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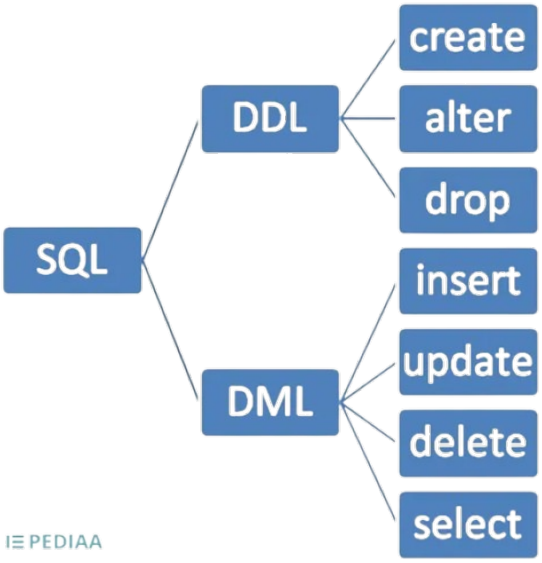
BATCH: B1
DBMS LAB 1

AIM: To implement DDL and DML commands.

Lab Objective: To understand the concept of designing issues related to the database with creating and populating the tables. Also familiarize students with different ways of manipulation in database.



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Lab 1: To implement DDL and DML

↳ Dr. E. F. Codd
↳ Relational Database Model
↳ 1970

→ Lab Performance Questions:

1. What is the difference between TRUNCATE and DELETE?

Feature	TRUNCATE	DELETE
Purpose	Remove all rows from a table quickly.	Removes one or more rows from a table based on a condition (or all rows if no condition is specified)
Command Syntax	TRUNCATE TABLE table_name;	DELETE FROM table_name; DELETE FROM table_name WHERE condition;
Speed	Generally faster.	Generally slower because it logs each deleted row.
Logging.	Minimal Logging.	Fully logged.

2. What is the difference between TRUNCATE and DROP?

Feature	TRUNCATE	DROP
Purpose	Delete all rows, keep table structure	Remove the entire table and definition.
Table structure remains?	Yes	No - structure is deleted.
Table data remains?	No	No.
Indexes remains?	Yes	No - all removed
Speed	Faster than DELETE, usually faster than DROP	Instant removal.
Can reuse table?	Yes, after truncate	No, must recreate table
Syntax	TRUNCATE TABLE table_name;	DROP TABLE table_name;

3. 5 tables.
4. Done (Added Bus_fare column to Bus).
5. Done (Changed char Sex to varchar from Ticket).
6. Done (From Bus changed Couch_Type to Coach_Type)
7. Done.

Working Procedure:

RDBMS is an acronym for **Relation Database Management System**. **Dr. E. F. Codd** first introduced the Relational Database Model in **1970**. The Relational model allows data to be represented in a simple row-column format. Each data field is considered as a **column**, and each record is considered as a **row**. A Relational Database is more or less similar to a Database Management System. In the relational model, there is a relation between their data elements. Data is stored in tables. Tables have columns, rows, and names. Tables can be related to each other if each has a column with a common type of information. The most famous RDBMS packages are Oracle, Sybase, and Informix. Simple example of the Relational model is as follows :

Degree of Relationship

- **One to One (1:1):** ***Student Has Roll No.*** One student has only one Roll no. For one occurrence of the first entity, there can be, at the most one related occurrence of the second entity, and vice-versa.

- **One to Many or Many to One (1:M / M: 1):** Course Contains Students. As per the Institutions Norm, One student can enroll in one course at a time however, in one course, there can be more than one student. For one occurrence of the first entity there can exist many related occurrences of the second entity and for every occurrence of the second entity there exists only one associated occurrence of the first.

- **Many to Many (M: M):** Students Appears Tests. The major disadvantage of the relational model is that a clear-cut interface cannot be determined. Reusability of a structure is not possible. The Relational Database now accepted model on which major database system are built.

The Degree of Relationship indicates the link between two entities for a specified occurrence of each.

E. F. Codd Rules

1. The Information Rule: All information must be store in table as data values.
2. The Rule of Guaranteed Access: Every item in a table must be logically addressable with the help of a table name.
3. The Systematic Treatment of Null Values: The RDBMS must be taken care of null values to represent missing or inapplicable information.

4. The Database Description Rule: A description of database is maintained using the same logical structures with which data was defined by the RDBMS.
5. Comprehensive Data Sub Language: According to the rule the system must support data definition, view definition, data manipulation, integrity constraints, authorization and transaction to represent missing or management operations.
6. The View Updating Rule: All views that are theoretically updateable are also updateable by the system.
7. The Insert and Update Rule: This rule indicates that all the data manipulation commands must be on sets of rows having a relation rather than on a single row.
8. The Physical Independence Rule: Application programs must remain unimpaired when any changes are made in storage representation or access methods.
9. The Logical Data Independence Rule: The changes that are made should not affect the user's ability to work with the data. The change can be splitting the table into many more tables.
10. The Integrity Independence Rule: The integrity constraints should be stored in the system catalog or in the database.
11. The Distribution Rule: The system must be access or manipulate the data that is distributed in other systems.
12. The Non-subversion Rule: If an RDBMS supports a lower-level language, then it should not bypass any integrity constraints defined in the higher level.

Efficient And Effective Solutions

DBMS product that provides efficient and effective solutions for major database features. This
includes:
1. Large databases and space management control
2. Many concurrent database users
3. High transaction processing performance
4. High availability
5. Controlled availability
6. Industry accepted standards
7. Manageable security
8. Database enforced integrity
9. Client/Server environment
10. Distributed database systems
11. Portability
12. Compatibility
13. Connectivity

Question:
Real World Scenario ROADWAY TRAVELS

"Roadway Travels" is in business since 1977 with several buses connecting different places in
India. Its main office is located in Dehradun. The company wants to computerize its operations
in the following areas:

- Reservations
- Ticketing
- Cancellations

Reservations: Reservations are handled directly by booking office. Reservations can be made
60 days in advance in either cash or credit. In case the ticket is not available, a waitlisted ticket
is issued to the customer. This ticket is confirmed against the cancellation.

Cancellation and Modification: Cancellations are also directly handed out at the booking
office. Cancellation charges will be charged. Wait listed tickets that do not get confirmed are
fully refunded.

AIM IS TO REPRESENT ALL ENTITIES IN A TABULAR FASHION

What is SQL?

Oracle was the first company to release a product that used the English-based Structured Query Language or SQL. This language allows end users to manipulate information of table(primary database object). To use SQL, you do not require any programming experience. SQL is a standard language common to all relational databases. SQL is database language used for storing and retrieving data from the database. Most Relational Database Management Systems provide extension to SQL to make it easier for application developers. A table is a primary object of database used to store data. It stores data in form of rows and columns. To communicate with Oracle, SQL supports the following categories of commands:

1. **Data Definition Language(DDL):** Create, Alter, Drop and Truncate
2. **Data Manipulation Language (DML):** Insert, Update, Delete and Select
3. **Transaction Control Language (TCL):** Commit, Rollback and Save point
4. **Data Control Language (DCL):** Grant and Revoke

DATA TYPE DESCRIPTION

1. Char(Size): It Stores fixed-length character data to store alphanumeric values, with a maximum size of 2000 bytes. Default and minimum size are 1 byte.
2. Varchar2(Size): It stores variable-length character data to store alphanumeric values, with maximum size of 4000 bytes.
3. char(Size): It stores fixed-length character data of length size characters or bytes, depending on the choice of national character set. Maximum size if determined by the number of bytes required storing each character with an upper limit of 2000 bytes. Default and minimum size is 1 character or 1 byte, depending on the character set.
4. Nvarchar2(Size): It stores variable-length character string having maximum length size
characters or bytes, depending on the choice of national character set. Maximum size is determined by the number of bytes required to store each character, with an upper limit of 4000 bytes.
5. Long: It stores variable-length character data up to 2GB(Gigabytes). Its length would be restricted based on memory space available in the computer.
6. Number [p, s]: Number having precision p and scale s. The precision p indicates total number of digits varies from 1 to 38. The scale s indicates number of digits in fraction part varies from –84 to 127.
7. Date: It stores dates from January 1, 4712 B.C. to December 31, 4712 A.D. Oracle predefine format of Date data type is DD-MON-YYYY.
8. Raw(Size): Stores binary data of length size. Maximum size is 2000 bytes. One must have to specify size with RAW type data, because by default it does not specify any size.
9. Long Raw: It stores binary data of variable length up to 2GB(Gigabytes).
10. LOBS – LARGE OBJECTS: LOB is used to store unstructured information such as sound and video clips, pictures up to 4 GB size.
11. CLOB: A Character Large Object containing fixed-width multi-byte characters. Varying-width character sets are not supported. Maximum size is 4GB.
12. NCLOB: A National Character Large Object containing fixed-width multi-byte characters. Varying-width character sets are not supported. Maximum size is 4GB. Store national character set data.
13. BLOB: To store a Binary Large Object such a graphics, video clips and sound files. Maximum size is 4GB.
14. BFILE: Contains a locator to a large Binary File stored outside the database. Enables byte stream I/O access to external LOBs residing on the database server. Maximum size is 4GB.Apart from oracle internal data types, user can create their own data type, which is used in database and other database object. We will discuss it in the later part.

STRUCTURE OF TABLES

The following are tabular representation of the above entities and relationships:

Bus		
COLOUMN NAME	**DATA TYPE**	**CONSTRAINT**
Bus No	varchar2(10)	Primary Key
Source	varchar2(20)	
Destination	varchar2(20)	
Couch Type	varchar2(20)	

Reservation		
COLOUMN NAME	**DATA TYPE**	**CONSTRAINT**
PNR_No	number(9)	Primary Key
Journey date	Date	
No-of-seats	integer(8)	
Address	varchar2(50)	
Contact_No	Number(9)	Should be equal to 10 numbers and not allow other than numeric
Bus_No	Varchar2(10)	Foreign key
Seat_No	Number	

Ticket		
COLOUMN NAME	**DATA TYPE**	**CONSTRAINT**
Ticket_No	number(9)	Primary Key
Journey-date	Date	
Age	int(4)	
Sex	char(10)	
Source	Varchar2(10)	
Destination	Varchar2(10)	
Dep-Time	Varchar2(10)	
Bus_No	Number2(10)	

Passenger		
COLOUMN NAME	**DATA TYPE**	**CONSTRAINT**
PNR_No	number(9)	Primary Key
Ticket_No	Number(9)	Foreign key
Name	Varchar2(15)	
Age	int(4)	
Sex	char(10)	(Male/Female)
Contact_No	Number(9)	Should be equal to 10 numbers and not allow other than numeric

Cancellation		
COLOUMN NAME	**DATA TYPE**	**CONSTRAINT**
PNR_No	number(9)	Primary Key
Journey-date	Number(9)	Foreign key
Seat_No	Varchar2(15)	
Contact_No	Number(9)	Should be equal to 10 numbers and not allow other than numeric

Practicing DDL Commands

Data Definition Language: The data definition language is used to create an object, alter the structure of an object and also drop already created object. The Data Definition Languages used for table definition can be classified into following:

Create table command

Create Table <table_name> (column1 datatype(size), column2 datatype(size), column(n) datatype(size));

Where, **table_name** is a name of the table and (column1, column2, …, column n) is a name of the column available in table. Each column is separated by comma.

Desc command

Desc <table name>;

Describe command is external command of Oracle. The describe command is used to view the structure of a table.

Alter table command

Once Simple Table is created, if there is a need to change the structure of a table at that time alter command is used. It is used when a user wants to add a new column or change the width of datatype or datatype itself or to add or drop integrity constraints or column.

Alter table <table_name> add(column1 datatype, column2 datatype);

Add option is used with alter table_ when you want to add a new column in existing table. If you want to Add more than one column then just write column name, data type and size in brackets. As usual Comma sign separates each column. For Example, suppose you want to add column comm in emp_master, then you have to perform the following command.

ALTER TABLE Persons ALTER COLUMN DateOfBirth year;

Truncate table command

TRUNCATE TABLE command is used to empty a table. This command is a sequence of DROP TABLE and CREATE TABLE statements and requires the DROP privilege.

TRUNCATE TABLE table_name;

Drop table command
DROP TABLE statement is a Data Definition Language (DDL) command that is used to remove a table's definition, and its data, indexes, triggers, constraints and permission specifications (if any).
DROP TABLE table_name;

Data Manipulation Commands

Insert

INSERT INTO Statement is used to add new rows of data into a table in the database. Almost all the RDBMS provide this SQL query to add the records in database tables.

INSERT INTO TABLE_NAME (column1, column2...columnN) VALUES (value1, value2…valueN);

INSERT INTO CUSTOMERS (ID,NAME,AGE,ADDRESS,SALARY) VALUES (1, 'Ramesh', 32, 'Ahmedabad', 2000.00);

Update

UPDATE statement makes use of locks on each row while modifying them in a table, and once the row is modified, the lock is released. Therefore, it can either make changes to a single row or multiple rows with a single query.

UPDATE table_name
SET column1 = value1, column2 = value2,..., columnN = valueN
WHERE [condition];

UPDATE table_name
SET column_name1 = new_value, column_name2 = new_value...
WHERE condition(s)

Delete

DELETE TABLE statement is used to delete the existing records from a table in a database. If you wish to delete only the specific number of rows from the table, you can use the WHERE clause with the DELETE statement. If you omit the WHERE clause, all rows in the table will be deleted. The SQL DELETE statement operates on a single table at a time.

Command
DELETE FROM table_name;
DELETE FROM table_name WHERE condition;

Example
DELETE FROM CUSTOMERS WHERE NAME=‘Hardik';

Select

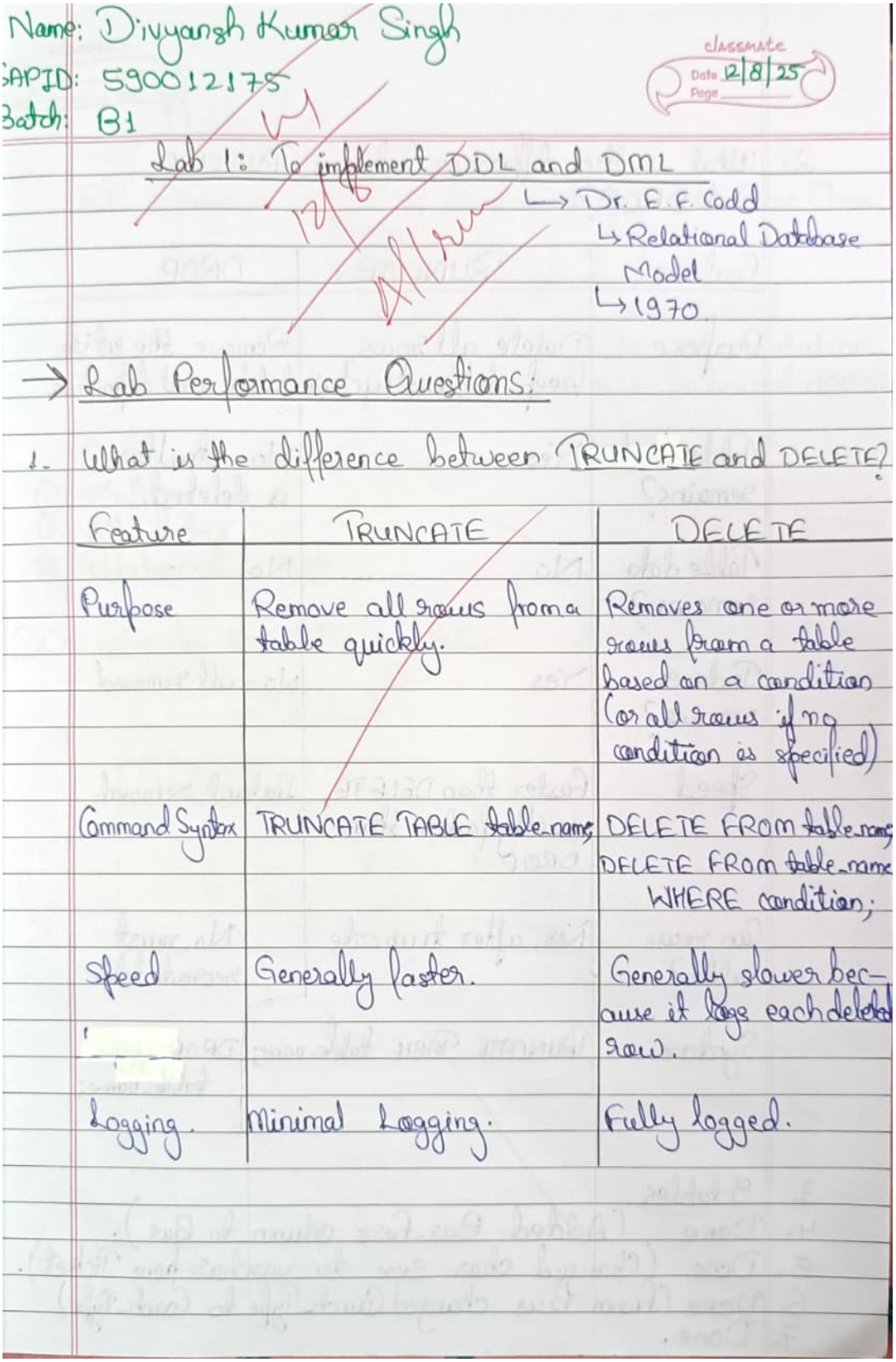
SELECT Statement is used to fetch the data from a database table which returns this data in the form of a table. These tables are called result-sets.

SELECT column1, column2, columnN FROM table_name;SELECT * FROM table_name;

Lab Performance Questions:

1 What is the difference between TRUNCATE and DELETE?
2 What is the difference between TRUNCATE and DROP?
3 Create all the given table.
4 Add a new column to the existing relation.
5 Change the datatype of the table from char to varchar2.
6 Change the name of column/field.
7 Modify the column width of all the table

Lab Performance Questions Solutions:



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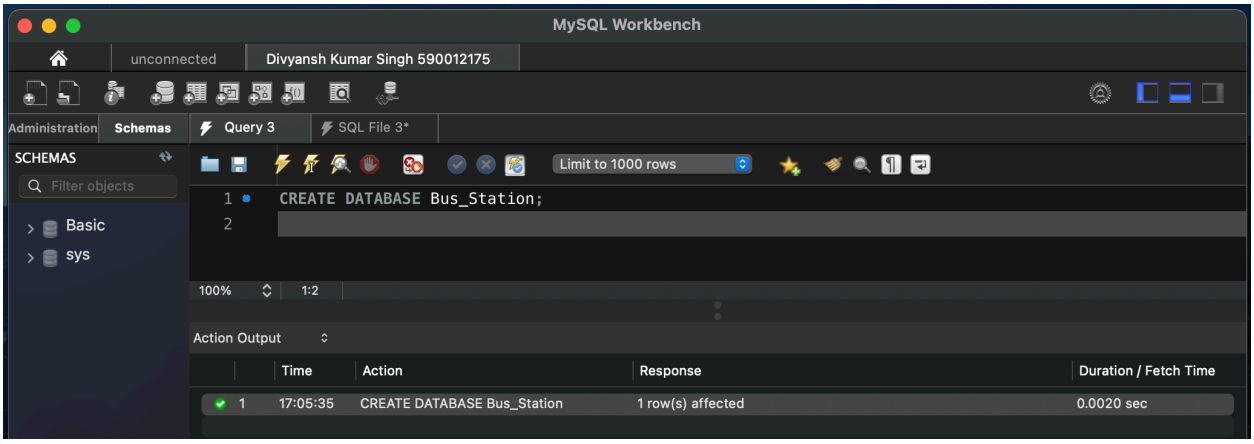
Syntax	TRUNCATE TABLE table_name;	DROP TABLE table_name;

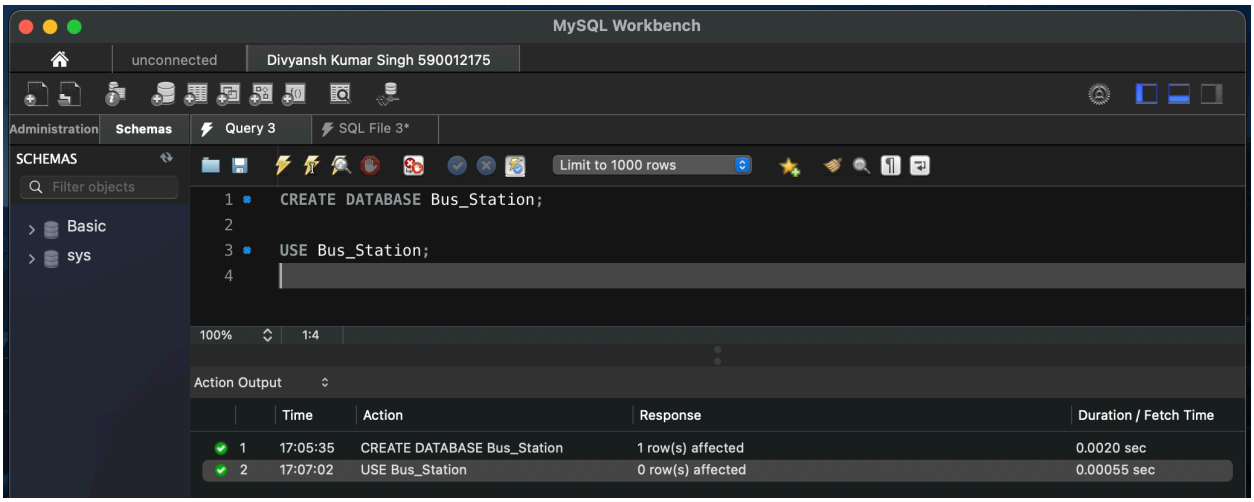
3. 5 tables.
4. Done (Added Bus_fare column to Bus).
5. Done (Changed char Sex to varchar from Ticket).
6. Done (From Bus changed Couch_Type to Coach_Type)
7. Done.

3.

Step 1: Create a new database name **“Bus_Station”.**

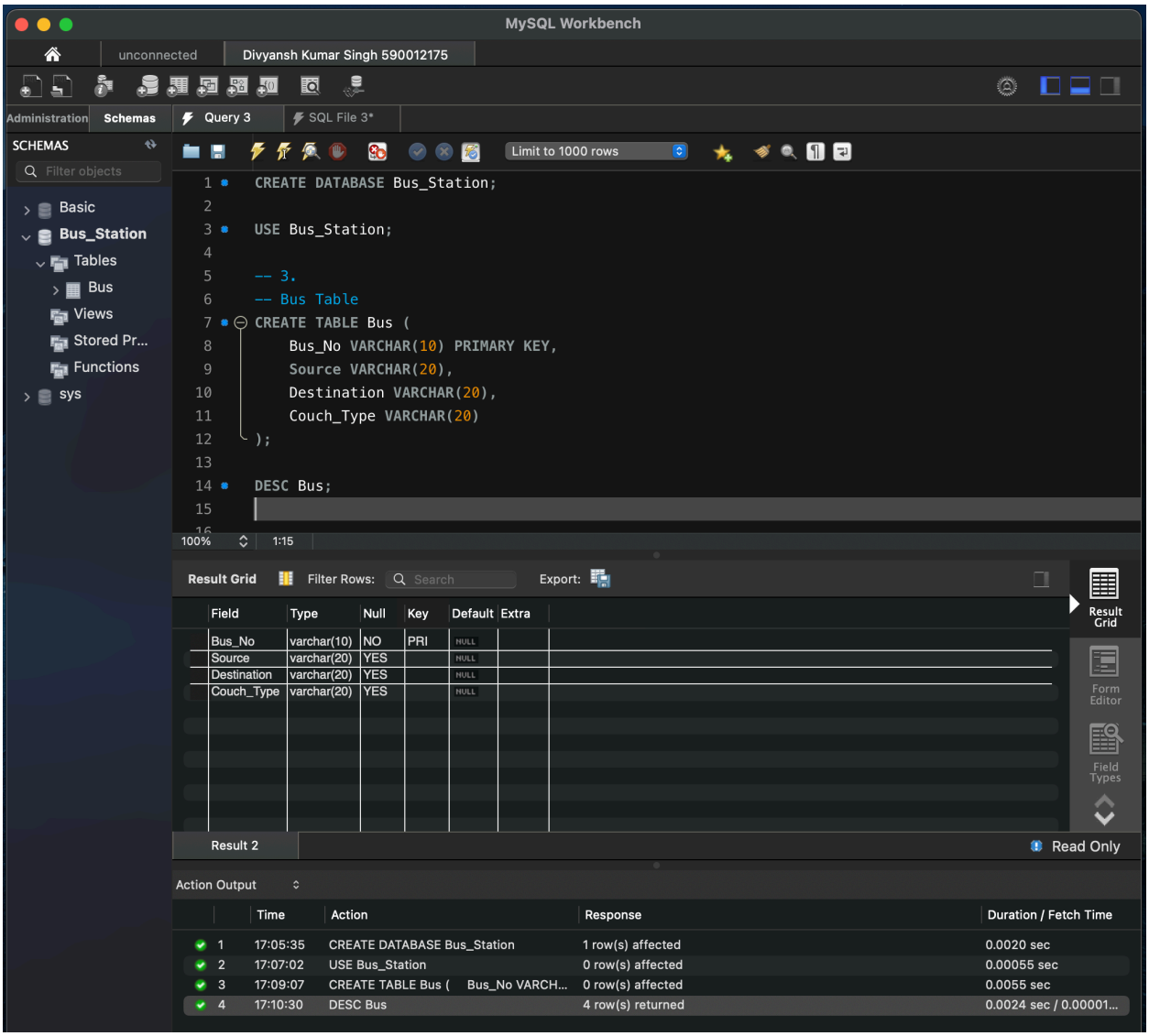


Step 2: Use the created database such that the commands that we write and execute gets saved and used only under **“Bus_Station”.**



Step 3: Create the first table named **“Bus”** with the following fields and display its structure using **DESC BUS.**

Bus		
COLOUMN NAME	**DATA TYPE**	**CONSTRAINT**
Bus No	varchar2(10)	Primary Key
Source	varchar2(20)	
Destination	varchar2(20)	
Couch Type	varchar2(20)	



Step 4: Similarly, make other tables as per the following details and display their structure.

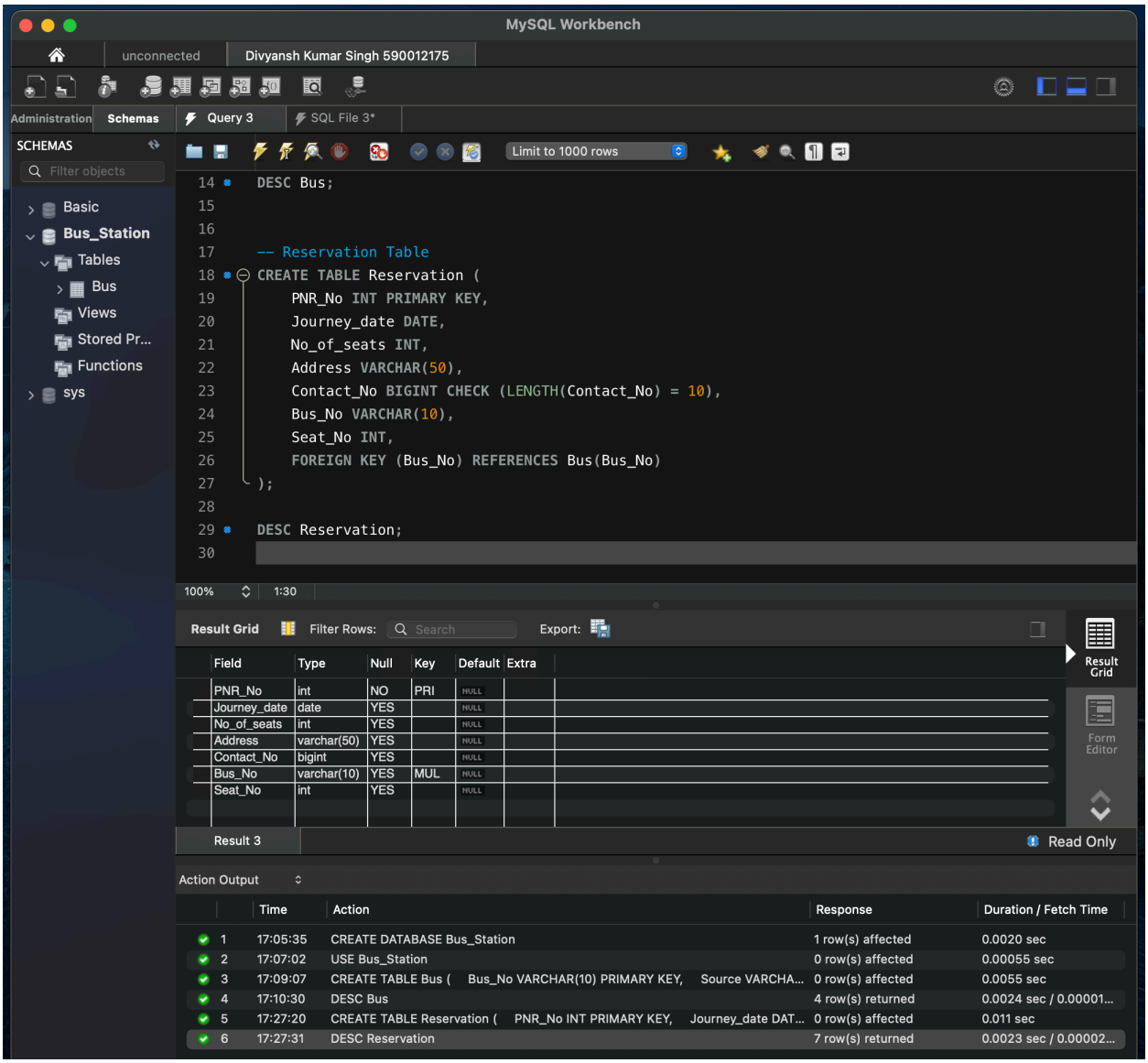
Reservation		
COLOUMN NAME	**DATA TYPE**	**CONSTRAINT**
PNR_No	number(9)	Primary Key
Journey date	Date	
No-of-seats	integer(8)	
Address	varchar2(50)	
Contact_No	Number(9)	Should be equal to 10 numbers and not allow other than numeric
Bus_No	Varchar2(10)	Foreign key
Seat_No	Number	

Ticket		
COLOUMN NAME	**DATA TYPE**	**CONSTRAINT**
Ticket_No	number(9)	Primary Key
Journey-date	Date	
Age	int(4)	
Sex	char(10)	
Source	Varchar2(10)	
Destination	Varchar2(10)	
Dep-Time	Varchar2(10)	
Bus_No	Number2(10)	

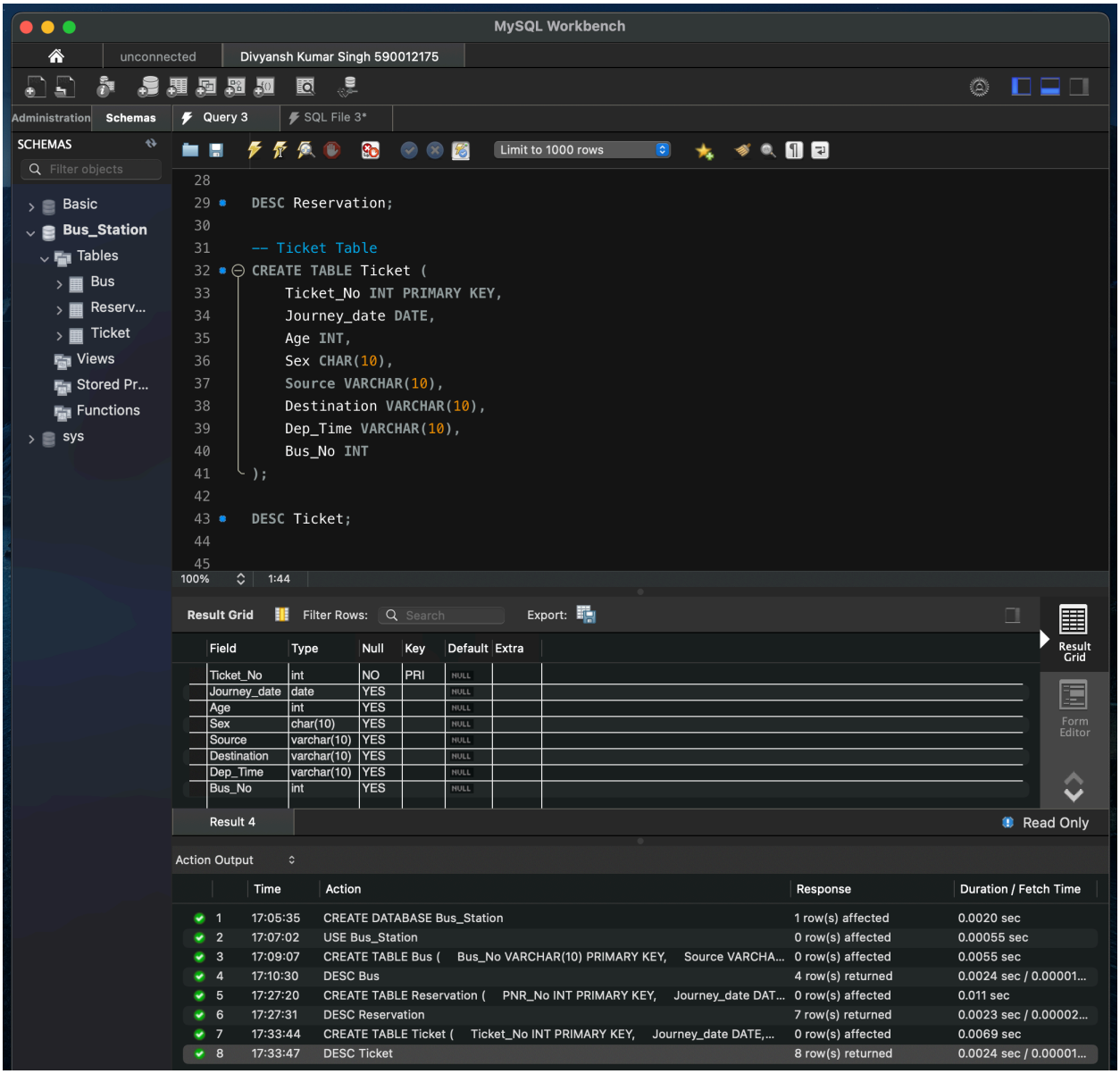
Passenger		
COLOUMN NAME	**DATA TYPE**	**CONSTRAINT**
PNR_No	number(9)	Primary Key
Ticket_No	Number(9)	Foreign key
Name	Varchar2(15)	
Age	int(4)	
Sex	char(10)	(Male/Female)
Contact_No	Number(9)	Should be equal to 10 numbers and not allow other than numeric

Cancellation		
COLOUMN NAME	**DATA TYPE**	**CONSTRAINT**
PNR_No	number(9)	Primary Key
Journey-date	Number(9)	Foreign key
Seat_No	Varchar2(15)	
Contact_No	Number(9)	Should be equal to 10 numbers and not allow other than numeric

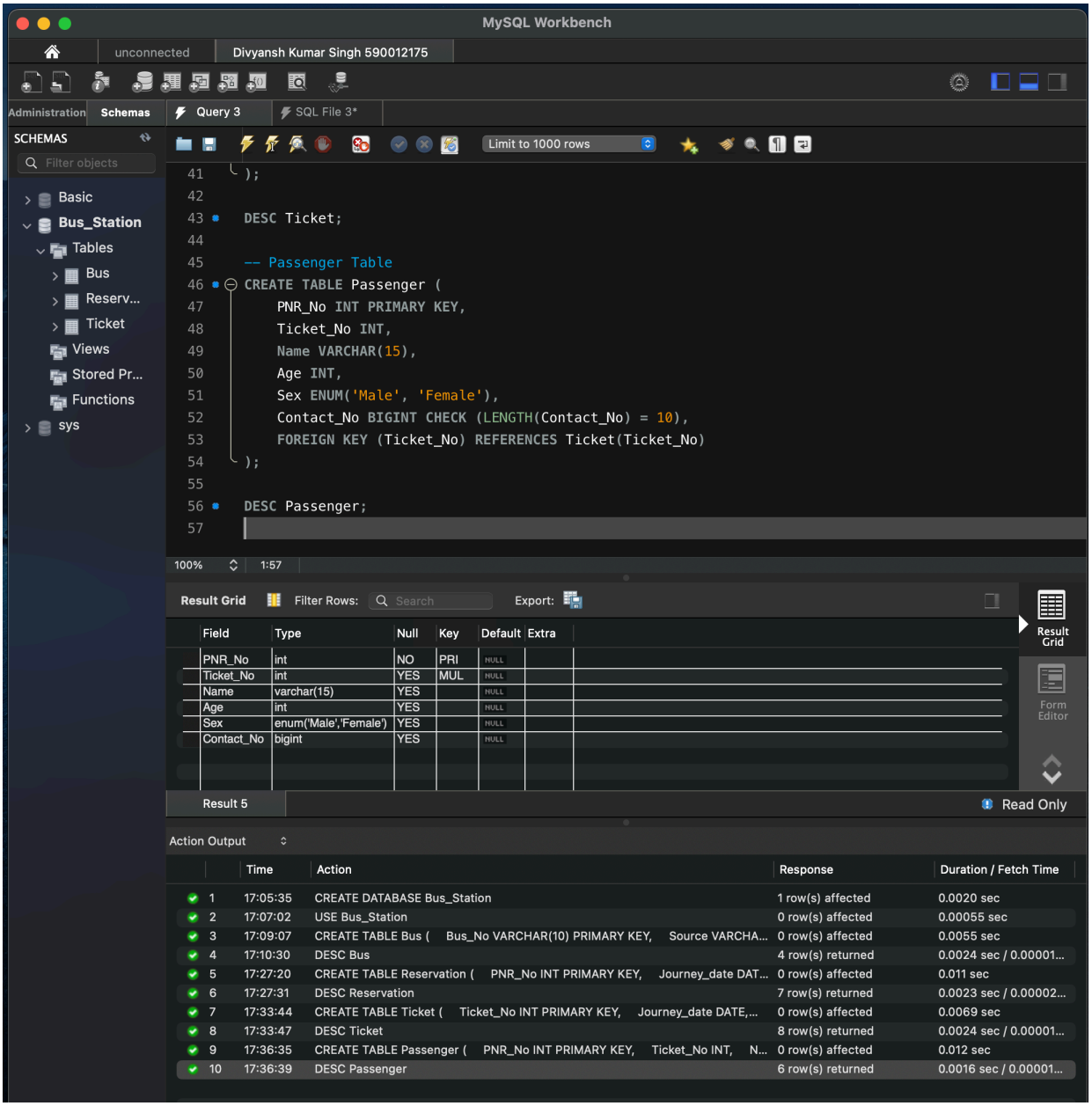
Reservation Table



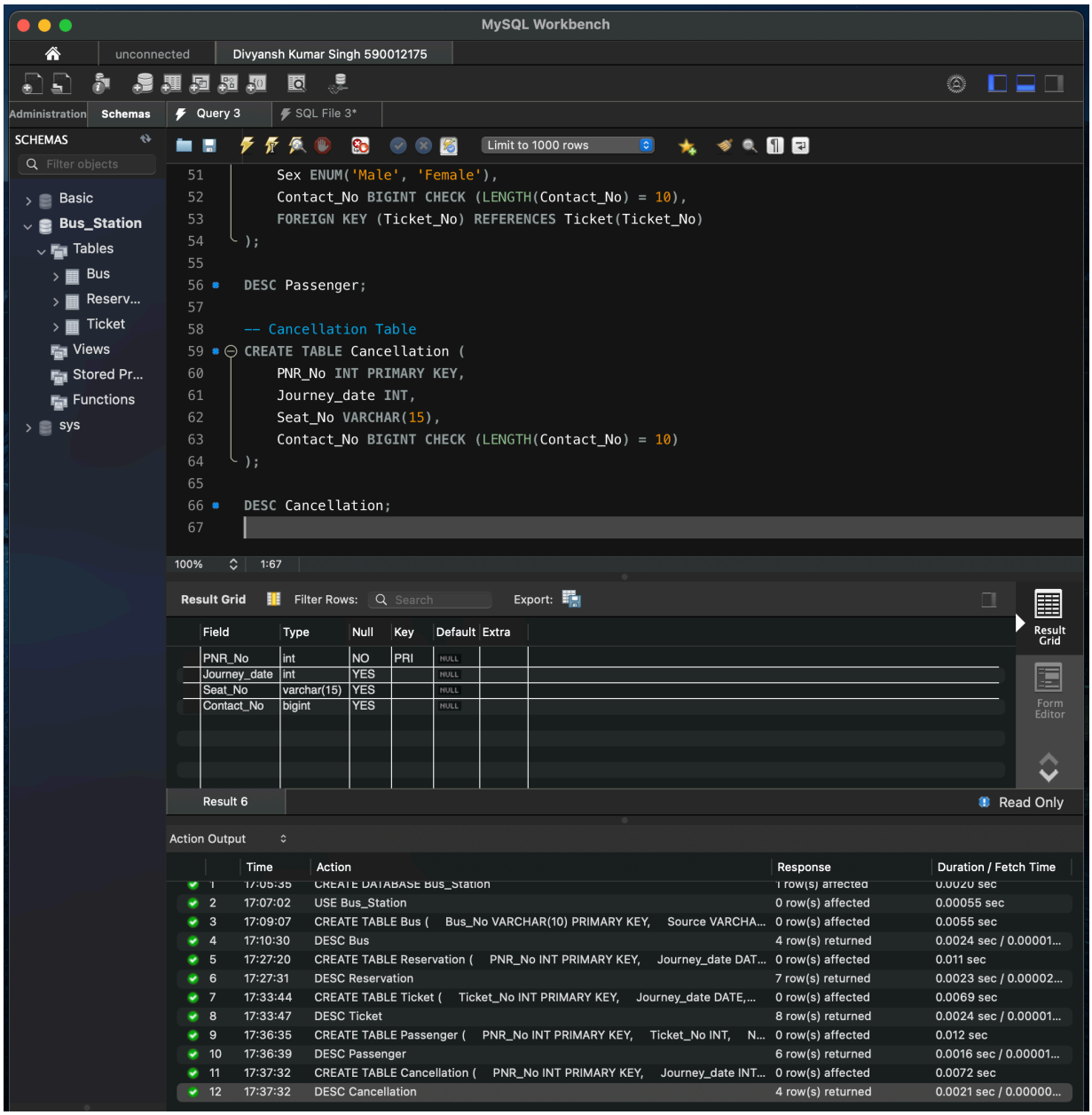
Ticket Table



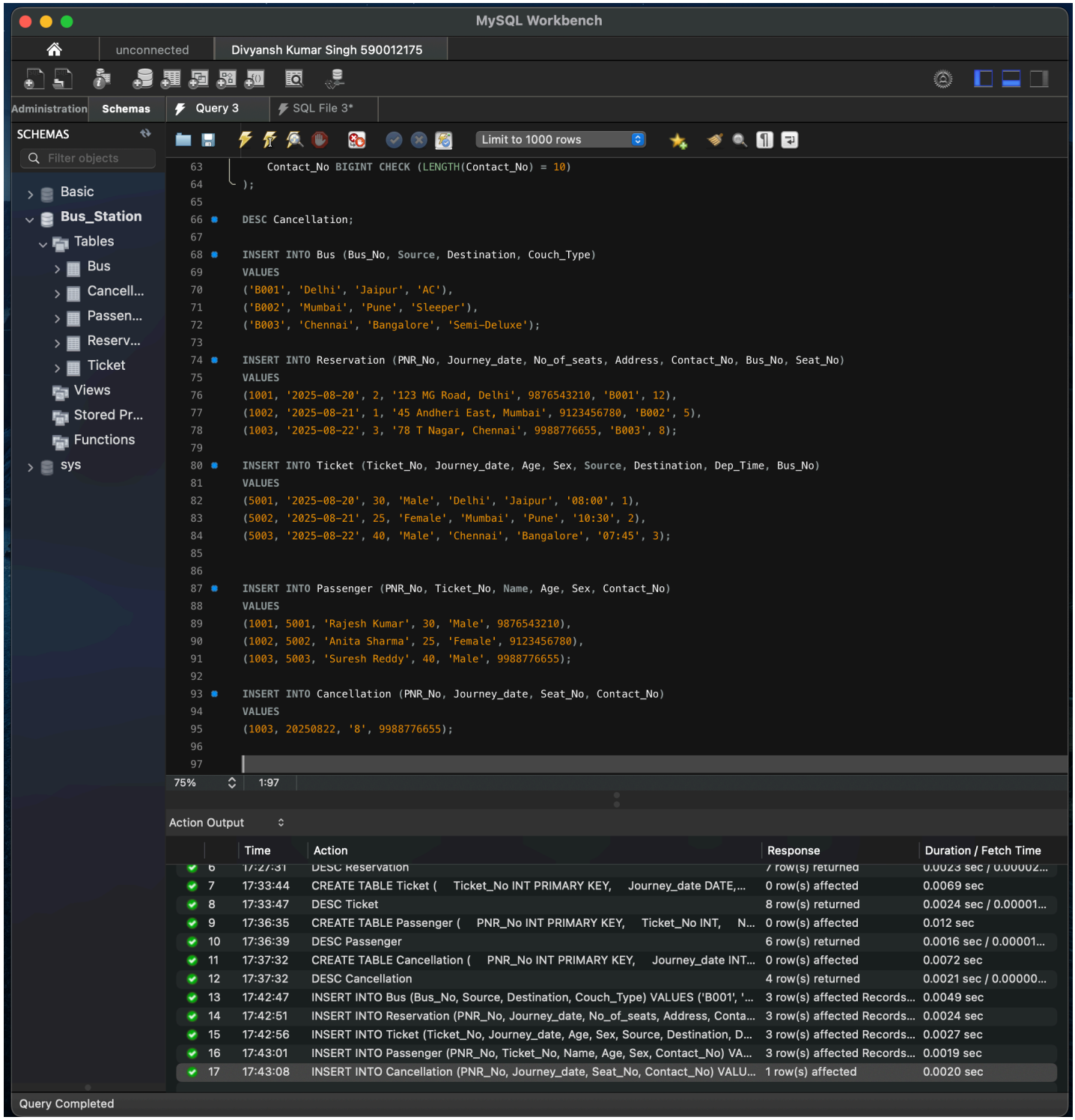
Passenger Table



Cancellation Table

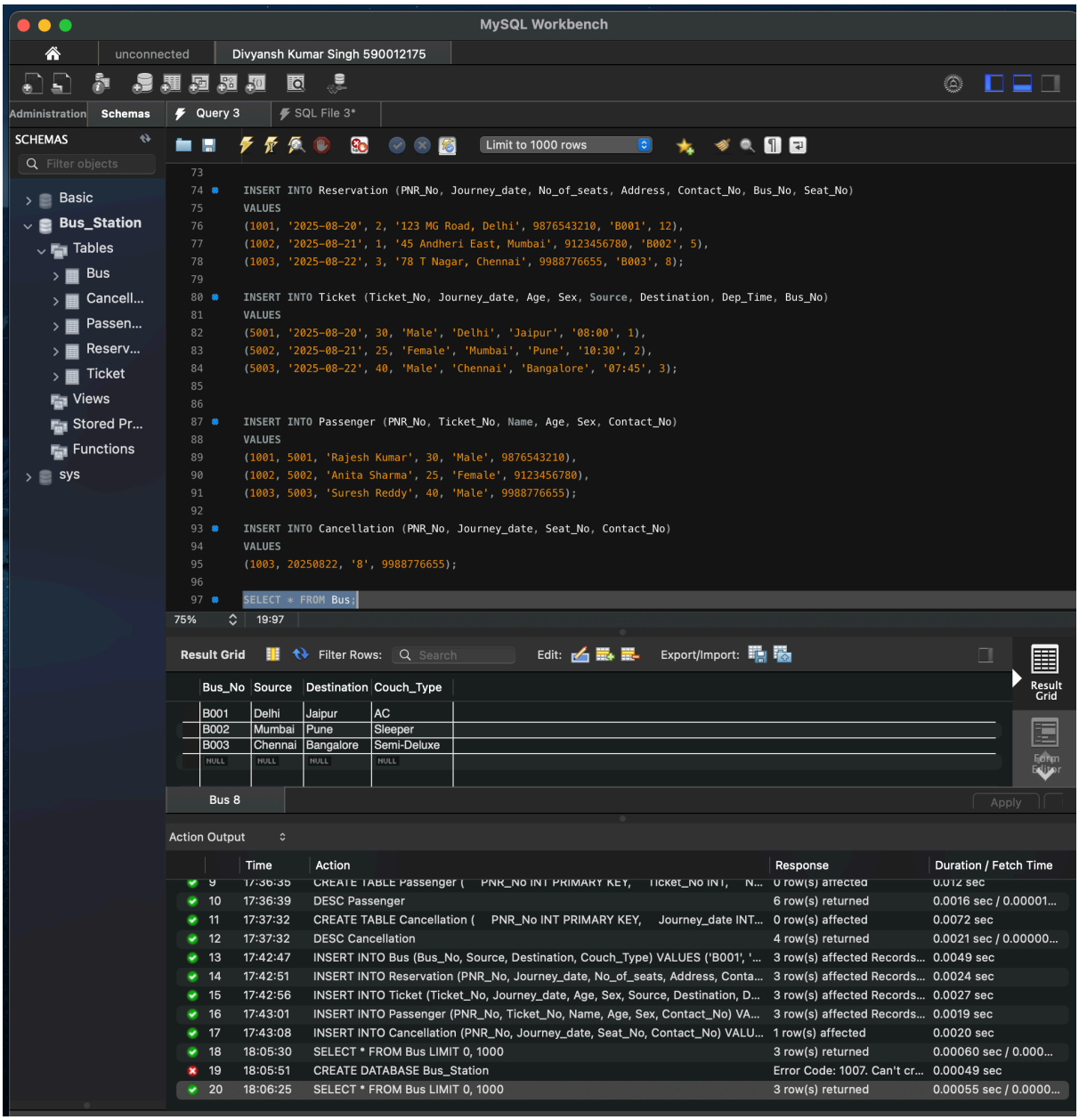


Step 5: Now add data to all tables using **INSERT INTO table_name.**

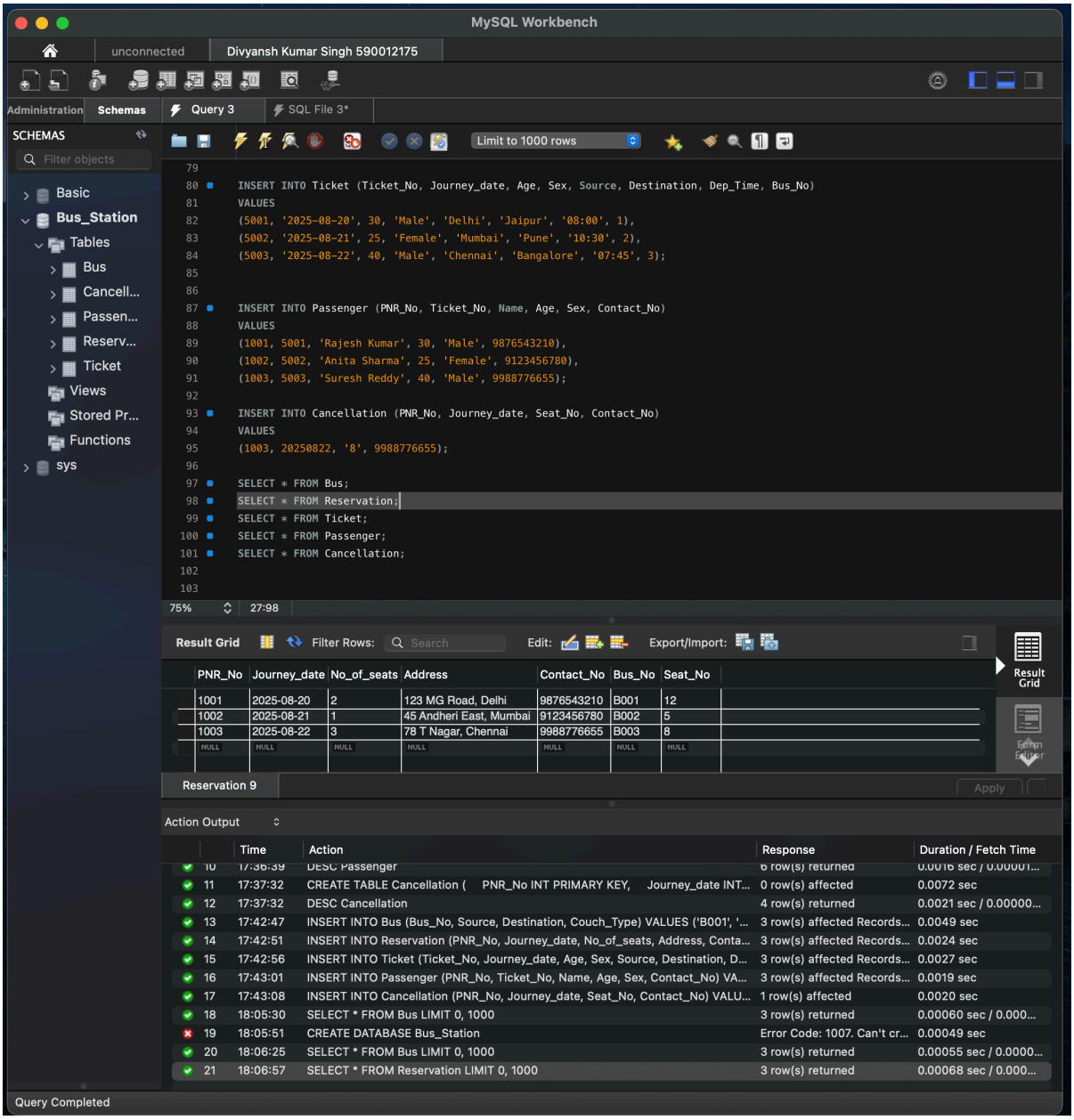


Step 6: Display the data of each table using **SELECT * FROM table_name.**

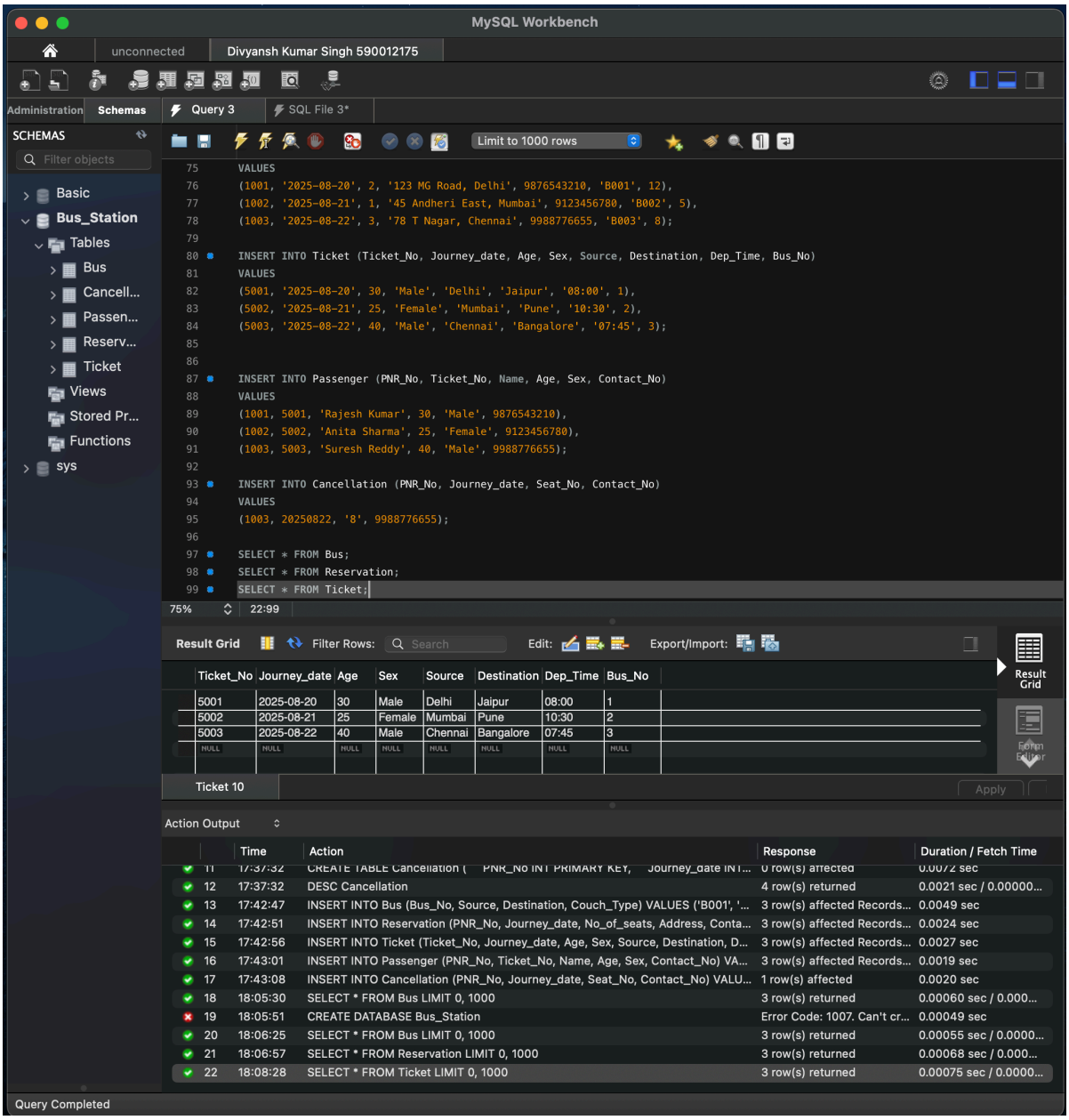
Bus Table



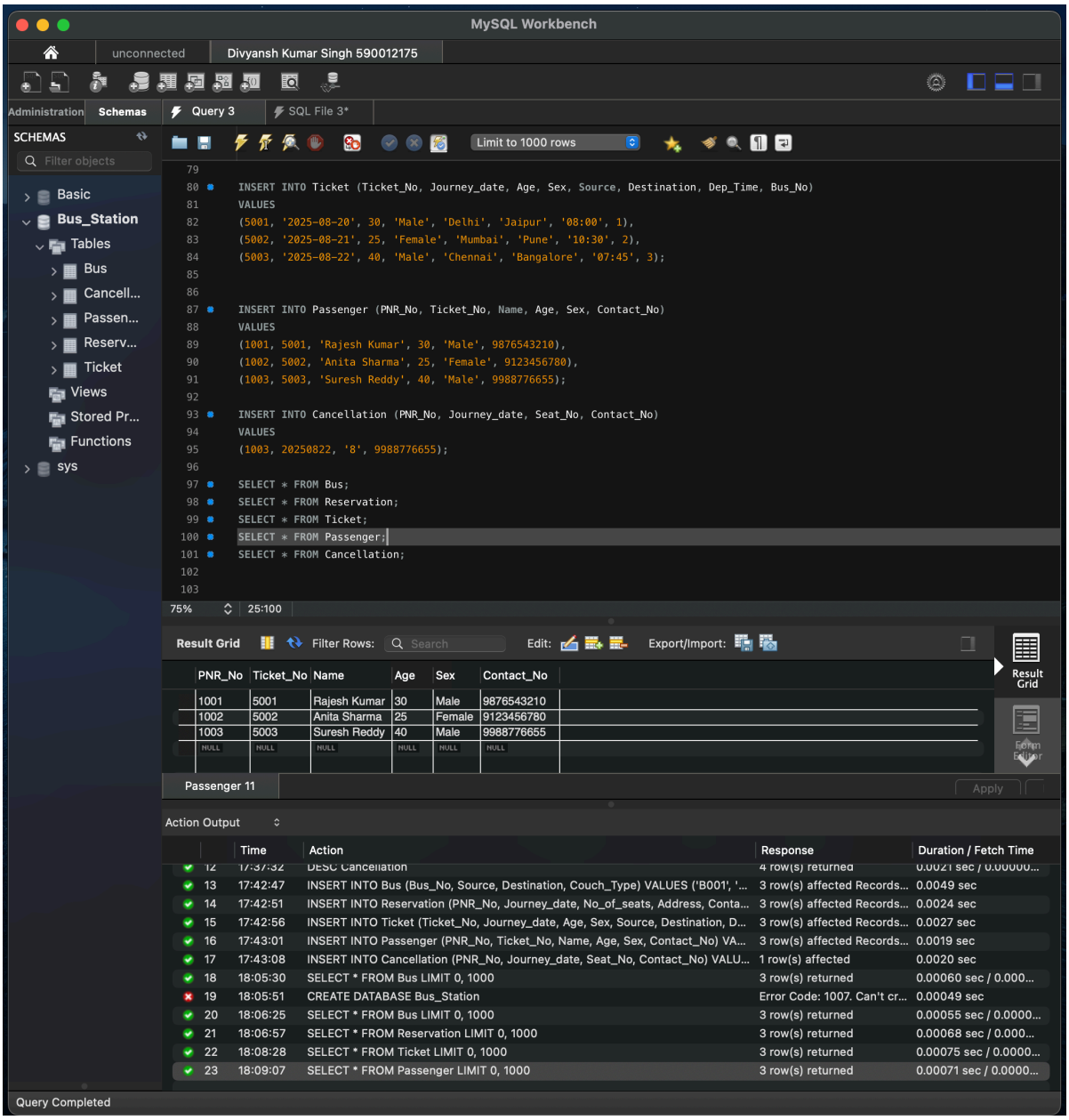
Reservation Table



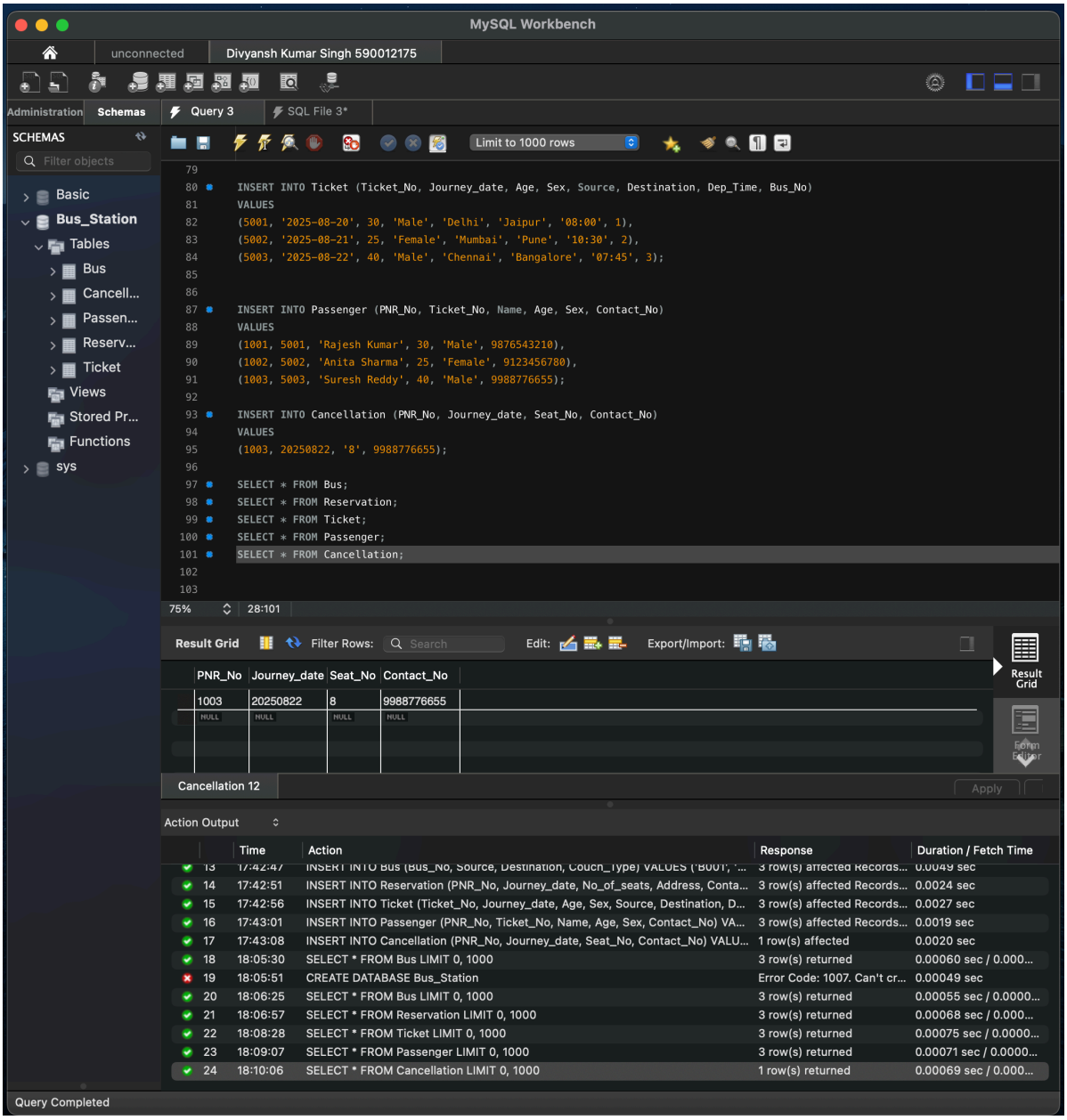
Ticket Table



Passenger Table



Cancellation Table

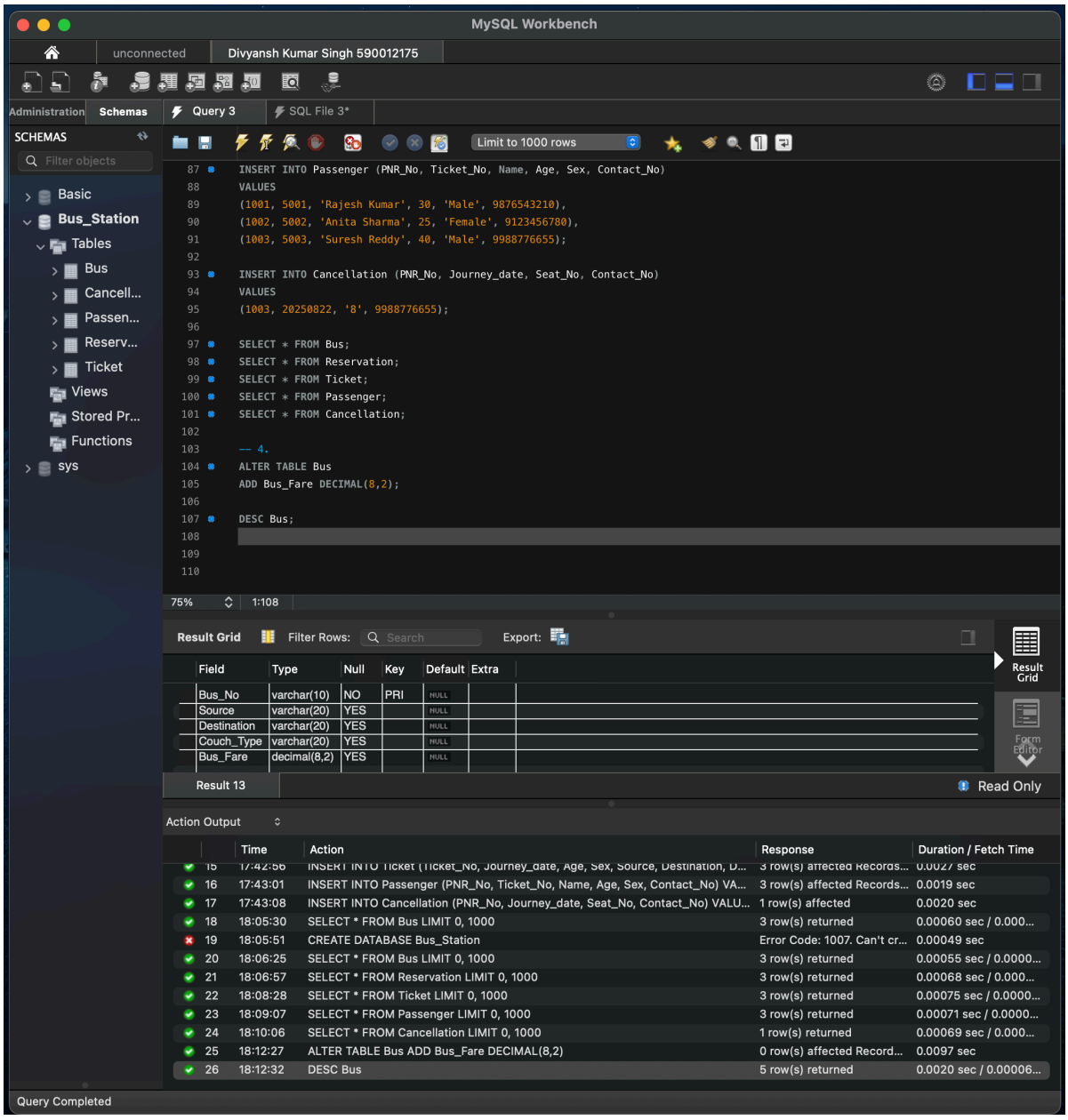


4.

Step 1 : Add a column ***Bus_Fare*** to the table ***Bus*** using

ALTER TABLE table_name
ADD Column_Name DATA_TYPE;

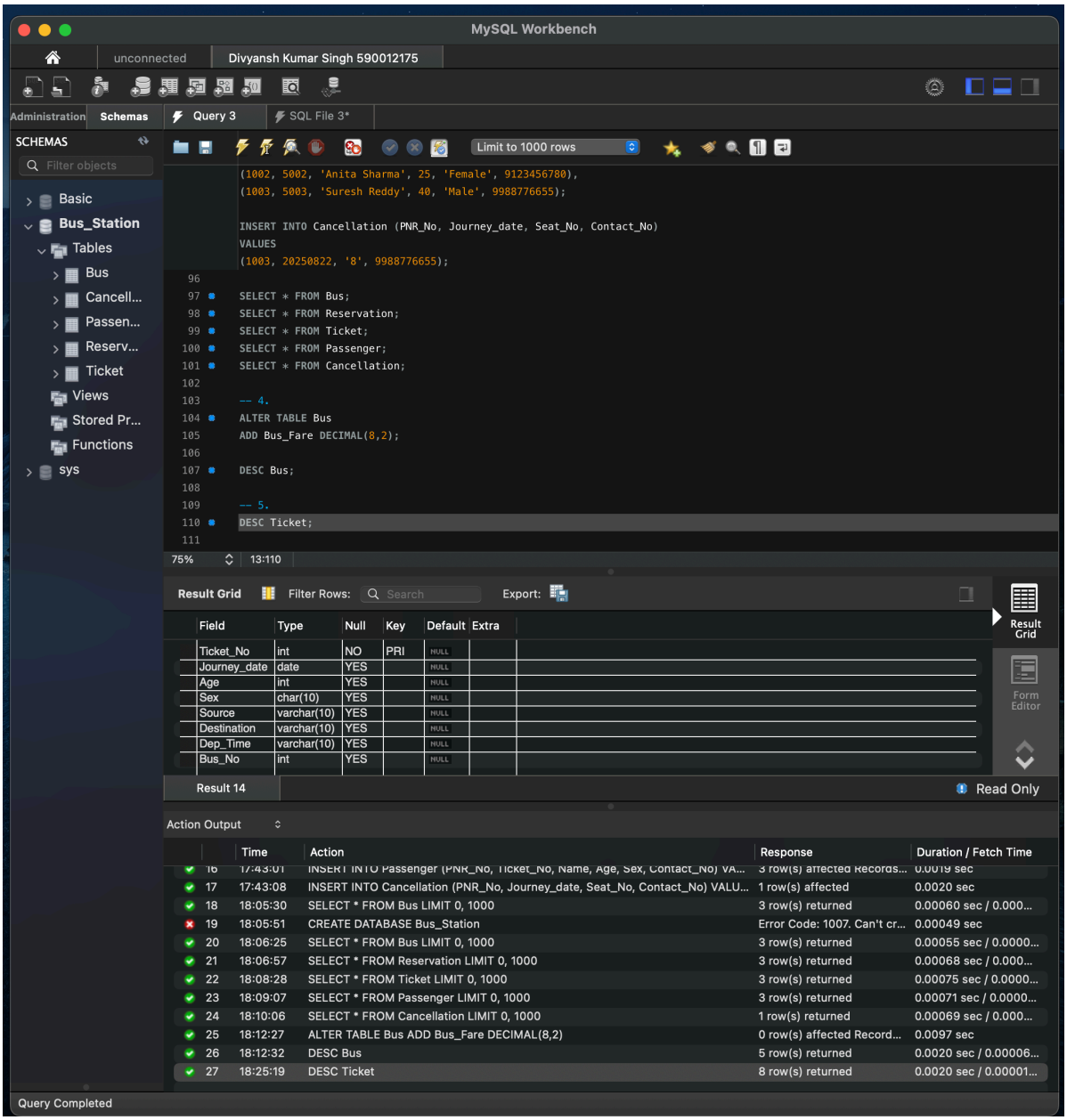
Step 2: Display the new structure of the altered table ***Bus*** using ***DESC table_name;***



Added ***Bus_Fare*** column to table ***Bus.***

5.

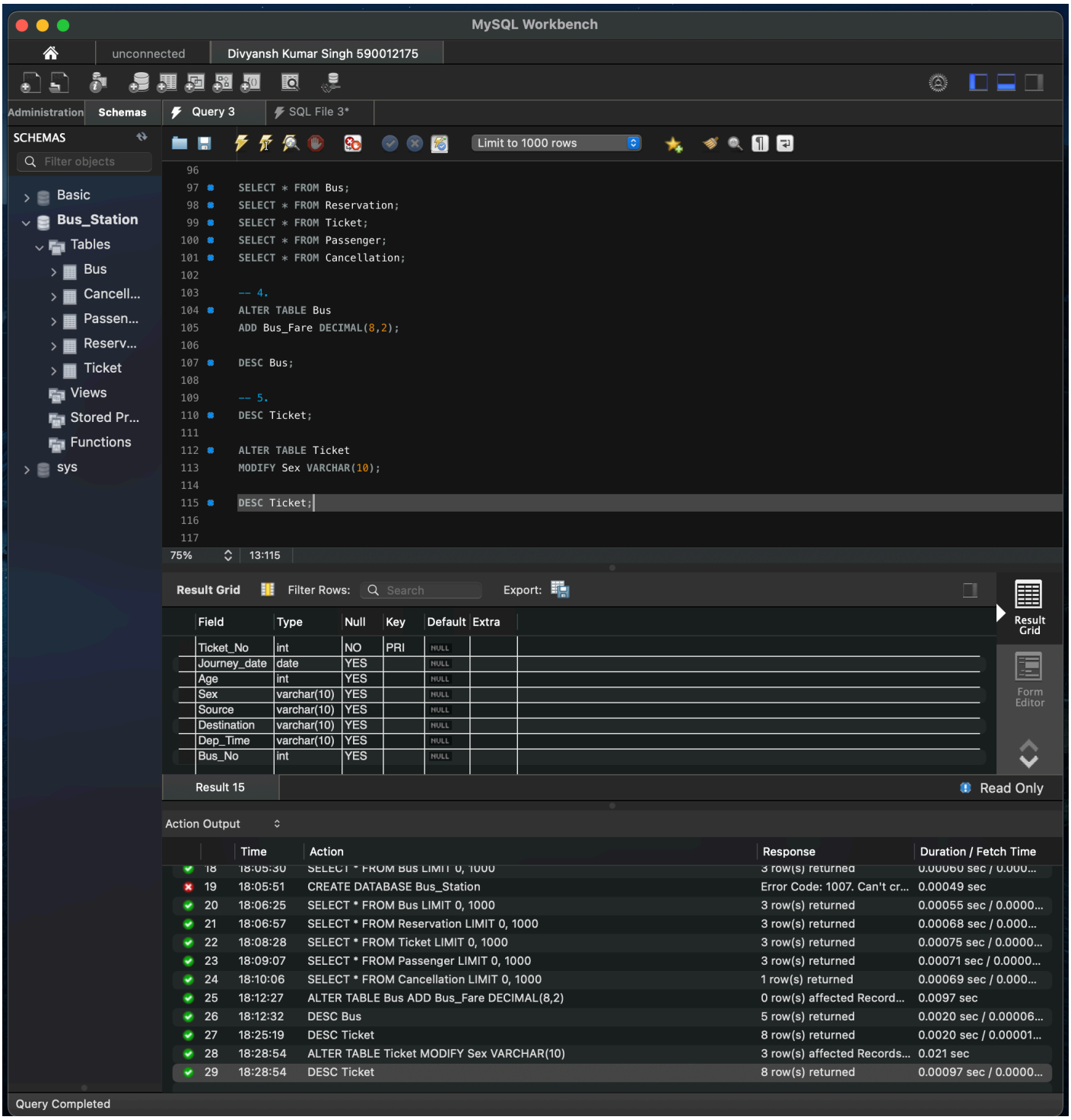
Step 1: Display the structure of the table ***Ticket*** such that we can notice the data type of the column ***Sex*** from table.



Step 2: Change the data type of the column ***Sex*** using

ALTER TABLE table_name
MODIFY column_name new_data_type;

Step 3: Display the new structureof the altered table ***Ticket*** using ***DESC table_name;***


MySQL Workbench
unconnected
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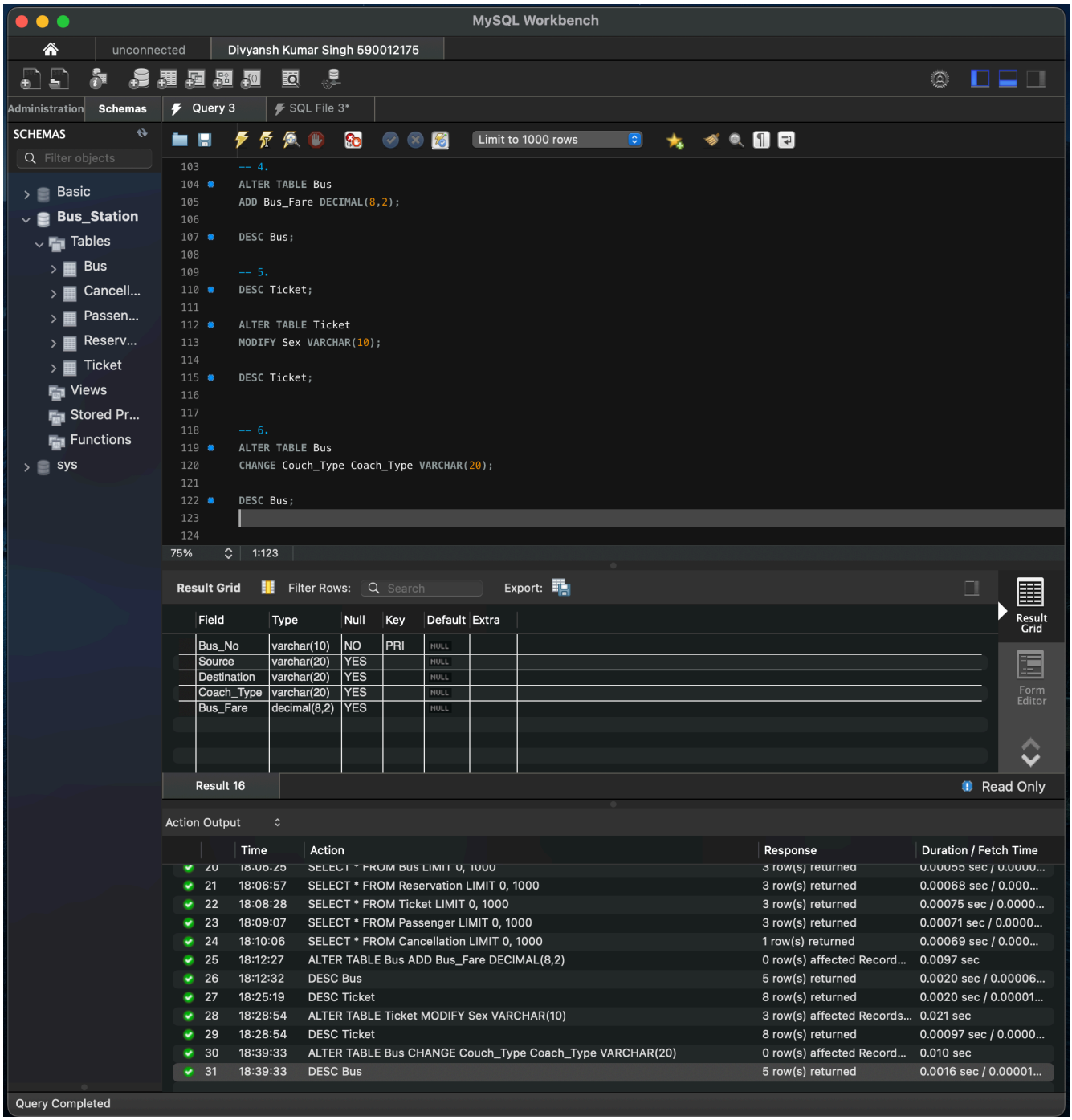
Administration
Schemas
Query 3
SQL File 3*
SCHEMAS
Filter objects
Basic
Bus_Station
Tables
Bus
Cancell...
Passen...
Reserv...
Ticket
Views
Stored Pr...
Functions
sys
Limit to 1000 rows
96
97 SELECT * FROM Bus;
98 SELECT * FROM Reservation;
99 SELECT * FROM Ticket;
100 SELECT * FROM Passenger;
101 SELECT * FROM Cancellation;
102
103 -- 4.
104 ALTER TABLE Bus
105 ADD Bus_Fare DECIMAL(8,2);
106
107 DESC Bus;
108
109 -- 5.
110 DESC Ticket;
111
112 ALTER TABLE Ticket
113 MODIFY Sex VARCHAR(10);
114
115 DESC Ticket;
116
117
75%
13:115
Result Grid
Filter Rows:
Search
Export:
Field Type Null Key Default Extra
Ticket_No int NO PRI NULL
Journey_date date YES NULL
Age int YES NULL
Sex varchar(10) YES NULL
Source varchar(10) YES NULL
Destination varchar(10) YES NULL
Dep_Time varchar(10) YES NULL
Bus_No int YES NULL
Result Grid
Form Editor
Result 15
Read Only
Action Output
Time Action Response Duration / Fetch Time
19 18:05:51 CREATE DATABASE Bus_Station Error Code: 1007. Can't cr... 0.00049 sec
20 18:06:25 SELECT * FROM Bus LIMIT 0, 1000 3 row(s) returned 0.00055 sec / 0.0000...
21 18:06:57 SELECT * FROM Reservation LIMIT 0, 1000 3 row(s) returned 0.00068 sec / 0.000...
22 18:08:28 SELECT * FROM Ticket LIMIT 0, 1000 3 row(s) returned 0.00075 sec / 0.0000...
23 18:09:07 SELECT * FROM Passenger LIMIT 0, 1000 3 row(s) returned 0.00071 sec / 0.0000...
24 18:10:06 SELECT * FROM Cancellation LIMIT 0, 1000 1 row(s) returned 0.00069 sec / 0.000...
25 18:12:27 ALTER TABLE Bus ADD Bus_Fare DECIMAL(8,2) 0 row(s) affected Record... 0.0097 sec
26 18:12:32 DESC Bus 5 row(s) returned 0.0020 sec / 0.00006...
27 18:25:19 DESC Ticket 8 row(s) returned 0.0020 sec / 0.00001...
28 18:28:54 ALTER TABLE Ticket MODIFY Sex VARCHAR(10) 3 row(s) affected Records... 0.021 sec
29 18:28:54 DESC Ticket 8 row(s) returned 0.00097 sec / 0.0000...
Query Completed

6.

Step 1: Change the name of the column ***Couch_Type*** to ***Coach_Type*** of the table ***Bus*** using

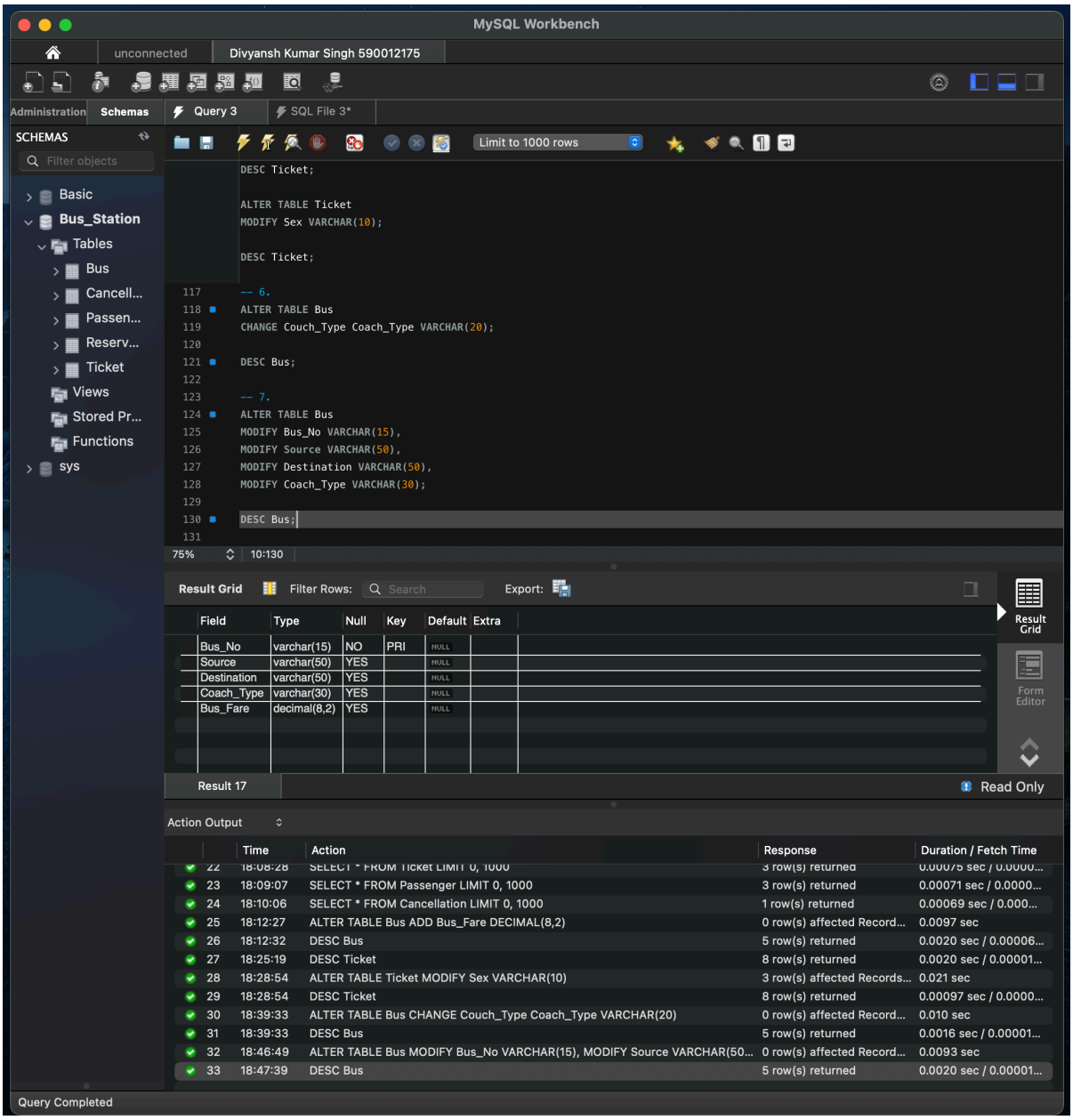
ALTER TABLE table_name
CHANGE column_old_name column_new_name data_type;

Step 2: Display the new structure of the altered table ***Bus*** using ***DESC table_name;***

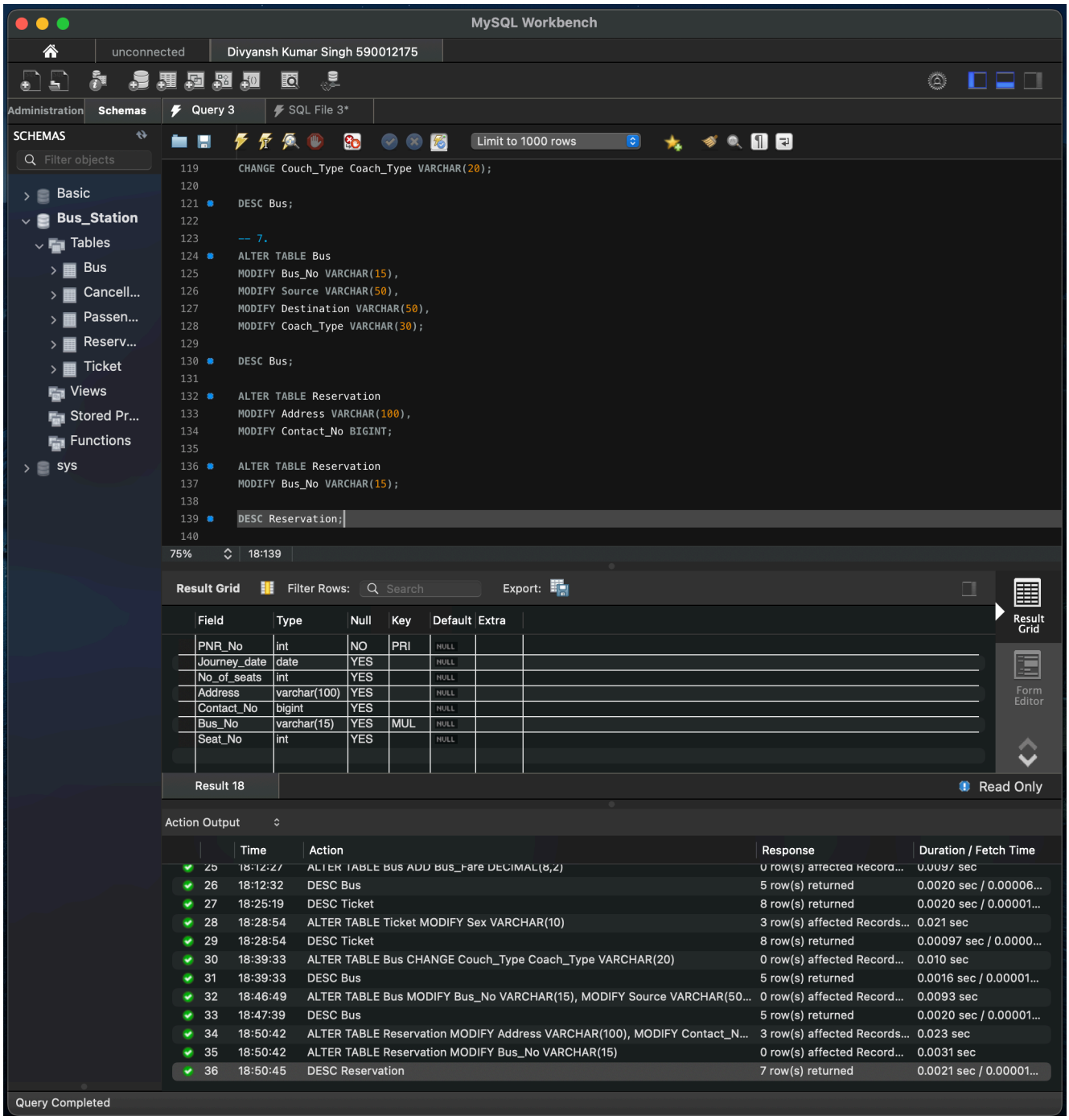


7.

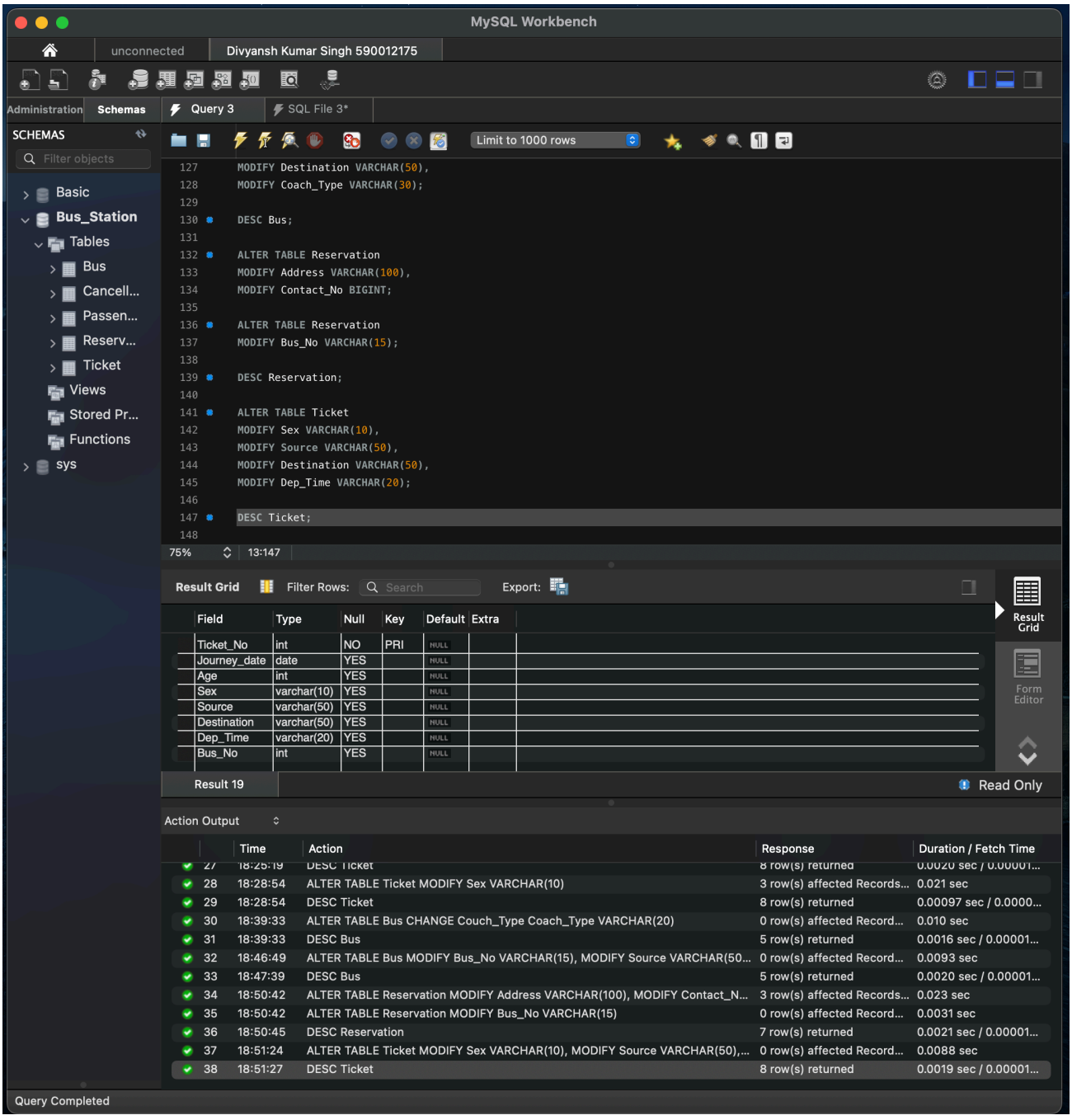
Changed the width of the table ***Bus*** and displayed its new structure.



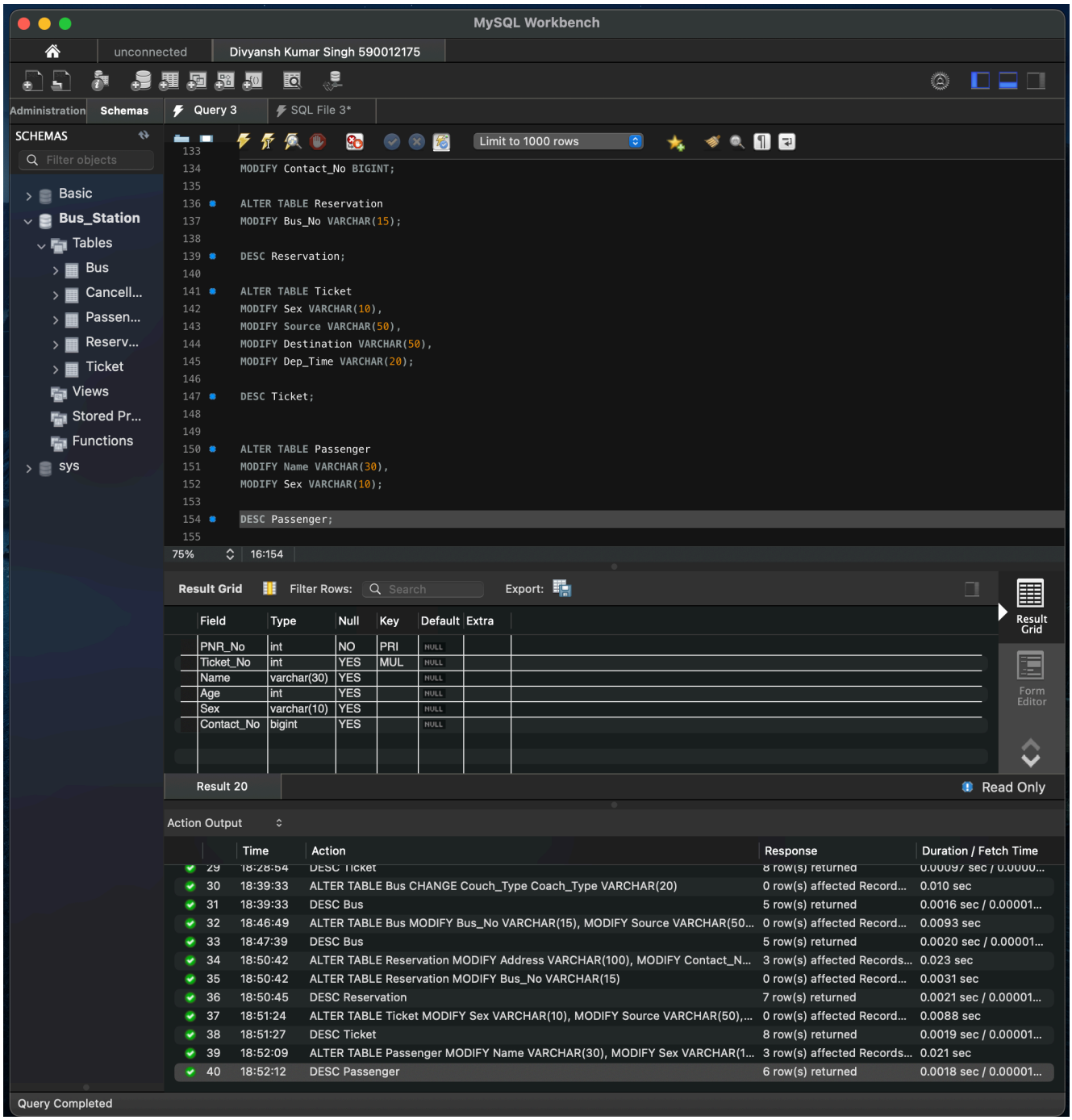
Changed the width of the table ***Reservation*** and displayed its new structure.



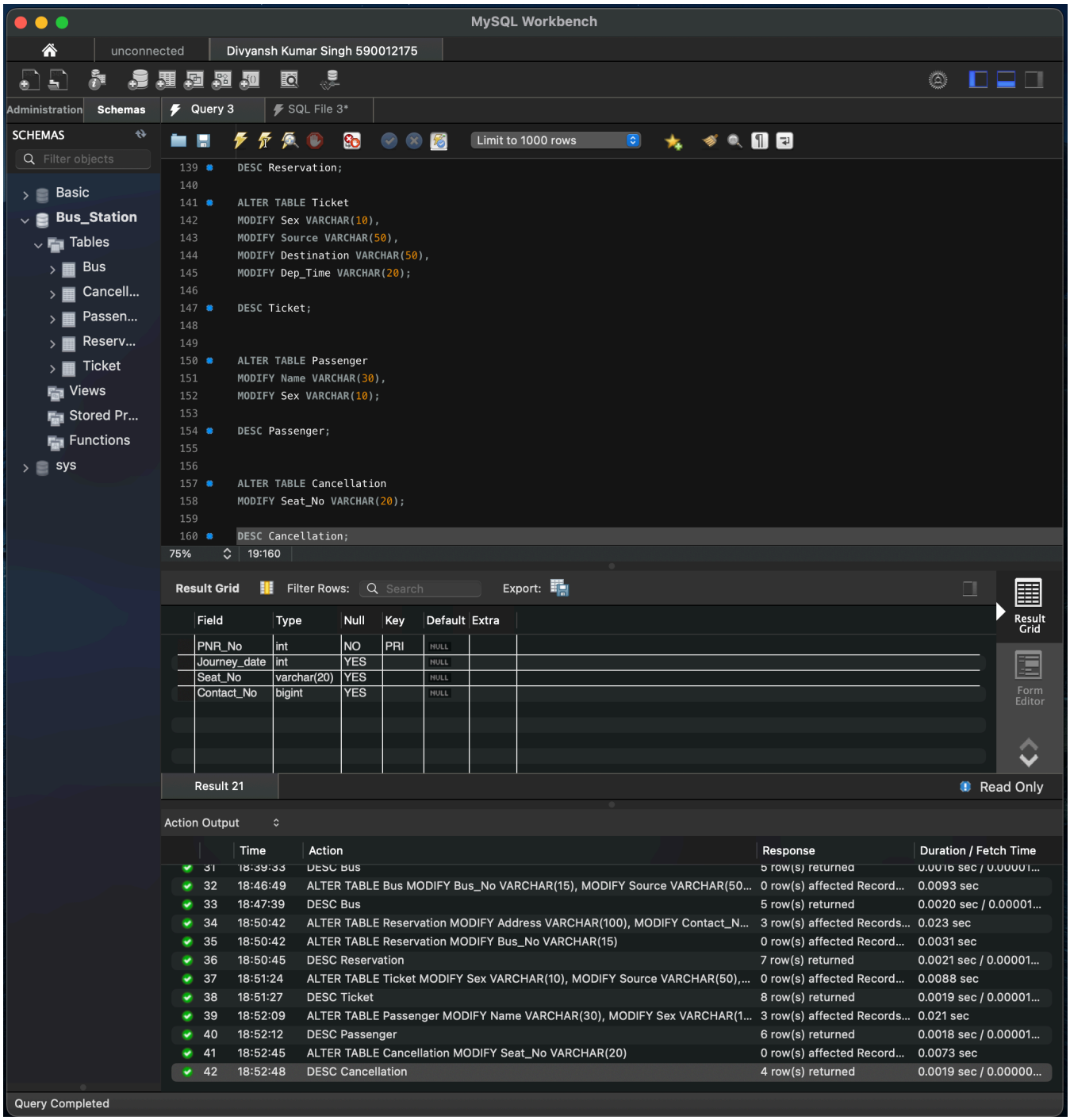
Changed the width of the table ***Ticket*** and displayed its new structure.



Changed the width of the table ***Passenger*** and displayed its new structure.



Changed the width of the table ***Cancellation*** and displayed its new structure.



Conclusion

While performing this lab, various **DDL (Data Definition Language)** and **DML (Data Manipulation Language)** commands were implemented to design, create, and manage a relational database for the *Roadway Travels* scenario. Multiple tables, such as **Bus, Reservation, Ticket, Passenger, and Cancellation,** were created with appropriate constraints, keys, and relationships to reflect real-world operations. Alterations like adding new columns, modifying data types, and changing column names were successfully demonstrated. Data insertion, retrieval, and deletion processes further showcased the use of SQL for managing records.

Overall, the lab provided hands-on experience in **database design, schema modification, and data manipulation**, reinforcing fundamental SQL concepts and their practical applications.

GITHUB DBMS REPOSITORY LINK:

https://github.com/JavaPyWizard/DBMS-LAB