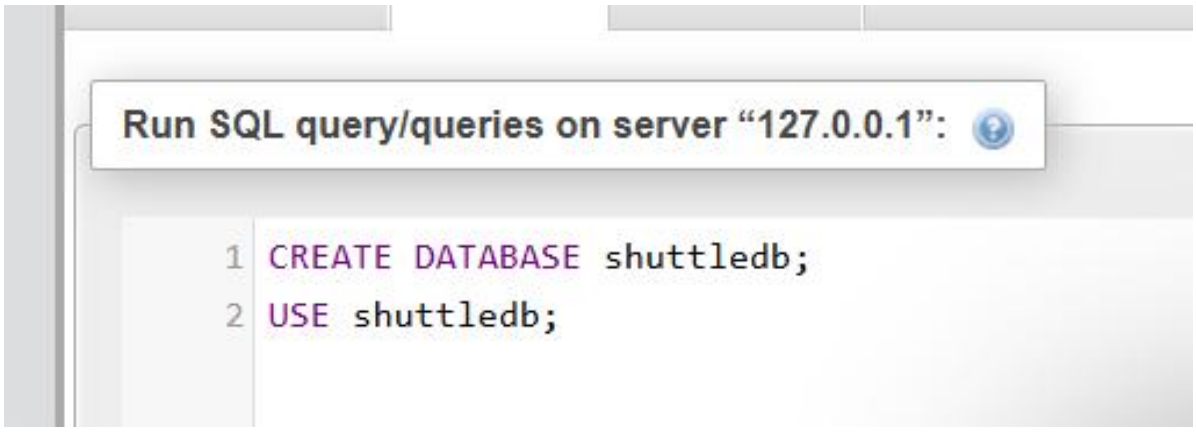
The database schema defines the physical structure of the database using SQL. It includes table definitions, data types, primary keys, and foreign key constraints. The schema is implemented using SQL CREATE DATABASE and CREATE TABLE statements for the Shuttle Management System.



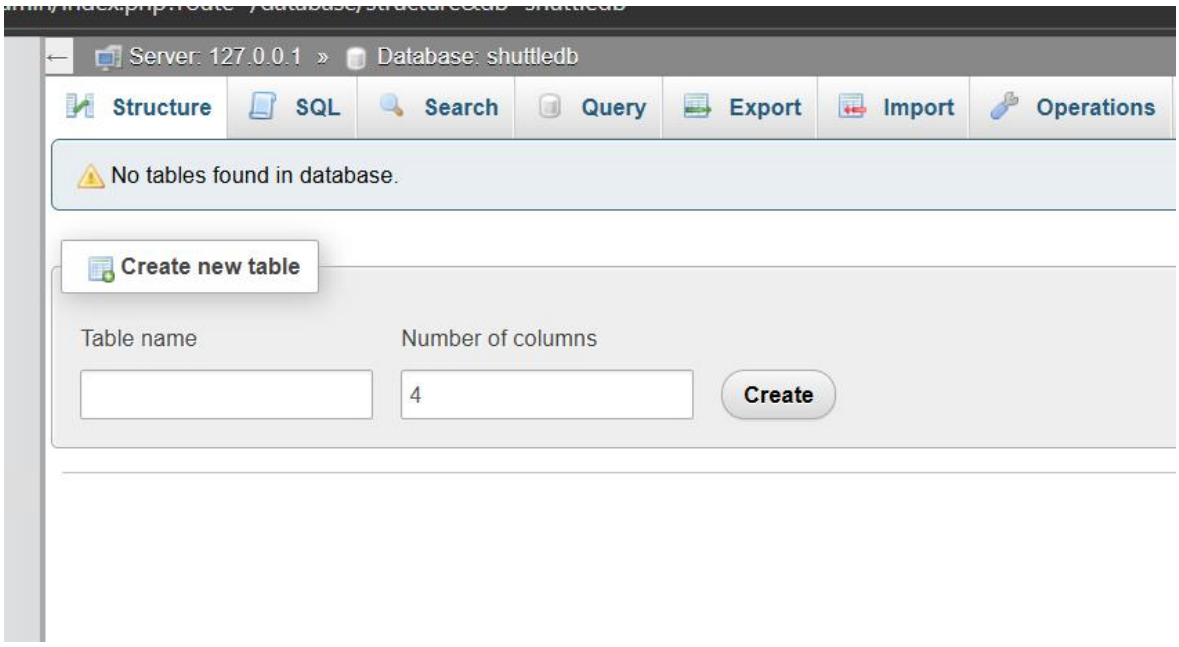
- **Database Implementation (SQL Scripts)**:

- CREATE DATABASE:

Input:



Output:



- CREATE TABLE Driver:

Input:

Run SQL query/queries on database shuttledb:

```sql
CREATE TABLE Driver (
    Driver_ID INT PRIMARY KEY,
    DriverName VARCHAR(50),
    PhoneNumber VARCHAR(15),
    Lic_no VARCHAR(20)
);
```

Output:

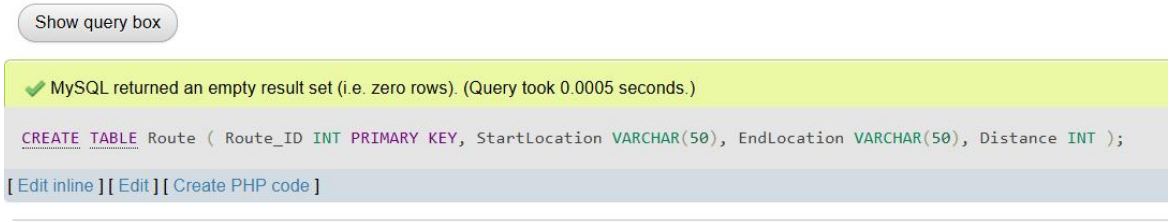
- CREATE TABLE Route:

Input:

Run SQL query/queries on database shuttledb:

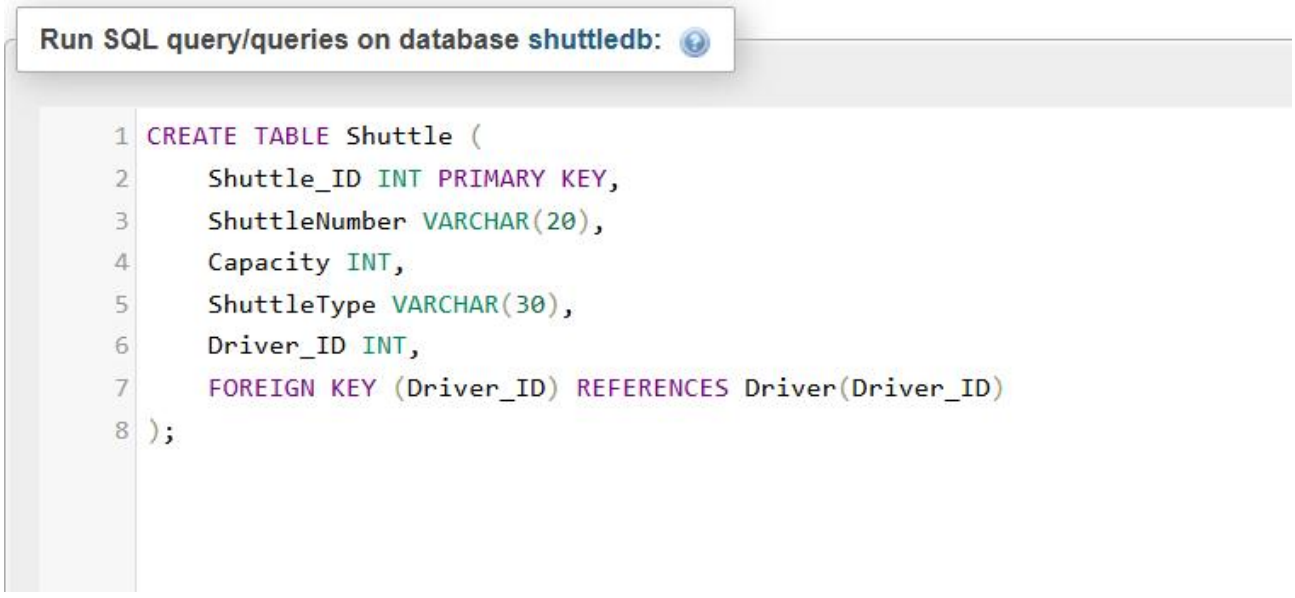
```sql
CREATE TABLE Route (
    Route_ID INT PRIMARY KEY,
    StartLocation VARCHAR(50),
    EndLocation VARCHAR(50),
    Distance INT
);
```

Output:

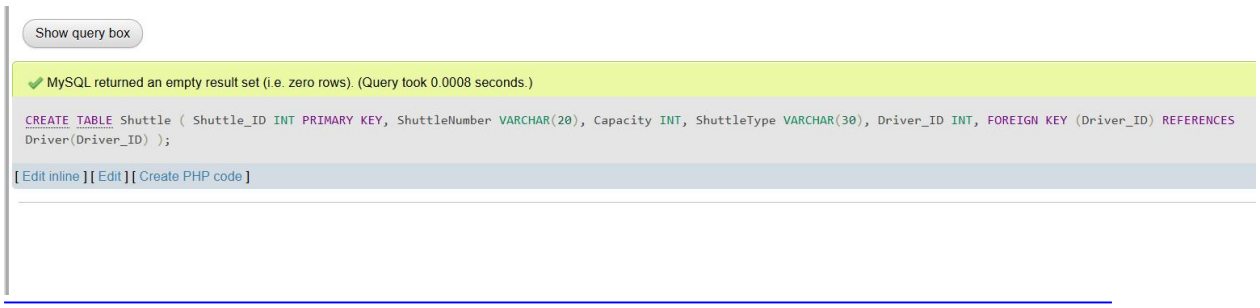


- CREATE TABLE Shuttle:

Input:



Output:



- CREATE TABLE Schedule:

Input:

Run SQL query/queries on database shuttledb:

```sql
CREATE TABLE Schedule (
    Schedule_ID INT PRIMARY KEY,
    DepartureTime TIME,
    ArrivalTime TIME,
    Shuttle_ID INT,
    Route_ID INT,
    FOREIGN KEY (Shuttle_ID) REFERENCES Shuttle(Shuttle_ID),
    FOREIGN KEY (Route_ID) REFERENCES Route(Route_ID)
);
```

Output:

Show query box

MySQL returned an empty result set (i.e. zero rows). (Query took 0.0006 seconds.)

```sql
CREATE TABLE Schedule ( Schedule_ID INT PRIMARY KEY, DepartureTime TIME, ArrivalTime TIME, Shuttle_ID INT, Route_ID INT, FOREIGN KEY (Shuttle_ID) REFERENCES Shuttle(Shuttle_ID), FOREIGN KEY (Route_ID) REFERENCES Route(Route_ID) );
```

[Edit inline] [Edit] [Create PHP code]

- CREATE TABLE Passenger:

Input:

Run SQL query/queries on database shuttledb:

```sql
CREATE TABLE Passenger (
    Passenger_ID INT PRIMARY KEY,
    PassengerName VARCHAR(50),
    Department VARCHAR(50),
    ContactNumber VARCHAR(15),
    Shuttle_ID INT,
    FOREIGN KEY (Shuttle_ID) REFERENCES Shuttle(Shuttle_ID)
);
```

Output:

Show query box

MySQL returned an empty result set (i.e. zero rows). (Query took 0.0004 seconds.)

```sql
CREATE TABLE Passenger ( Passenger_ID INT PRIMARY KEY, PassengerName VARCHAR(50), Department VARCHAR(50), ContactNumber VARCHAR(15), Shuttle_ID INT, FOREIGN KEY (Shuttle_ID) REFERENCES Shuttle(Shuttle_ID) );
```

[Edit inline] [Edit] [Create PHP code]

- INSERT:

INSERT INTO Driver VALUES:

Input:

Run SQL query/queries on table shuttledb.driver:

```
INSERT INTO Driver VALUES
(1,'Rahim','01711111111','LIC101'),
(2,'Karim','01722222222','LIC102'),
(3,'Salam','01733333333','LIC103'),
(4,'Jamal','01744444444','LIC104'),
(5,'Kamal','01755555555','LIC105'),
(6,'Babul','01766666666','LIC106'),
(7,'Rasel','01777777777','LIC107'),
(8,'Imran','01788888888','LIC108'),
(9,'Noman','01799999999','LIC109'),
(10,'Arif','01800000000','LIC110');
```

Output:

Extra options

	Driver_ID	DriverName	PhoneNumber	Lic_no
Edit Copy Delete	1	Rahim	01711111111	LIC101
Edit Copy Delete	2	Karim	01722222222	LIC102
Edit Copy Delete	3	Salam	01733333333	LIC103
Edit Copy Delete	4	Jamal	01744444444	LIC104
Edit Copy Delete	5	Kamal	01755555555	LIC105
Edit Copy Delete	6	Babul	01766666666	LIC106
Edit Copy Delete	7	Rasel	01777777777	LIC107
Edit Copy Delete	8	Imran	01788888888	LIC108
Edit Copy Delete	9	Noman	01799999999	LIC109
Edit Copy Delete	10	Arif	01800000000	LIC110

Check all *With selected:* Edit Copy Delete Export

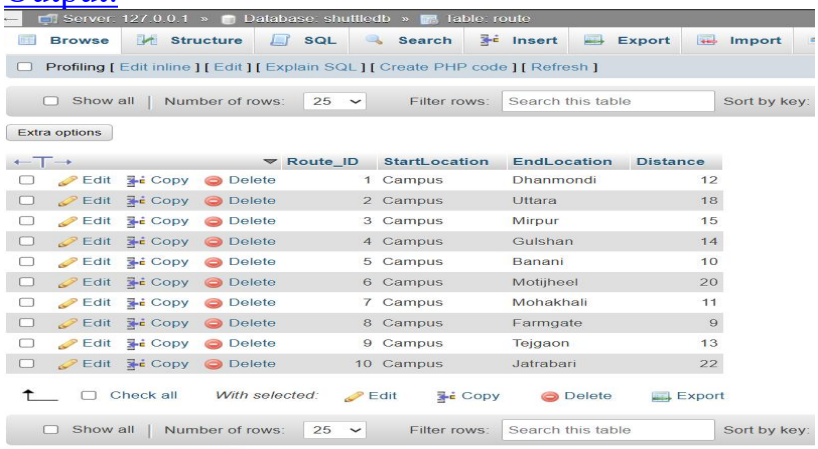
- INSERT INTO Route VALUES:

Input:

Run SQL query/queries on table shuttledb.route:

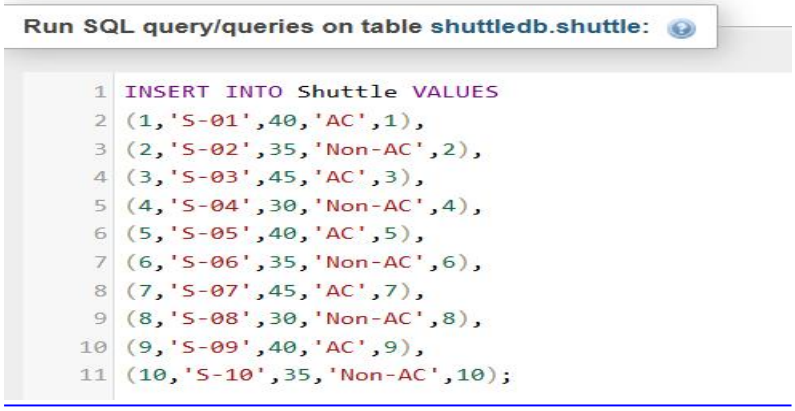
```
INSERT INTO Route VALUES
(1,'Campus','Dhanmondi',12),
(2,'Campus','Uttara',18),
(3,'Campus','Mirpur',15),
(4,'Campus','Gulshan',14),
(5,'Campus','Banani',10),
(6,'Campus','Motijheel',20),
(7,'Campus','Mohakhali',11),
(8,'Campus','Farmgate',9),
(9,'Campus','Tejgaon',13),
(10,'Campus','Jatrabari',22);
```

Output:

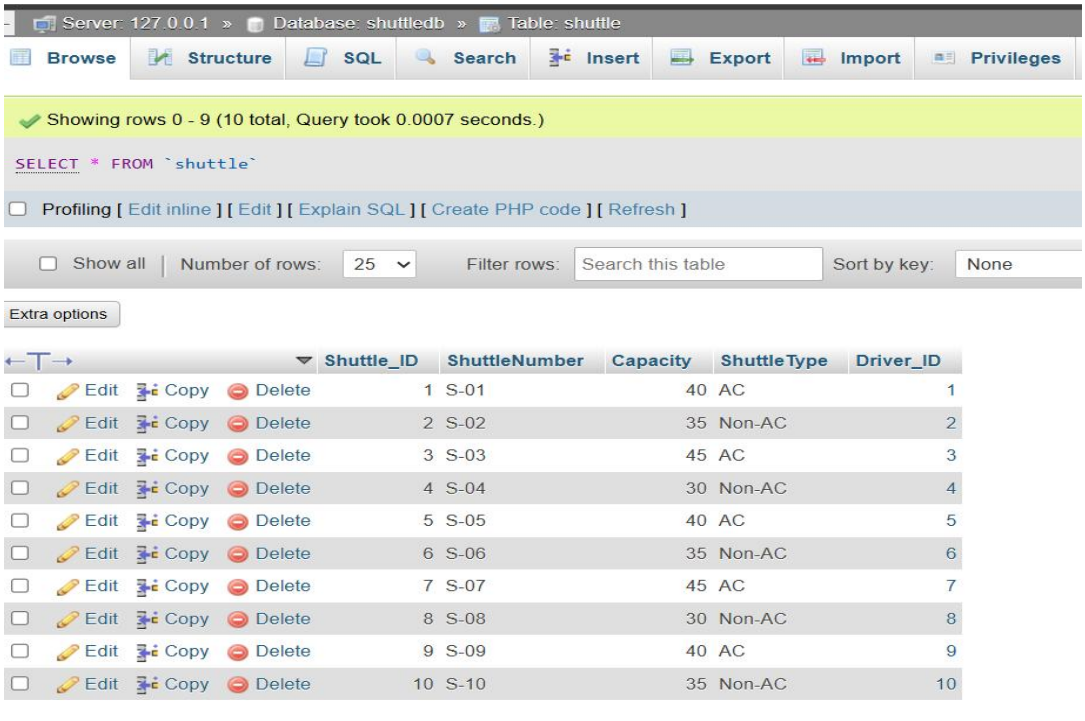


- INSERT INTO Shuttle VALUES:

Input:



Output:



- INSERT INTO Schedule VALUES:

Input:

Run SQL query/queries on table shuttledb.schedule:

```
1  INSERT INTO Schedule VALUES
2  (1,'08:00','09:00',1,1),
3  (2,'09:00','10:00',2,2),
4  (3,'10:00','11:00',3,3),
5  (4,'11:00','12:00',4,4),
6  (5,'12:00','13:00',5,5),
7  (6,'13:00','14:00',6,6),
8  (7,'14:00','15:00',7,7),
9  (8,'15:00','16:00',8,8),
10 (9,'16:00','17:00',9,9),
11 (10,'17:00','18:00',10,10);
```

Output:

Server: 127.0.0.1 » Database: shuttledb » Table: schedule

Browse | Structure | SQL | Search | Insert | Export | Import | Privilege

Showing rows 0 - 9 (10 total, Query took 0.0004 seconds.)

```
SELECT * FROM `schedule`
```

Profiling [Edit inline] [Edit] [Explain SQL] [Create PHP code] [Refresh]

Show all | Number of rows: 25 | Filter rows: Search this table | Sort by key: None

Extra options

	Schedule_ID	DepartureTime	ArrivalTime	Shuttle_ID	Route_ID
Edit Copy Delete	1	08:00:00	09:00:00	1	1
Edit Copy Delete	2	09:00:00	10:00:00	2	2
Edit Copy Delete	3	10:00:00	11:00:00	3	3
Edit Copy Delete	4	11:00:00	12:00:00	4	4
Edit Copy Delete	5	12:00:00	13:00:00	5	5
Edit Copy Delete	6	13:00:00	14:00:00	6	6
Edit Copy Delete	7	14:00:00	15:00:00	7	7
Edit Copy Delete	8	15:00:00	16:00:00	8	8
Edit Copy Delete	9	16:00:00	17:00:00	9	9
Edit Copy Delete	10	17:00:00	18:00:00	10	10

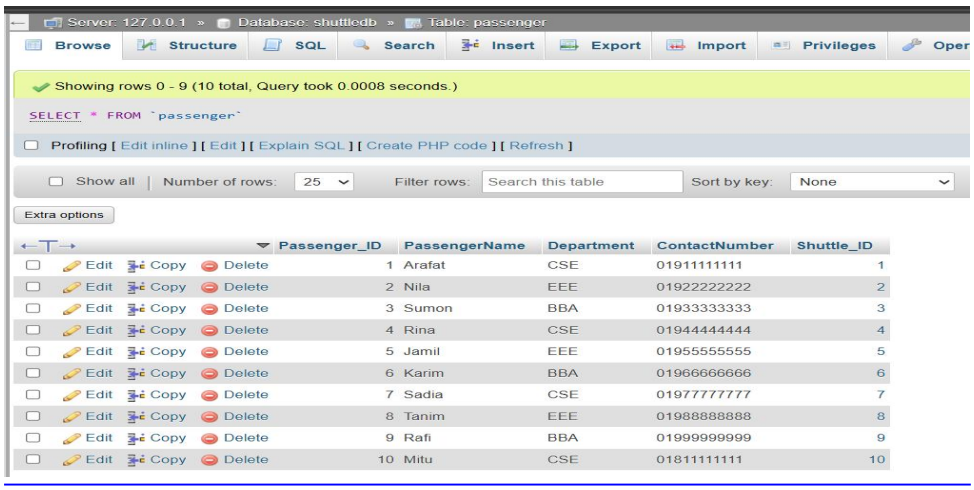
- INSERT INTO Passenger VALUES:

Input:

Run SQL query/queries on table shuttledb.passenger:

```
INSERT INTO Passenger VALUES
(1,'Arafat','CSE','01911111111',1),
(2,'Nila','EEE','01922222222',2),
(3,'Sumon','BBA','01933333333',3),
(4,'Rina','CSE','01944444444',4),
(5,'Jamil','EEE','01955555555',5),
(6,'Karim','BBA','01966666666',6),
(7,'Sadia','CSE','01977777777',7),
(8,'Tanim','EEE','01988888888',8),
(9,'Rafi','BBA','01999999999',9),
(10,'Mitu','CSE','01811111111',10);
```

Output:



■ SQL Queries:

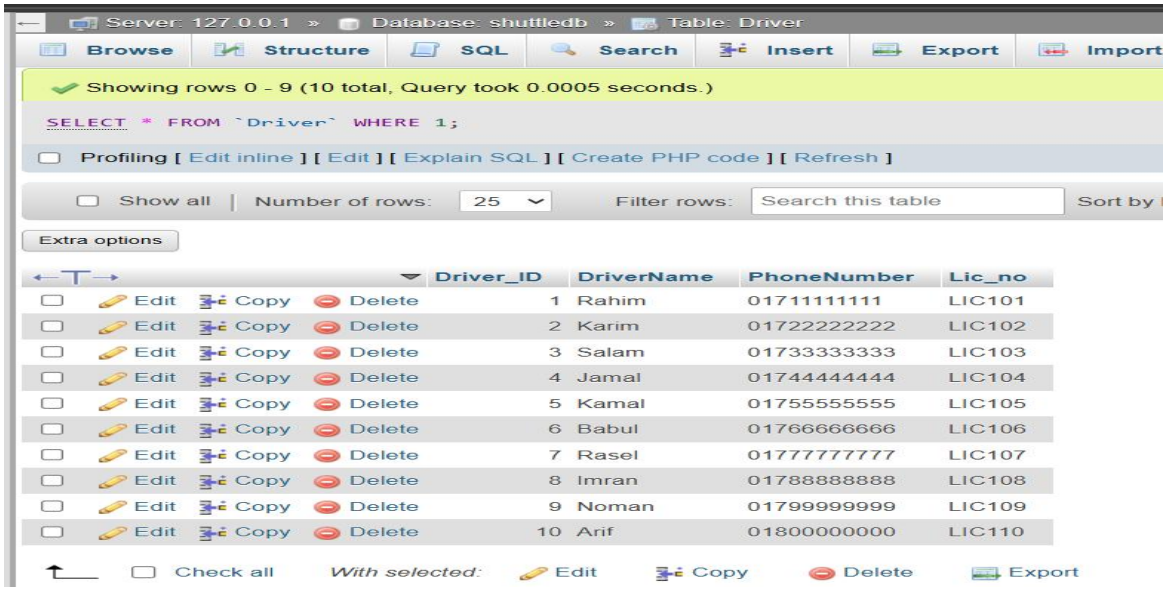
1. Show all drivers:

Input:

Run SQL query/queries on table shuttledb.driver:

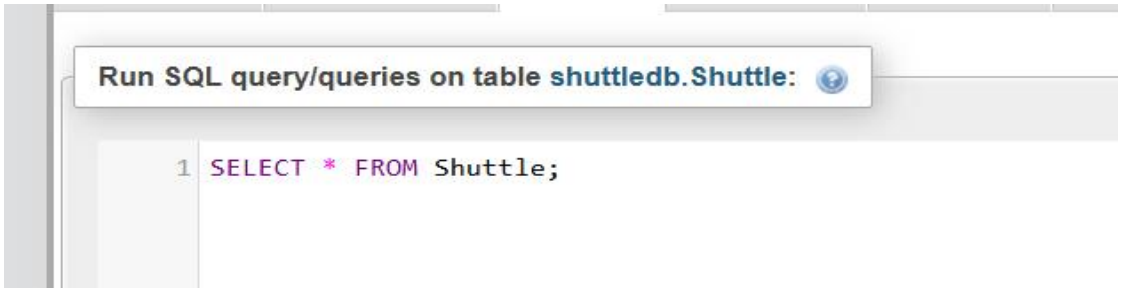
```
SELECT * FROM Driver;
```

Output:

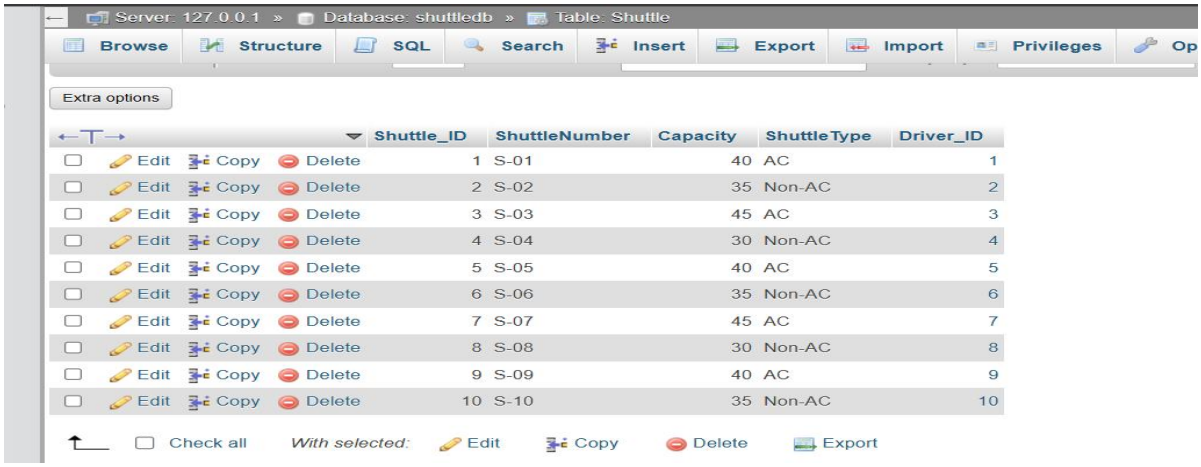


2.Show all shuttles

Input:



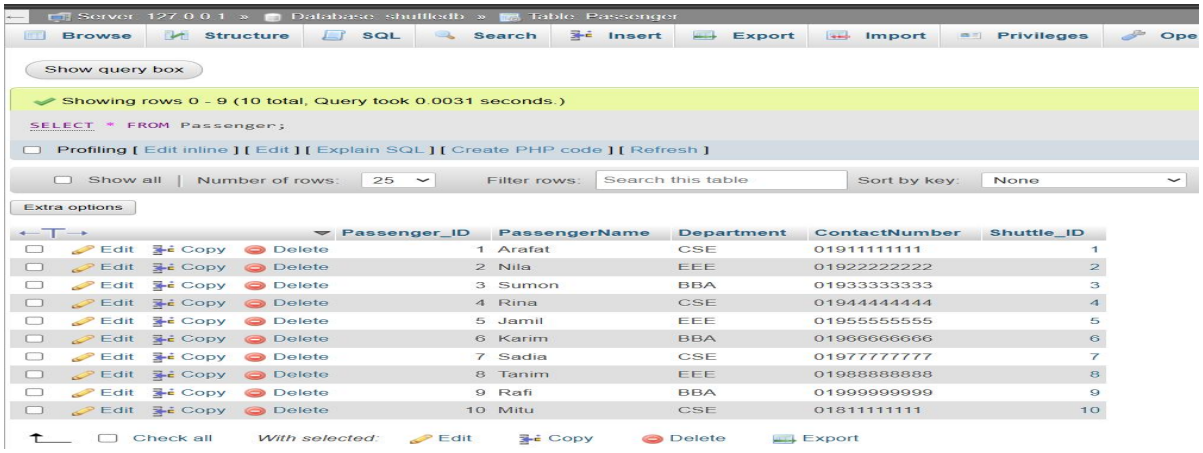
Output:



3.Show all passengers

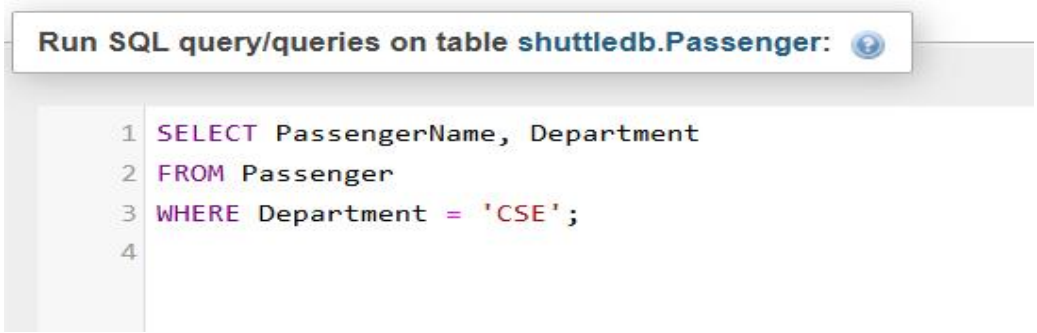
Input:

Output:

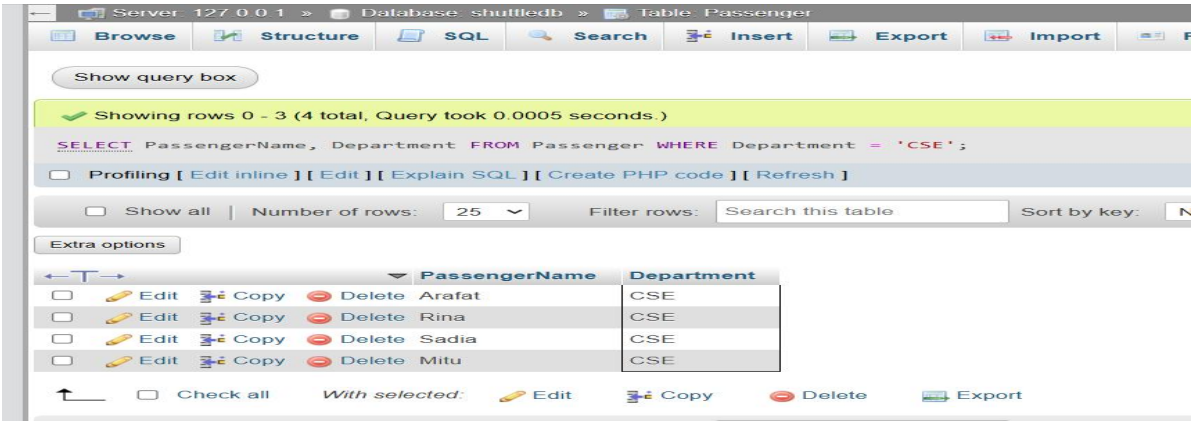


4.Find passengers from CSE department

Input:

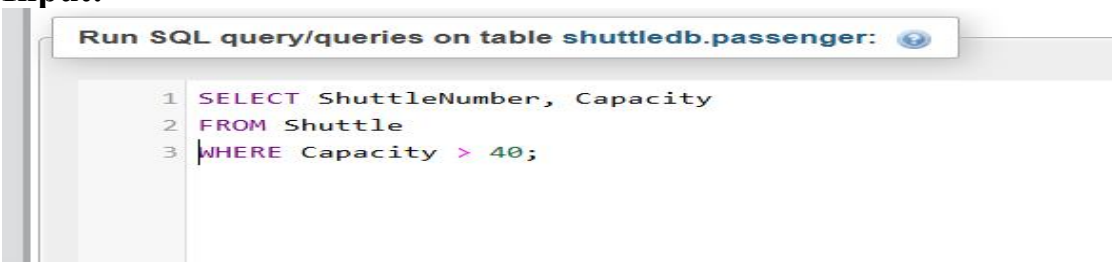


Output:

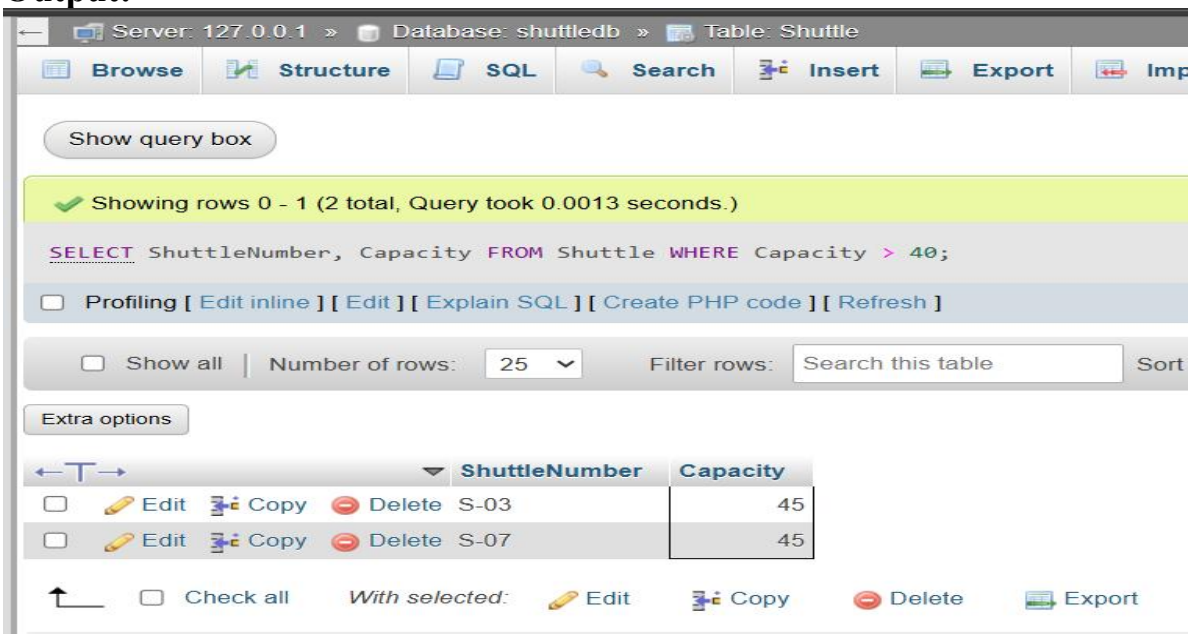


5.Find shuttles with capacity greater than 40

Input:



Output:



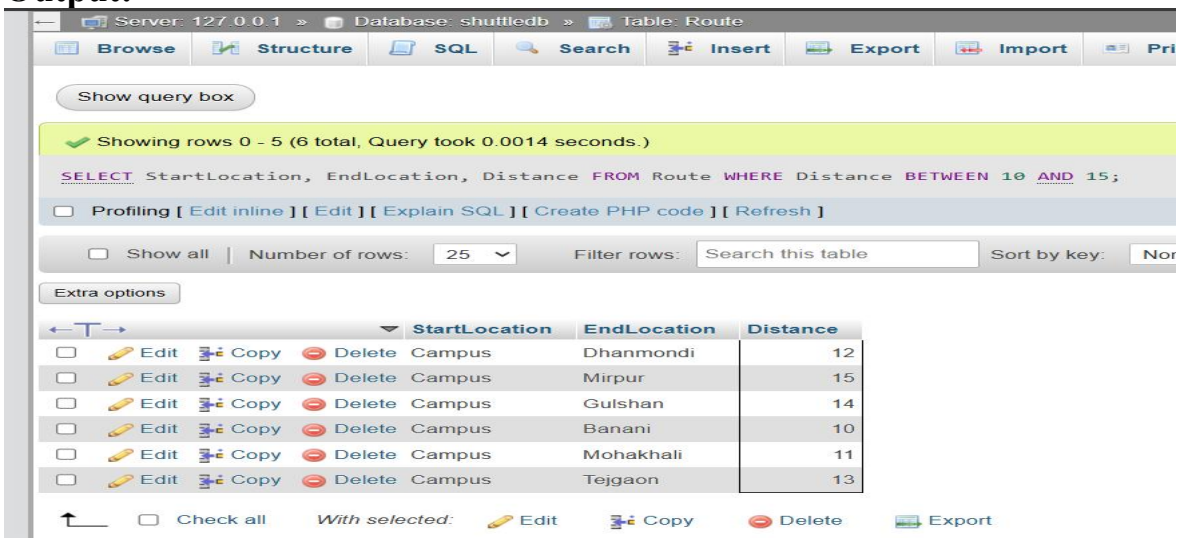
6.Find routes with distance between 10 and 15

Input:

Run SQL query/queries on table shuttledb.route:

```
SELECT StartLocation, EndLocation, Distance
FROM Route
WHERE Distance BETWEEN 10 AND 15;
```

Output:



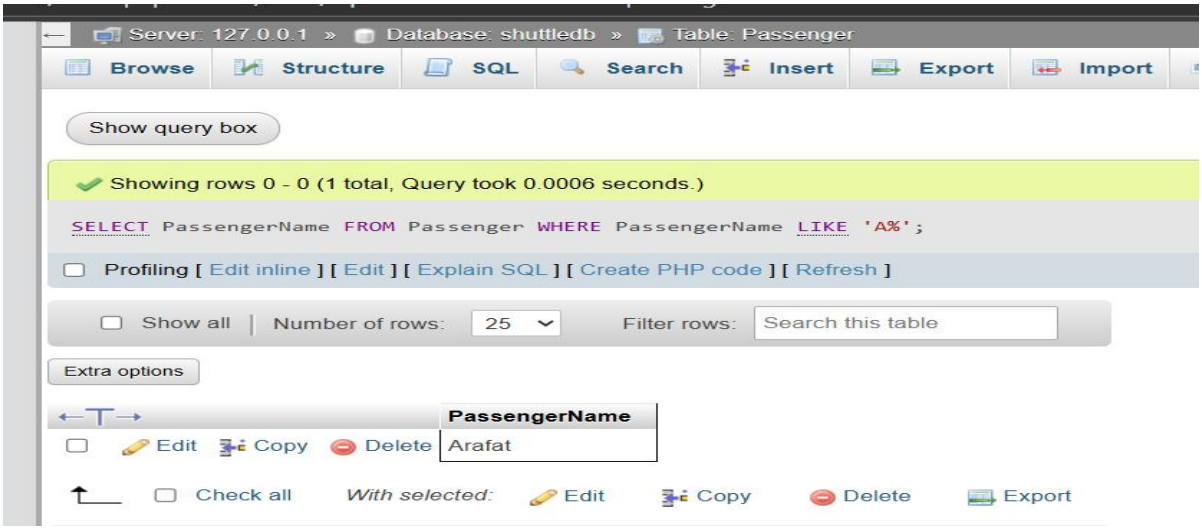
7. Find passengers whose name starts with 'A'

Input:

Run SQL query/queries on table shuttledb.passenger:

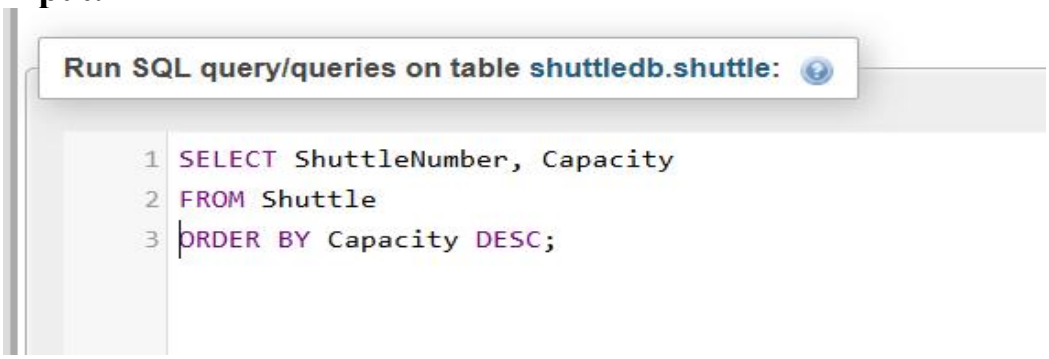
```
SELECT PassengerName
FROM Passenger
WHERE PassengerName LIKE 'A%';
```

Output:

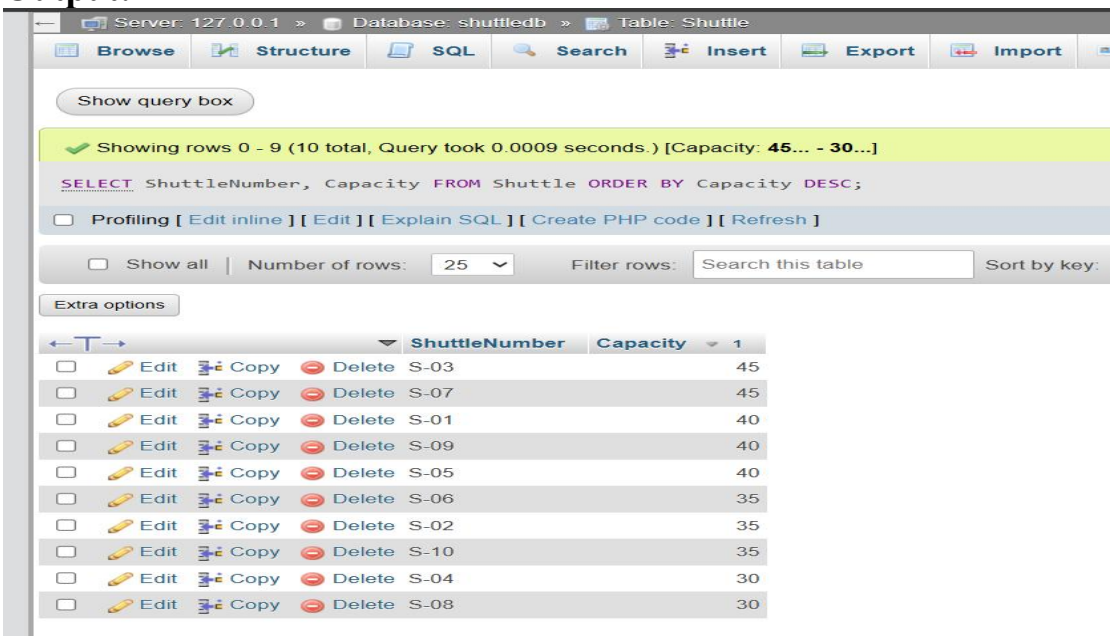


8. Sort shuttles by capacity (descending)

Input:



Output:



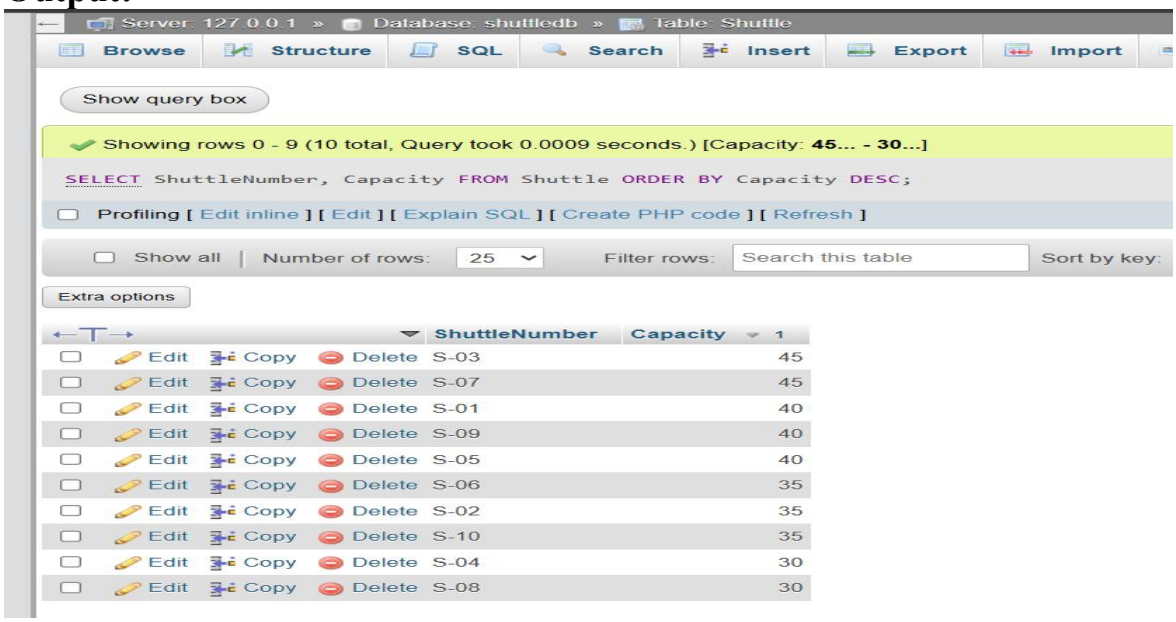
9. Count total number of passengers:

Input:

Run SQL query/queries on table shuttledb.passenger:

```
SELECT COUNT(Passenger_ID) AS Total_Passengers
FROM Passenger;
```

Output:



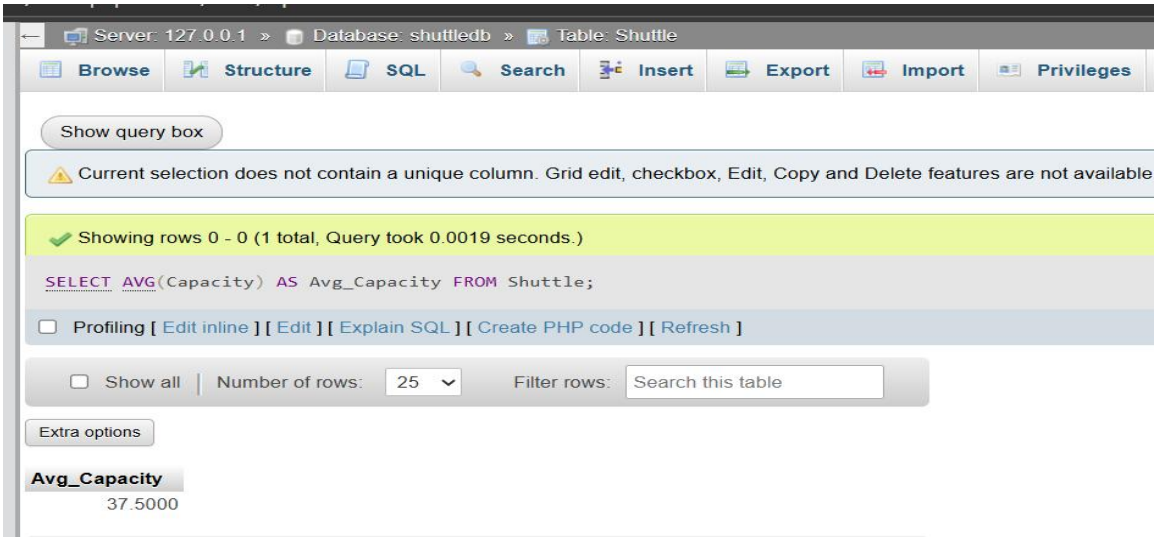
10. Find average shuttle capacity

Input:

Run SQL query/queries on table shuttledb.shuttle:

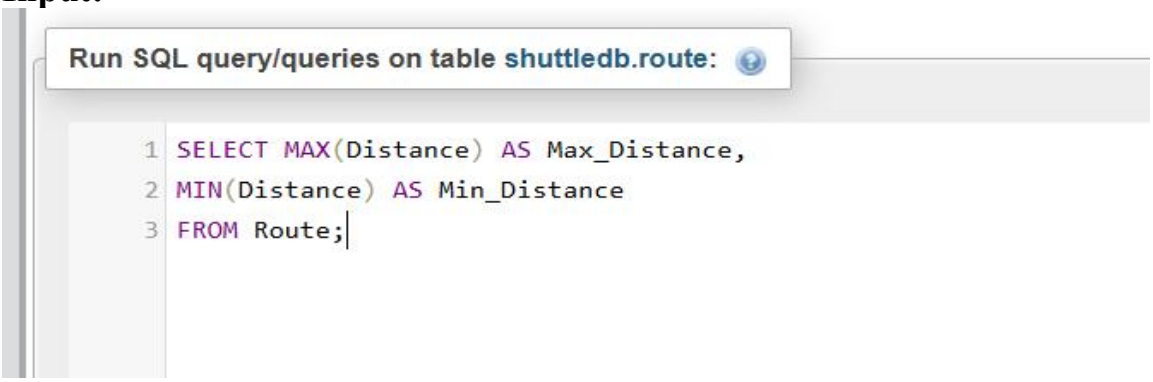
```
SELECT AVG(Capacity) AS Avg_Capacity
FROM Shuttle;
```

Output:

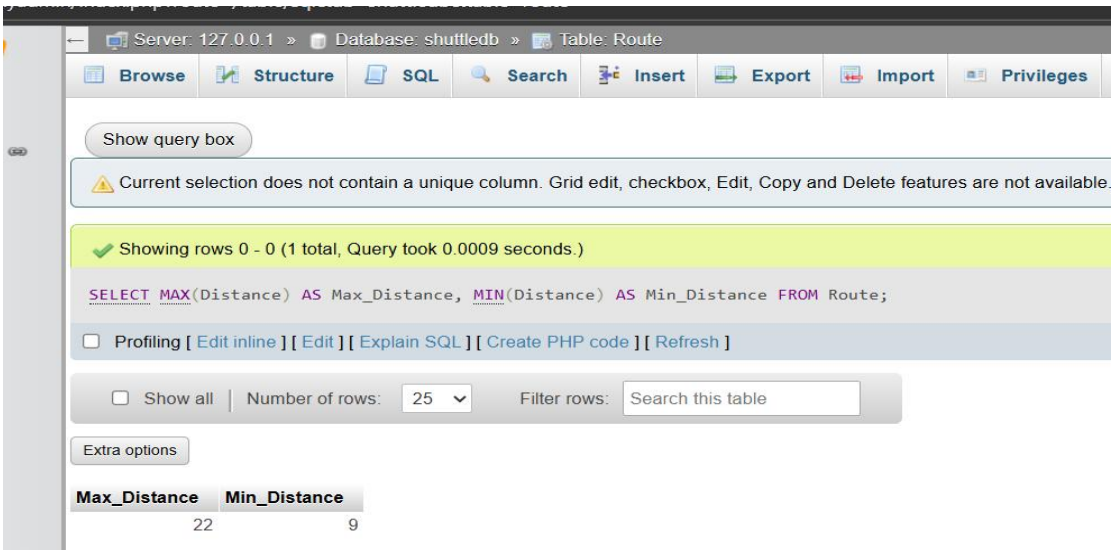


11. Find maximum and minimum route distance

Input:



Output:



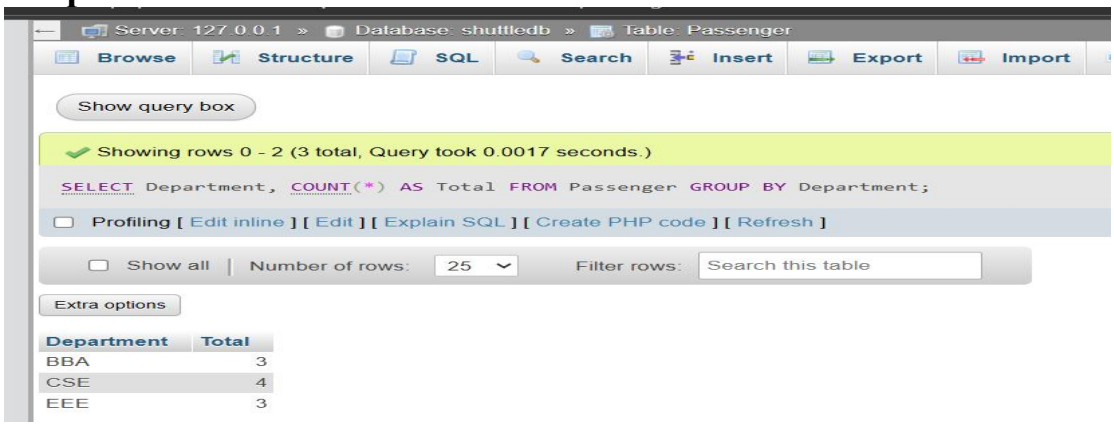
12.Count passengers per department:

Input:

Run SQL query/queries on table shuttledb.passenger:

```
SELECT Department, COUNT(*) AS Total
FROM Passenger
GROUP BY Department
```

Output:



13.Count passengers per department

Input:

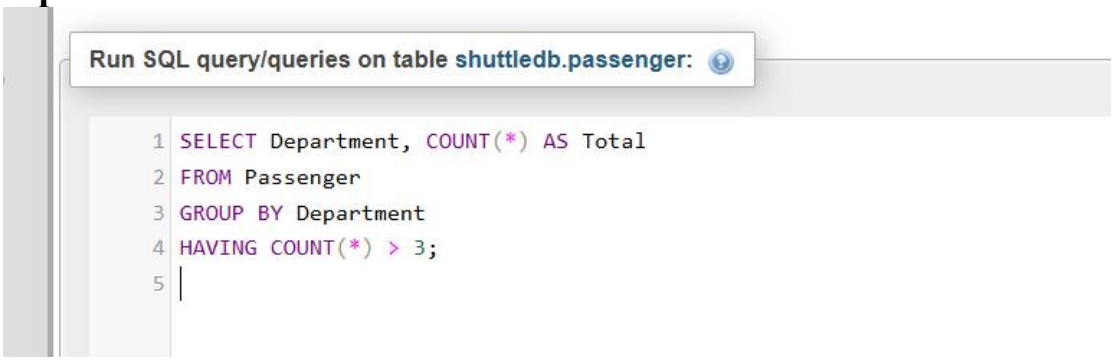
Run SQL query/queries on table shuttledb.passenger:

```
SELECT Department, COUNT(*) AS Total
FROM Passenger
GROUP BY Department;
```

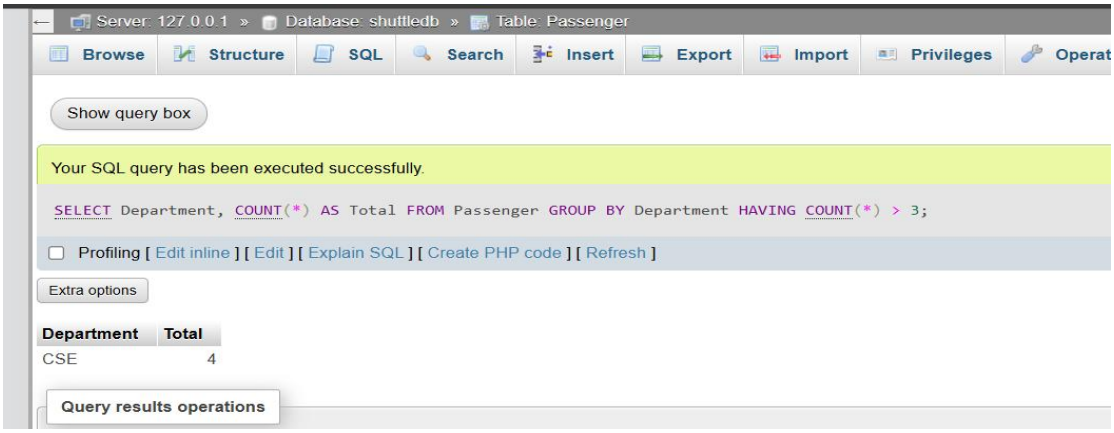
Output:

14.Show departments having more than 3 passengers

Input:



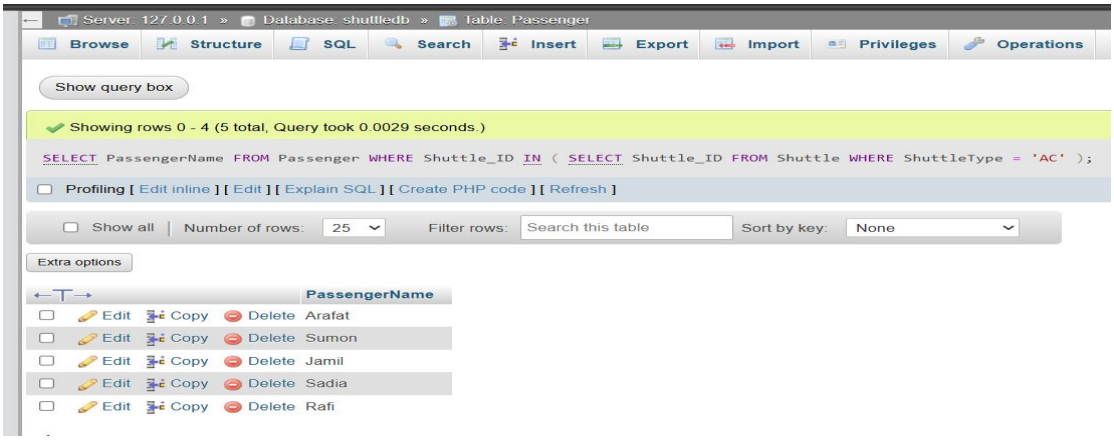
Output:



15.Find passengers who travel in AC shuttles

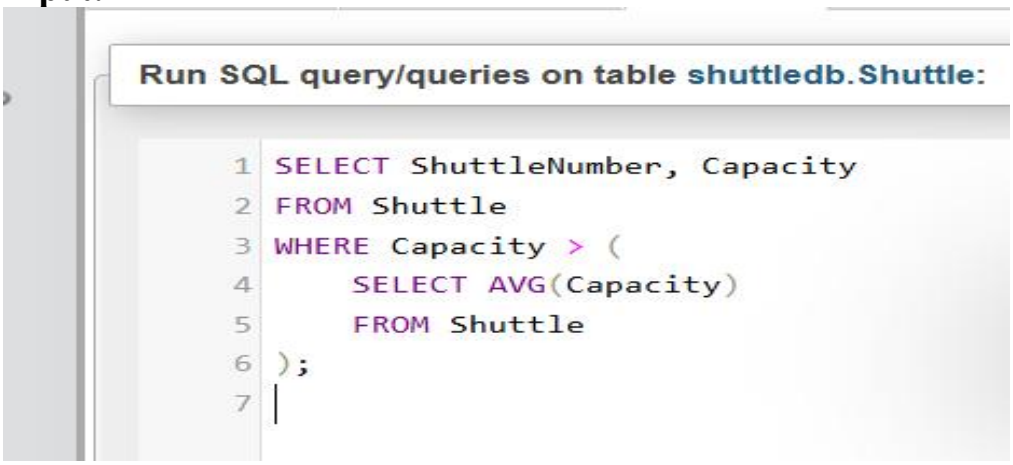
Input:

Output:

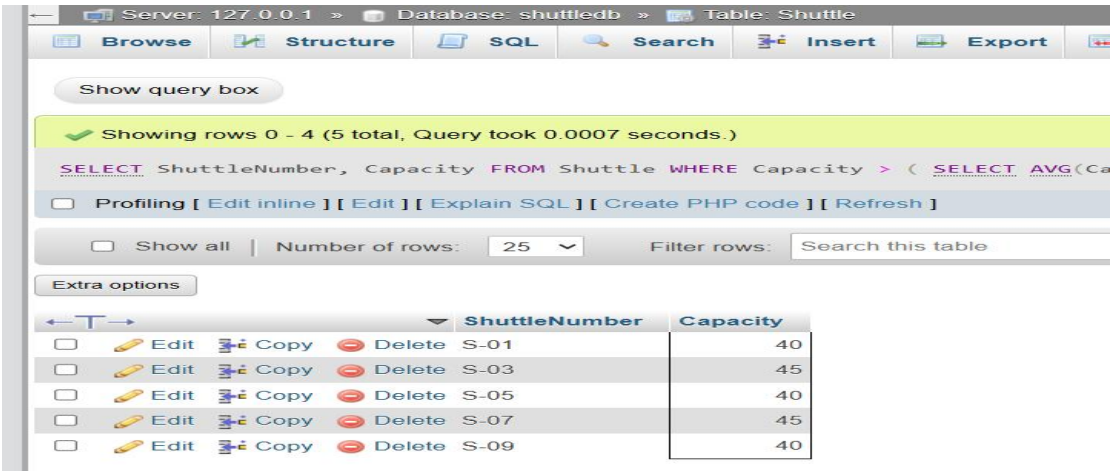


15.Find shuttles having capacity greater than average capacity

Input:

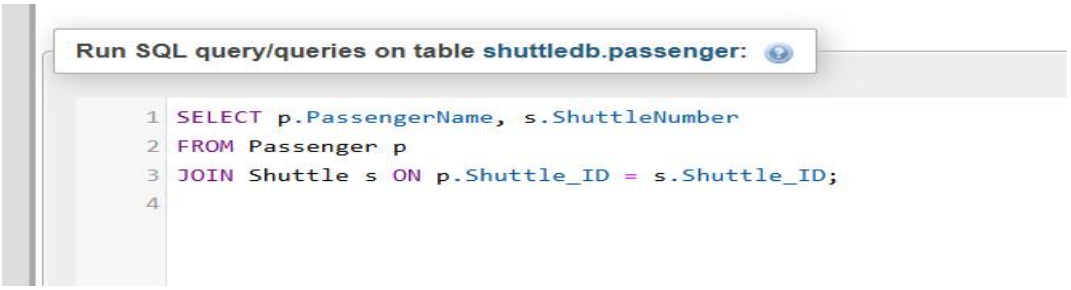


Output:

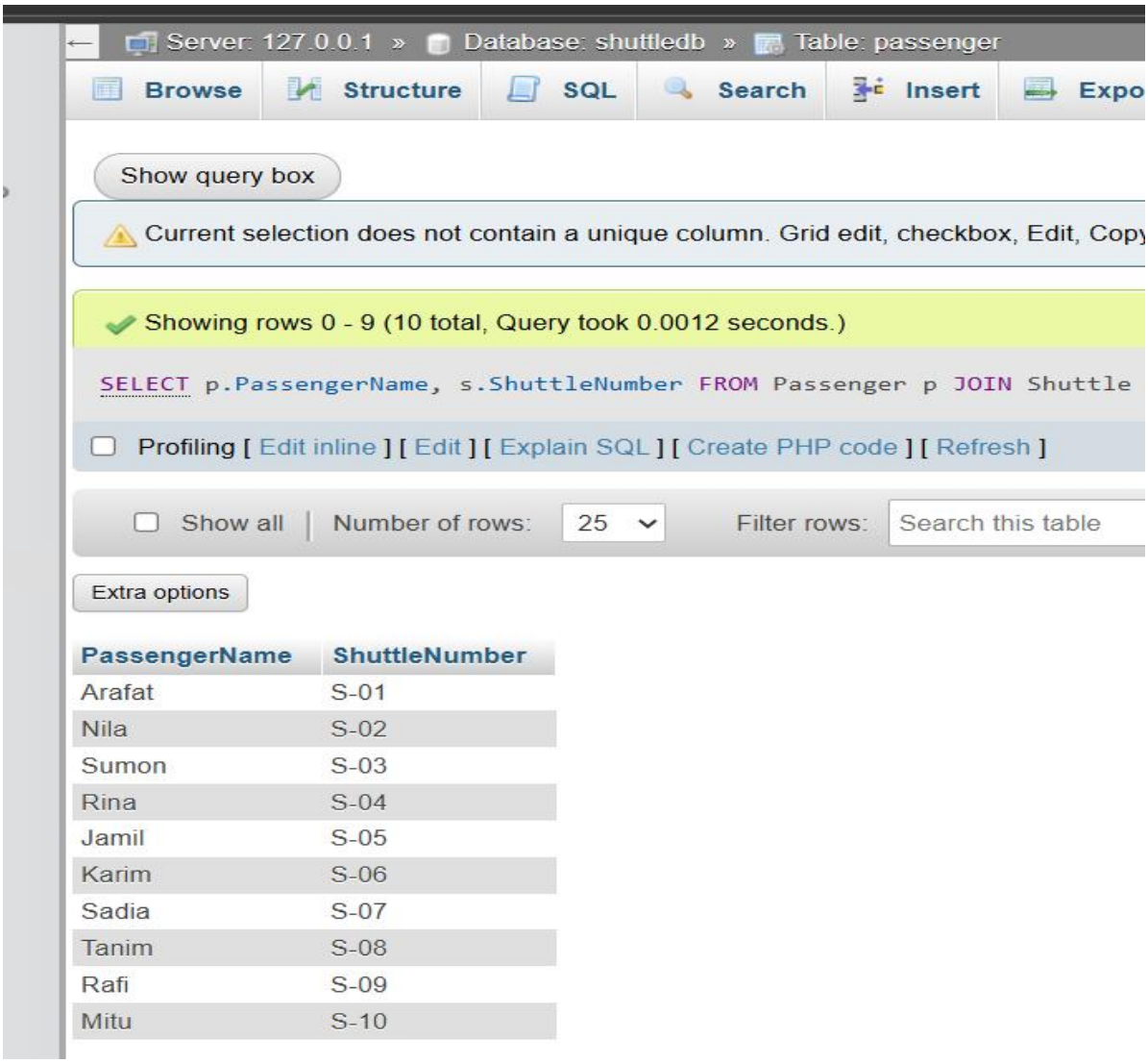


16.Show passenger names with their shuttle numbers

Input: Inner Join



Output:



PassengerName	ShuttleNumber
Arafat	S-01
Nila	S-02
Sumon	S-03
Rina	S-04
Jamil	S-05
Karim	S-06
Sadia	S-07
Tanim	S-08
Rafi	S-09
Mitu	S-10

17.Show drivers with their assigned shuttle numbers

Input: Inner Join

Run SQL query/queries on table shuttledb.shuttle:

```
SELECT d.DriverName, s.ShuttleNumber
FROM Driver d
JOIN Shuttle s ON d.Driver_ID = s.Driver_ID;
```

Output:

Server: 127.0.0.1 » Database: shuttledb » Table: shuttle

Browse | Structure | SQL | Search | Insert | Export | Im

Show query box

Current selection does not contain a unique column. Grid edit, checkbox, Edit, Copy and Delete

Showing rows 0 - 9 (10 total, Query took 0.0005 seconds.)

SELECT d.DriverName, s.ShuttleNumber FROM Driver d JOIN Shuttle s ON d.Driver_ID

Profiling [Edit inline] [Edit] [Explain SQL] [Create PHP code] [Refresh]

Show all | Number of rows: 25 Filter rows: Search this table So

Extra options

DriverName	ShuttleNumber
Rahim	S-01
Karim	S-02
Salam	S-03
Jamal	S-04
Kamal	S-05
Babul	S-06
Rasel	S-07
Imran	S-08
Noman	S-09
Arif	S-10

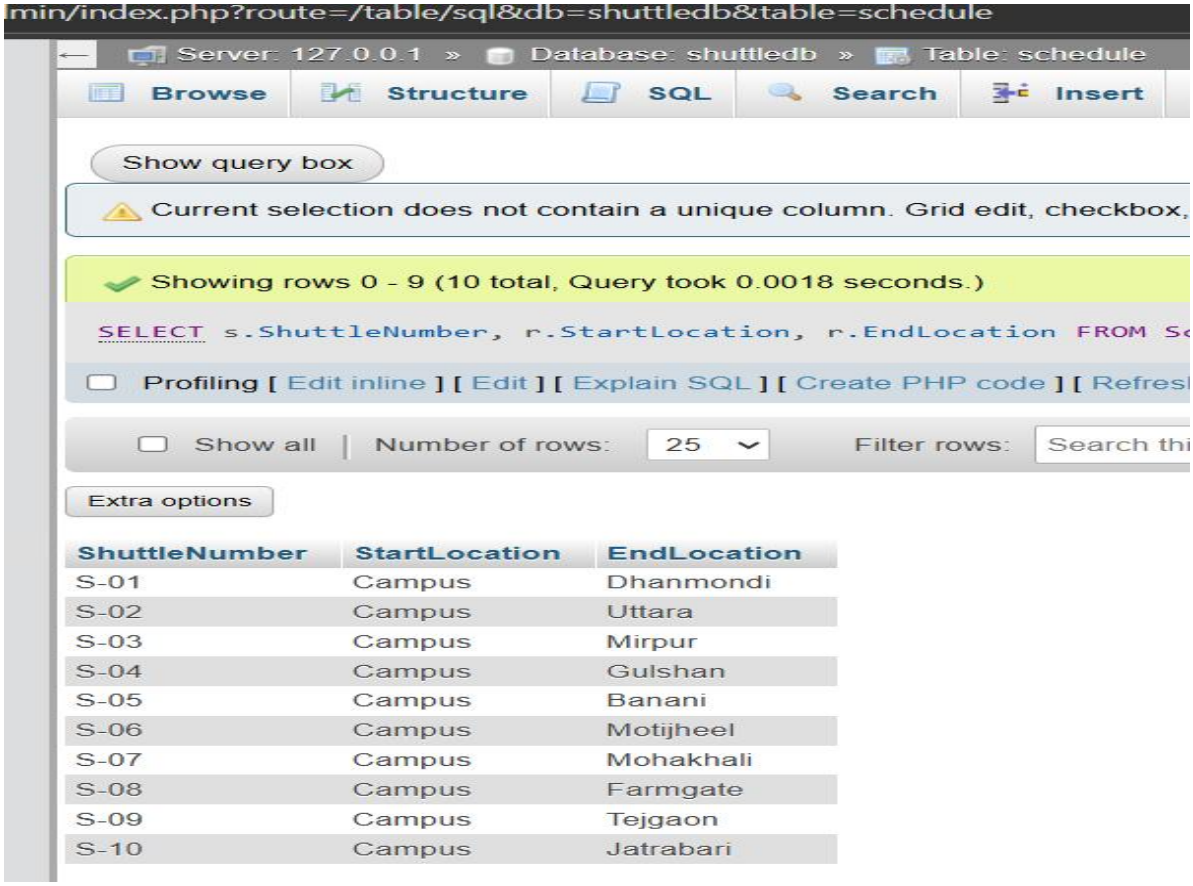
18.Show shuttle number and route details

Input: Join

Run SQL query/queries on table shuttledb.schedule:

```
SELECT s.ShuttleNumber, r.StartLocation, r.EndLocation
FROM Schedule sc
JOIN Shuttle s ON sc.Shuttle_ID = s.Shuttle_ID
JOIN Route r ON sc.Route_ID = r.Route_ID;
```

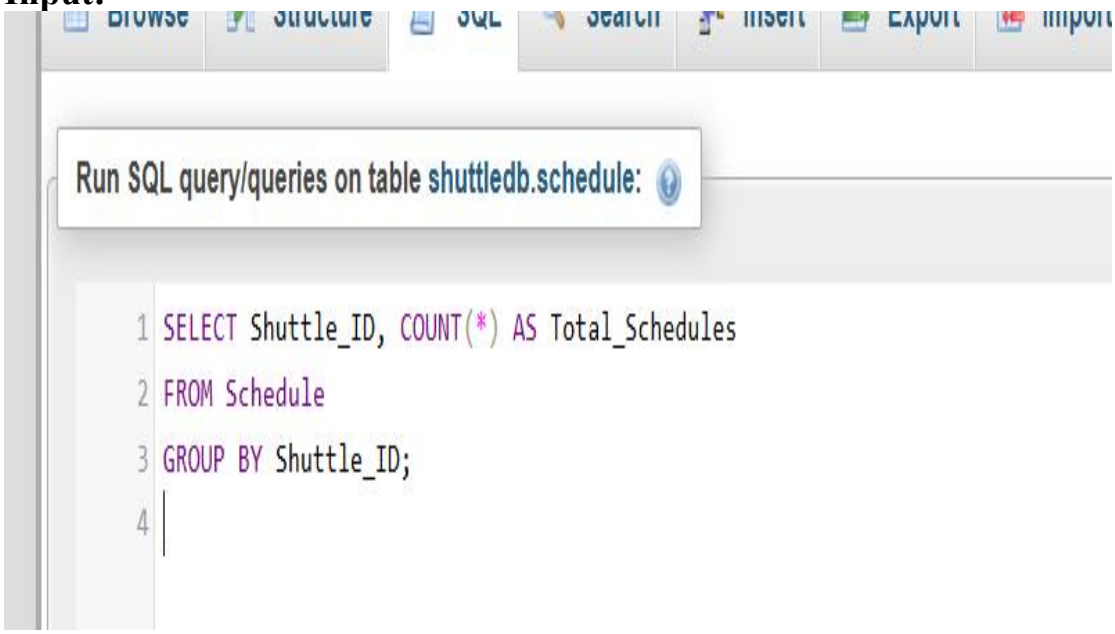
Output:



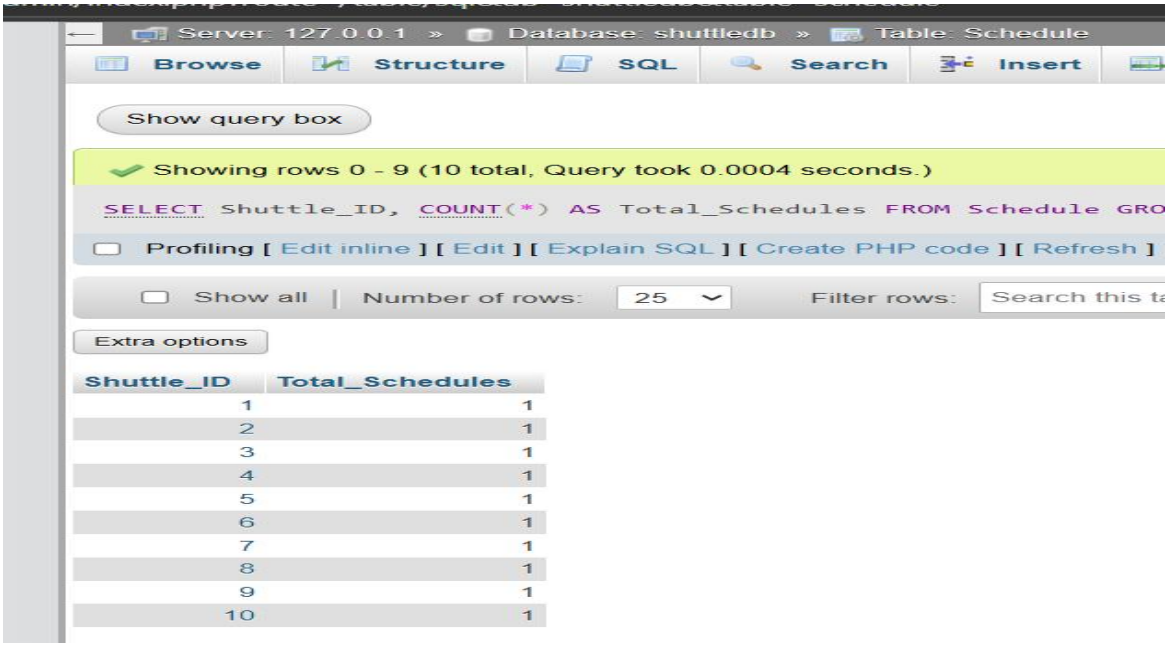
ShuttleNumber	StartLocation	EndLocation
S-01	Campus	Dhanmondi
S-02	Campus	Uttara
S-03	Campus	Mirpur
S-04	Campus	Gulshan
S-05	Campus	Banani
S-06	Campus	Motijheel
S-07	Campus	Mohakhali
S-08	Campus	Farmgate
S-09	Campus	Tejgaon
S-10	Campus	Jatrabari

19.Find total number of schedules per shuttle

Input:

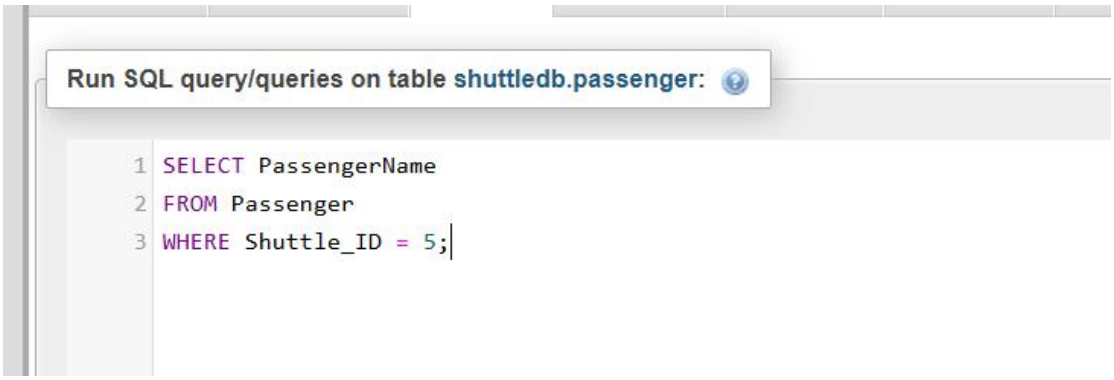


Output:

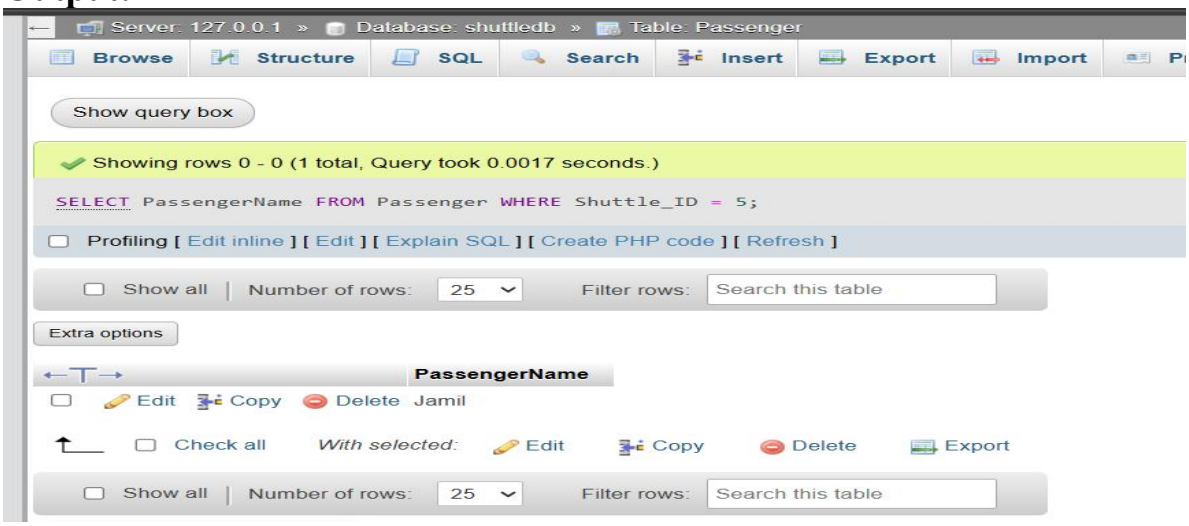


20.Find passengers who use shuttle ID 5

Input:



Output:



● Conclusion and Future Advancement:

In this project, we designed and implemented a Shuttle Management System database using the concepts learned in the Database Design Lab. The project included requirement analysis, ER diagram creation, and conversion into relational and database schema. SQL was used to create tables, insert data, and execute different types of queries such as selection, joins, and aggregation.
Also through this work, we gained practical knowledge of database design, SQL queries, and handling relationships between tables. We also faced some challenges in maintaining foreign key relationships, which helped improve our understanding of database concepts.

The future advancements are,
In the future, this system can be extended by adding features like user authentication, real-time shuttle tracking, and online seat booking. More entities such as Admin and Payment can be included, and a web or mobile interface can be developed to make the system more efficient and user-friendly.

● Contribution of each team member:

Member Name	ID	Contribution
1. Md.Shaurov Hayat Emon	2023100000315	Relational Schema,SQL Table Creation,Insert Data,Screenshorts,Creating the full Database
2. Shakila Khan Nawreen	2023100000286	ER Diagram,Normalization,SQL Queries,Report Writing and Formatting
3. Shoaeb Islam	2023100000120	Database Schema,Finalizing Relational Schema,Conceptualizing full project