Foundations of Information Technology - 15CSE377
Department of Electronics and Communication Engineering
Amrita School of Engineering, Bengaluru

RELATIONAL DATABASE MANAGEMENT SYSTEM MODEL

(A Hypothetical RDBMS System for Railways based on IRCTC)

A Project by:

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Contents

1. Abstract

A Relational Database Management System (RDBMS) is a collection of programs that enable people to create, update, administer and interact with a relational database. An RDBMS is a powerful data management tool used widely across the world.

The main aim of this Relational Database Management System (RDBMS) project is to understand the process of learning how to create and manage a Relational Database through the use of RDBMS software. We aim to demonstrate the use of create, read, update, delete, join operations in Structured Query Language (SQL) through the use of MySQL, an open-source RDBMS software in this project. This project starts by adding tables of trains, employees, passengers, tickets, stations and food plans. The relation between each table and its attributes has been made with the help of a Entity Relationship (E-R) diagram and implemented the same in MySQL. The data is retrieved from the database by using different SQL queries and the results are displayed, thus simulating a small-scale, hypothetical database model that could be used in a real-life scenario of a Railway corporation, in this case, the Indian Railway Catering and Tourism Corporation (IRCTC).

2. The Entity-Relationship (E-R) Diagram

An Entity–Relationship model (E-R model) describes the structure of a database with the help of a diagram using notations known as E-R notations. There are different kinds of E-R notations, in this case the Crow's Foot notation has been used. E-R diagrams can be viewed as an abstract of a database model. The main components of an E-R model are: Entity set and Relationship set. It helps us understand the relationship between each instance or entity. Every database design starts with the design of a blueprint (E-R diagram) which is later used to extract or capture all the details required to build the application.

Relational database design can be sophisticated, hence it is required that the database architect breaks down the design plan into smaller parts and focuses on every minute detail. E-R diagrams help make the structure of the database simpler and easier to understand.

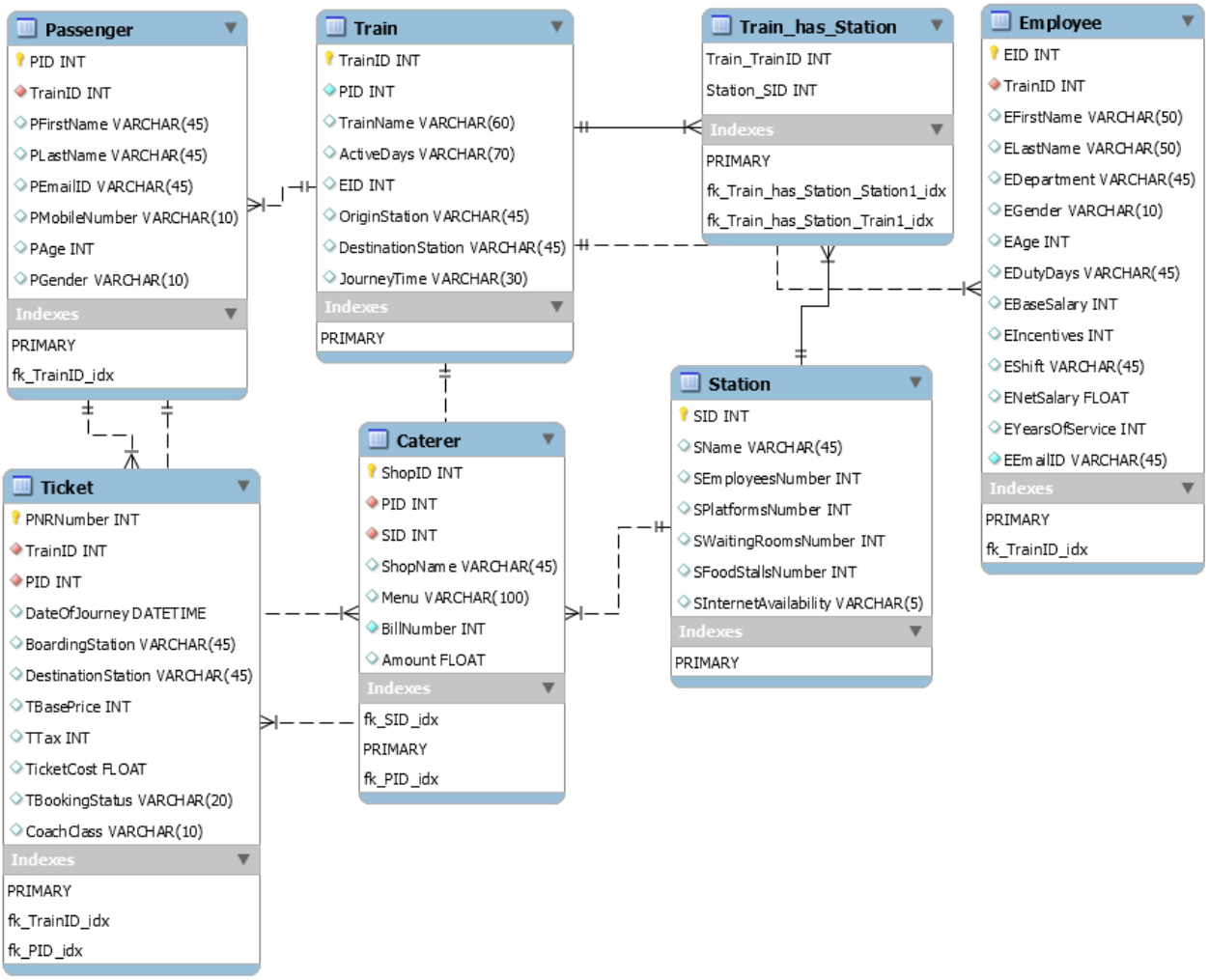


Figure 2.1: The E-R Diagram for the IRCTC RDBMS Model.

Figure 2.1 represents the relationships of the various tables used in our model. This diagram helps in future in drafting the code for this project. We have broken down our database design into six different entities namely:

1. Passenger
2. Train
3. Station
4. Ticket
5. Employee
6. Caterer

Each entity will have a cardinality with another entity that defines their relationship. In Figure 2.1,

- The **Passenger** table has a **many-to-one relationship (N:1)** with the **Train** table which means that more than one passenger can travel in one train.
- The **Stations** Table has a **one-to-many relationship (1:N)** with the **Caterer** table since each station can house many food outlets at a time.
- The **Train** table has a **many-to-many relationship (N:M)** with the **Station** table which means that many trains can pass by many stations.
- The **Caterer** table has a **many-to-one relationship (N:1)** with the **Passenger** table which means that multiple items can be bought from one particular caterer by one person.
- The **Ticket** table is a **weak entity** since it **depends** upon the **existence** of the **Passenger** table and the cardinality between these tables is **one-to-many (1:N)** as each passenger can buy/hold many tickets.
- The **Employee** table has a **many-to-one relationship (N:1)** with the **Train** table which means that many employees (Loco-pilot, Ticket Collector, Cleaner, etc.) can work for one particular train.

3. The Passenger table

```sql
-- CREATING TABLE 'PASSENGER' WITH PRIMARY KEY 'PID' (PASSENGER ID)
  CREATE TABLE passenger (
    pid INT NOT NULL AUTO_INCREMENT,
    pfirstname VARCHAR(30),
    plastname VARCHAR(30),
    p_age INT NOT NULL,
    pgender VARCHAR(6),
    pemail VARCHAR(30),
    pmobilenumber VARCHAR(10),
    paddress VARCHAR(20),
    PRIMARY KEY (pid)
  );

-- STARTING 'PID' VALUE WITH THE VALUE '10100'
  ALTER TABLE passenger AUTO_INCREMENT = 10100;

-- INSERTING VALUES INTO 'PASSENGER'
  INSERT INTO passenger(pfirstname, plastname, p_age, pgender, pemail, pmobilenumber,
  ↪ paddress)
    VALUES
    -- Done for 20 different iterations
    ('Jacob', 'Stevonson', 42, 'Male', 'jacob@gmail.com', '8941372561', 'Pondicherry'),
    ('Mohan', 'Dadvani', 60, 'Male', 'mohan@gmail.com', '9217334768', 'Delhi'),
    ('Harshitha', 'Gowda', 23, 'Female', 'harshitha@gmail.com', '7619842536', 'Bangalore'),
    ('Srikar', 'Varma', 58, 'Male', 'srikar@gmail.com', '8945167661', 'Hyderabad'),
    ('Anindita', 'Deb', 45, 'Female', 'anu@gmail.com', '9657987415', 'Kolkata'),
    ('Shiva', 'Anandan', 45, 'Male', 'shiva@gmail.com', '9977465371', 'Chennai'),
    ('Pranita', 'Wadhekar', 35, 'Female', 'pranita@gmail.com', '9212364144', 'Mumbai'),
    ('Chirag', 'Nair', 36, 'Male', 'chirag@gmail.com', '9465112365', 'Trivandrum'),
    ('Geeta', 'Jaa', 50, 'Female', 'geeta@gmail.com', '8439716528', 'Lucknow'),
    ('Xiang', 'Chi', 50, 'Male', 'xiang@gmail.com', '6871982345', 'Gangtok'),
    ('Anup', 'Bandhary', 78, 'Male', 'anup@gmail.com', '7642359815', 'Ahmedabad'),
    ('Tara', 'Singh', 19, 'Female', 'tara@gmail.com', '7765125492', 'Chandigarh'),
    ('Dhanush', 'Hegde', 17, 'Male', 'dhanush@gmail.com', '9277652812', 'Hubali'),
    ('Preeti', 'Seikh', 29, 'Female', 'preeti@gmail.com', '6998274311', 'Nainital'),
    ('Mohith', 'Tiwari', 49, 'Male', 'mohith@gmail.com', '9768544712', 'Jaipur'),
    ('Suhasini', 'Gupta', 38, 'Female', 'suhasini@gmail.com', '8462317137', 'Noida'),
    ('Kunal', 'Khanna', 28, 'Male', 'kunal@gmail.com', '8685468454', 'Jodhpur'),
    ('Vaidehi', 'Balakrishnan', 37, 'Female', 'vaidehi@gmail.com', '9557186415', 'Ranchi'),
    ('Simran', 'Hegde', 43, 'Female', 'simran@gmail.com', '9561574313', 'Mangalore'),
    ('Akarsh', 'Bhatia', 36, 'Male', 'akarsh@gmail.com', '9611365168', 'Amaravati');

-- VIEWING THE FINAL TABLE 'PASSENGER'
  SELECT * FROM passenger;
```

4. The Stations table

```sql
-- CREATING TABLE 'STATIONS' WITH PRIMARY KEY 'SID' (STATION ID)
  CREATE TABLE stations (
    sid INT NOT NULL AUTO_INCREMENT,
    stationname VARCHAR(30),
    numberofplatforms INT NOT NULL,
    numberoffoodstalls INT,
    numberofwaitingrooms INT,
    internet VARCHAR(3),
    numberofemp INT NOT NULL,
    arrivingtrains VARCHAR(40),
    PRIMARY KEY (sid)
  );

-- INSERTING VALUES INTO 'STATIONS'
  INSERT INTO stations(stationname, numberofplatforms, numberoffoodstalls,
  ↪  numberofwaitingrooms, internet, numberofemp, arrivingtrains)
    VALUES
    ('KSR Bengaluru', 12, 39, 10, 'YES', 25, '1025, 1027, 1032'),
    ('Margao Station,  Goa', 4, 7, 2, 'NO', 8, '1029'),
    ('Bandra', 8, 15, 4, 'YES', 11, '1024, 1032'),
    ('Ernakulam', 10, 30, 10, 'YES', 18, '1023, 1027'),
    ('Kota', 2, 6, 0, 'NO', 10, '1032, 1031'),
    ('Kollam', 5, 11, 3, 'NO', 12, '1023, 1027'),
    ('Mumbai', 12, 50, 13, 'YES', 35, '1024, 1026, 1028, 1029, 1030'),
    ('Thrissur', 2, 6, 0, 'NO', 6, '1023'),
    ('Hyderabad', 9, 21, 6, 'YES', 17, '1030, 1032'),
    ('Surat', 2, 0, 0, 'NO', 6, '1028, 1031'),
    ('Pune', 7, 17, 5, 'YES', 15, '1026, 1030'),
    ('Indore', 8, 20, 4, 'YES', 21, '1031, 1032, 1028'),
    ('Thiruvananthapuram', 8, 20, 6, 'YES', 15, '1023'),
    ('Palakkad', 6, 18, 5, 'NO', 13, '1023'),
    ('Mysore', 5, 14, 3, 'YES', 11, '1025, 1032'),
    ('Jaipur', 12, 39, 6, 'YES', 16, '1028, 1030, 1031, 1032');

-- VIEWING THE FINAL TABLE 'STATIONS'
  SELECT * FROM stations;
```

5. The Train table

```sql
-- CREATING TABLE 'TRAIN' WITH PRIMARY KEY 'TRAINID'
  CREATE TABLE `train` (
    `trainid` INT NOT NULL AUTO_INCREMENT,
    `trainname` VARCHAR(255),
    `activedays` VARCHAR(255),
    `locopilotID` VARCHAR(255),
    `originstation` VARCHAR(255),
    `destinationstation` VARCHAR(255),
    `pickupstation` VARCHAR(255),
    `journeytime` TIME NOT NULL,
    PRIMARY KEY (`trainid`)
  );

-- STARTING 'TRAINID' VALUE WITH THE VALUE '1023'
  ALTER TABLE train AUTO_INCREMENT = 1023;

-- INSERTING VALUES INTO 'TRAIN'
  INSERT INTO `irctc`.`train`(`trainname`, `activedays`, `locopilotID`, `originstation`,
  ↪  `destinationstation`, `pickupstation`, `journeytime`)
  VALUES
    ('Amritha Express', 'Daily', 100342, ' Thiruvananthapuram Central', 'Palakkad Town',
    ↪  'Kollam, Kottayam, Ernakulam, Aluva, Thrissur, Palakkad, Dindigul', '00:15:45'),
    ('Bandra Terminus UdaipurExpress', 'Sun, Wed, Fri', 100343, ' Bandra Terminus', '
    ↪  Udaipur', 'Bandra, Mumbai, Rajsthan, Udaipur', '00:16:55'),
    ('Chamundi Express', 'Daily', 100344, ' Bangalore City ', 'Mysore City', 'Kengeri,
    ↪  Mandya, Pandavpura', '00:03:05'),
    ('Deccan Express', 'Daily', 100345, ' Mumbai CST', ' Pune Junction ', 'Thane, Kalyan,
    ↪  Karjur', '00:04:05'),
    ('Ernakulam-BangaloreExpress', 'Daily', 100346, 'Bangalore City', 'Ernakulam',
    ↪  'BloreCant, Carmelaram, KRpuram', '00:09:00'),
    ('Flying Ranee', 'Daily', 100347, 'Mumbai City', 'Surat', 'Andheri, Borivalli, Vapi',
    ↪  '00:04:40'),
    ('Goa Express', 'Daily', 100348, 'Goa', 'New Delhi', ' Margao, Gwalior,  Agra ',
    ↪  '00:39:25'),
    ('Hyderabad Mumbai Express', 'Daily', 100349, 'Hyderabad', 'Mumbai', 'Wadi, Solapur,
    ↪  Pune', '00:15:20'),
    ('Indore - Jammu Tawi Weekly Superfast Express ', 'Mon, Wed', 100350, 'Indore',
    ↪  'Jammu', 'Kota, Panipat, Ludhiana', '00:25:30'),
    ('Jaipur Mysore Superfast Express', 'Thurs, Sat', 100351, 'Jaipur', 'Mysore', 'Kota,
    ↪  Hyderabad, Bangalore City', '00:44:00');

-- VIEWING THE FINAL TABLE 'TRAIN'
  SELECT * FROM train;
```

6. The Caterer table

```sql
-- CREATING TABLE 'CATERER' WITH PRIMARY KEY 'SHOPID'
  CREATE TABLE `caterer` (
    `shopid` INT NOT NULL AUTO_INCREMENT,
    `shopname` VARCHAR(45) NOT NULL,
    `menu` VARCHAR(255) DEFAULT NULL,
    `billnumber` INT NOT NULL,
    `amount` INT,
    PRIMARY KEY (`shopid`)
  );

SET SQL_SAFE_UPDATES = 0;
-- ADDING A COLUMN TO SET 'SID' AS FOREIGN KEY
  ALTER TABLE caterer ADD COLUMN sid INT NULL;
  UPDATE caterer SET sid = 1;
-- ADDING 'SID' AS FOREIGN KEY
  ALTER TABLE caterer ADD FOREIGN KEY (sid) REFERENCES stations (sid);
-- ADDING A COLUMN TO SET 'PID' AS FOREIGN KEY
  ALTER TABLE caterer ADD COLUMN pid INT NULL;
  UPDATE caterer SET pid = 10100;
-- ADDING 'PID' AS FOREIGN KEY
  ALTER TABLE caterer ADD FOREIGN KEY (pid) REFERENCES passenger (pid);
-- STARTING 'SHOPID' VALUE WITH THE VALUE '6588832'
  ALTER TABLE caterer AUTO_INCREMENT = 6588832;

-- INSERTING VALUES INTO 'CATERER'
  INSERT INTO `irctc`.`caterer` (`shopname`, `menu`, `billnumber`, `amount`, `sid`, `pid`)
    VALUES
    ('Raju Pan Masala', 'Sweet Paan, Cigarettes, Cheni Kheni, Biscuits, Chakli, Kaccha
    ↪  Mango Bite', '24568732', '300', '1', '10105'),
    ('Shiv Sagar', 'Idli, Dosa, Bisi Bele Bath, Masala Dosa, Set Dosa, Pongal, Vada, Tomato
    ↪  Bath', '24568733', '630', '2', '10109'),
    ('Goli Vada PAV', 'Cheese Vada Pav, Sabudana Vada, Special Vada, Coke', '24568734',
    ↪  '229', '2', '10112'),
    ('Halli Thindi', 'Chapati, Curry, South Indian Meals, North Indian Meals', '24568735',
    ↪  '709', '3', '10104'),
    ('Banki Mane', 'Bhelpuri, Pani puri, Tikki puri, Dahi puri', '24568736', '350', '4',
    ↪  '10107'),
    ('Bachlu Mane', 'Ragi Mudde, Biryani, Lemon Juice, Chicken curry', '24568737', '523',
    ↪  '5', '10102'),
    ('Green Veggies', 'Salad, Russian salad, Sandwich, Fries', '24568738', '206', '6',
    ↪  '10101'),
    ('MTR', 'Idli vada, Sambar, Chutney, Dosa, Pongal, Mysore Vada, Paneer dosa',
    ↪  '24568739', '420', '7', '10115'),
    ('Just Bake', 'Brownie, Choco Lava cake, Cheese cake, Pastries, Cookies', '24568740',
    ↪  '352', '8', '10111'),
    ('Udupi Upahar', 'Rava idli, Upma, Coffee, Tea, Green Tea, Veg Meals, Onion less
    ↪  Biryani', '24568741', '294', '9', '10117');

-- VIEWING THE FINAL TABLE 'CATERER'
  SELECT * FROM caterer;
```

7. The Ticket table

```sql
-- CREATING TABLE 'TICKET' WITH PRIMARY KEY 'PNRNUMBER'
  CREATE TABLE `ticket` (
    `pnrnumber` INT NOT NULL AUTO_INCREMENT,
    `dateofjourney` DATETIME NOT NULL,
    `boardingstation` VARCHAR(45) DEFAULT NULL,
    `destinationstation` VARCHAR(45) NOT NULL,
    `tprice` INT DEFAULT 90,
    `ttax` FLOAT DEFAULT 0.18,
    `ticketcost` FLOAT GENERATED ALWAYS AS (tprice + (tprice * ttax)) STORED,
    `tbookingstatus` VARCHAR(20),
    `coachclass` VARCHAR(10),
    PRIMARY KEY (`pnrnumber`)
  );

SET SQL_SAFE_UPDATES = 0;
-- ADDING A COLUMN TO SET 'TRAINID' AS FOREIGN KEY
  ALTER TABLE ticket ADD COLUMN trainid INT NULL;
  UPDATE ticket SET trainid = 1023;
-- ADDING 'TRAINID' AS FOREIGN KEY
  ALTER TABLE ticket ADD FOREIGN KEY (trainid) REFERENCES train (trainid);
-- ADDING A COLUMN TO SET 'PID' AS FOREIGN KEY
  ALTER TABLE ticket ADD COLUMN pid INT NULL;
  UPDATE ticket SET pid = 10100;
-- ADDING 'PID' AS FOREIGN KEY
  ALTER TABLE ticket ADD FOREIGN KEY (pid) REFERENCES passenger (pid);
-- STARTING 'PNRNUMBER' VALUE WITH THE VALUE '1883332598'
  ALTER TABLE ticket AUTO_INCREMENT = 1883332598;

-- INSERTING VALUES INTO 'TICKET'
  INSERT INTO `irctc`.`ticket` (`dateofjourney`, `boardingstation`, `destinationstation`,
  ↪ `tprice`, `tbookingstatus`, `coachclass`, `trainid`, `pid`)
    VALUES
    ('2020-12-12 12:12:12', 'Thiruvananthapuram Central', 'Goa', 300, 'RAC', 'SLEEPER',
    ↪ '1023', '10100'),
    ('2020-12-13 01:34:01', 'KSR Bengaluru', 'Bandra', 630, 'CNF', '2AC', '1024', '10101'),
    ('2020-12-13 19:23:37', 'Thrissur', 'Hyderabad', 229, 'WL32', 'CHAIR', '1025',
    ↪ '10102'),
    ('2020-12-14 03:52:56', 'Palakkad', 'Jaipur', 709, 'CNF', '1AC', '1026', '10103'),
    ('2020-12-14 11:13:45', 'Kota', 'Kollam', 350, 'WL321', 'SLEEPER', '1027', '10104'),
    ('2020-12-14 23:43:32', 'Mysore', 'Bandra', 523, 'RAC', '3AC', '1028', '10105'),
    ('2020-12-15 12:29:57', 'Surat', 'Indore', 206, 'WL1', 'GENERAL', '1029', '10106'),
    ('2020-12-16 17:17:53', 'Bandra', 'Goa', 420, 'WL50', '2AC', '1030', '10109'),
    ('2020-12-18 03:16:13', 'Pune', 'Thiruvananthapuram', 352, 'CNF', 'SLEEPER', '1031',
    ↪ '10109'),
    ('2020-12-23 08:39:00', 'Ernakulam', 'Mumbai', 294, 'WL512', 'GENERAL', '1032',
    ↪ '10109');

-- VIEWING THE FINAL TABLE 'TICKET'
  SELECT * FROM ticket;
```

8. The Employee table

```sql
-- CREATING TABLE 'EMPLOYEE' WITH PRIMARY KEY 'EID'
  CREATE TABLE `employee` (
    `eid` INT NOT NULL auto_increment,
    `ename` VARCHAR(255),
    `epostionheld` VARCHAR(255),
    `eage` INT NOT NULL,
    `egender` VARCHAR(255),
    `edaysofduty` VARCHAR(255),
    `ebasesalary` INT NOT NULL,
    `eshift` VARCHAR(255),
    `eyearsofservice` INT NOT NULL,
    `eincentives` FLOAT NOT NULL,
    `enetsalary` DOUBLE GENERATED ALWAYS AS (ebasesalary + eincentives) STORED,
     PRIMARY KEY (`eid`)
  );

SET SQL_SAFE_UPDATES = 0;

-- ADDING A COLUMN TO SET 'TRAINID' AS FOREIGN KEY
  ALTER TABLE employee ADD COLUMN trainid INT NULL;
  UPDATE employee SET trainid = 1023;

-- ADDING 'TRAINID' AS FOREIGN KEY
  ALTER TABLE employee ADD FOREIGN KEY (trainid) REFERENCES train (trainid);

-- STARTING 'EID' VALUE WITH THE VALUE '100234'
  ALTER TABLE employee AUTO_INCREMENT = 100234;

-- INSERTING 'ENGINEER' VALUES INTO 'EMPLOYEE'
  INSERT INTO `irctc`.`employee` (`ename`, `epostionheld`, `eage`, `egender`,
  ↪  `edaysofduty`, `ebasesalary`, `eshift`, `eyearsofservice`, `eincentives`, `trainid`)
    VALUES
    ('Rohini', 'Engineer', '32', 'Female', 'Mon, Tue, Wed', '16000', '8', '5', '500',
    ↪  '1023'),
    ('Himesh', 'Engineer', '27', 'Male', 'Tue, Wed, Thurs, Fri', '16000', '8', '1', '0',
    ↪  '1024'),
    ('Manisha', 'Engineer', '27', 'Female', 'Tue, Wed, Thur, Fri', '16000', '8', '1', '0',
    ↪  '1023'),
    ('Suresh', 'Engineer', '28', 'Male', 'Tue, Wed, Thur, Fri', '16000', '8', '2', '100',
    ↪  '1025'),
    ('Lokesh', 'Engineer', '29', 'Male', 'Tue, Wed, Thur, Fri', '16000', '8', '3', '200',
    ↪  '1024'),
    ('Mohini', 'Engineer', '30', 'Female', 'Mon, Sat, Sun', '16000', '8', '5', '600',
    ↪  '1026'),
    ('Hishmii', 'Engineer', '33', 'Female', 'Mon, Sat, Sun', '16000', '8', '8', '900',
    ↪  '1027'),
```

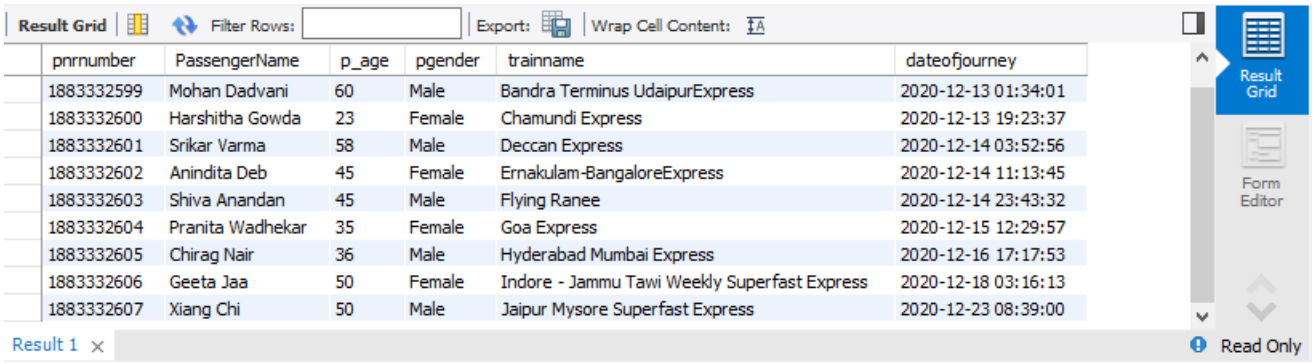
```
    ('Rukmini', 'Engineer', '32', 'Female', 'Mon, Sat, Sun', '16000', '8', '7', '800',
    ↪  '1032'),
    ('Rohan', 'Engineer', '33', 'Male', 'Mon, Fri, Sat, Sun', '16000', '8', '8', '800',
    ↪  '1028'),
    ('Shuba', 'Engineer', '32', 'Female', 'Tue, Wed, Thur', '16000', '8', '7', '800',
    ↪  '1024'),
    ('Aditya', 'Engineer', '33', 'Male', 'Mon, Fri, Sat, Sun', '16000', '8', '8', '800',
    ↪  '1026'),
    ('Ashuba', 'Engineer', '33', 'Female', 'Tue, Wed, Thur', '16000', '8', '7', '700',
    ↪  '1029'),
    ('Romy', 'Engineer', '33', 'Male', 'Mon, Fri, Sat, Sun', '16000', '8', '8', '800',
    ↪  '1030'),
    ('Roshini', 'Engineer', '32', 'Female', 'Tue, Wed, Thur', '16000', '8', '5', '500',
    ↪  '1025'),
    ('Aravind', 'Engineer', '38', 'Male', 'Mon, Fri, Sat, Sun', '17000', '8', '11', '1100',
    ↪  '1026'),
    ('Sukanya', 'Engineer', '36', 'Female', 'Tue, Wed, Thur', '17000', '8', '9', '1000',
    ↪  '1031'),
    ('Sukant', 'Engineer', '40', 'Male', 'Mon, Fri, Sat, Sun', '20000', '8', '20', '2000',
    ↪  '1029');

ALTER TABLE employee AUTO_INCREMENT = 100343;

-- INSERTING 'LOCOPILOT' VALUES INTO 'EMPLOYEE'
  INSERT INTO `irctc`.`employee` (`Ename`, `Epostionheld`, `Eage`, `Egender`,
  ↪  `Edaysofduty`, `Ebasesalary`, `Eshift`, `Eyearsofservice`, `Eincentives`, `trainid`)
    VALUES
    ( 'Rony', 'Locopilot', '27', 'Male', 'Mon, Tue, Wed, Thur, Fri, Sat, Sun', '10000',
    ↪  '10', '5', '500', '1023'),
    ( 'Rodney', 'Locopilot', '24', 'Male', 'Mon, Tue, Wed, Thur, Fri, Sat, Sun', '10000',
    ↪  '10', '2', '0', '1024' ),
    ( 'Rami', 'Locopilot', '25', 'Male', 'Mon, Tue, Wed, Thur, Fri, Sat, Sun', '10000',
    ↪  '10', '3', '200', '1025' ),
    ( 'Asrao', 'Locopilot', '26', 'Male', 'Mon, Tue, Wed, Thur, Fri, Sat, Sun', '10000',
    ↪  '10', '4', '300', '1026'),
    ( 'Ramesh', 'Locopilot', '27', 'Male', 'Mon, Tue, Wed, Thur, Fri, Sat, Sun', '10000',
    ↪  '10', '10', '1000', '1027'),
    ( 'Ashwin', 'Locopilot', '28', 'Male', 'Mon, Tue, Wed, Thur, Fri, Sat, Sun', '10000',
    ↪  '10', '6', '500', '1028'),
    ( 'Raju', 'Locopilot', '29', 'Male', 'Mon, Tue, Wed, Thur, Fri, Sat, Sun', '10000',
    ↪  '10', '6', '500', '1029'),
    ( 'Romil', 'Locopilot', '30', 'Male', 'Mon, Tue, Wed, Thur, Fri, Sat, Sun', '15000',
    ↪  '8', '6', '800', '1030'),
    ( 'bharat', 'Locopilot', '31', 'Male', 'Mon, Tue, Wed, Thur, Fri, Sat, Sun', '15000',
    ↪  '9', '6', '900', '1031'),
    ( 'Lakshman', 'Locopilot', '33', 'Male', 'Mon, Tue, Wed, Thur, Fri, Sat, Sun', '15000',
    ↪  '11', '6', '1100', '1032');

ALTER TABLE employee AUTO_INCREMENT = 100567;

-- INSERTING 'TTE' VALUES INTO 'EMPLOYEE'
  INSERT INTO `irctc`.`employee` (`Ename`, `Epostionheld`, `Eage`, `Egender`,
  ↪  `Edaysofduty`, `Ebasesalary`, `Eshift`, `Eyearsofservice`, `Eincentives`, `trainid`)
    VALUES
```

```
71      ('Govind', 'TTE', '28', 'Male', 'Mon, Tue, Wed, Thur, Fri', '16000', '10', '4', '400',
        ↪  '1023'),
72      ('Vishnu', 'TTE', '23', 'Male', 'Mon, Tue, Wed, Thur, Fri, Sat, Sun', '16000', '10',
        ↪  '1', '0', '1024'),
73      ('Shiva', 'TTE', '24', 'Male', 'Mon, Tue, Wed, Thur, Fri, Sat, Sun', '16000', '10',
        ↪  '2', '200', '1025'),
74      ('Parvati', 'TTE', '28', 'Female', 'Mon, Tue, Wed, Thur, Fri, Sat, Sun', '16000', '10',
        ↪  '6', '600', '1026'),
75      ('Lakshmi', 'TTE', '31', 'Female', 'Mon, Tue, Wed, Thur, Fri, Sat, Sun', '17000', '10',
        ↪  '9', '800', '1027'),
76      ('Saraswati', 'TTE', '32', 'Female', 'Mon, Tue, Wed, Thur, Fri, Sat, Sun', '17000',
        ↪  '10', '10', '1000', '1028'),
77      ('Pachadurga', 'TTE', '33', 'Female', 'Mon, Tue, Wed, Thur, Fri, Sat, Sun', '17000',
        ↪  '10', '11', '1100', '1029'),
78      ('Ramya', 'TTE', '34', 'Female', 'Mon, Tue, Wed, Thur, Fri, Sat, Sun', '17000', '10',
        ↪  '12', '1200', '1030'),
79      ('Shkuntala', 'TTE', '36', 'Female', 'Mon, Tue, Wed, Thur, Fri, Sat, Sun', '17000',
        ↪  '10', '14', '1400', '1031'),
80      ('Vidya', 'TTE', '38', 'Female', 'Mon, Tue, Wed, Thur, Fri, Sat, Sun', '17000', '10',
        ↪  '16', '2000', '1032');
81
82  ALTER TABLE employee AUTO_INCREMENT = 100768;
83
84  -- INSERTING 'CLEANER' VALUES INTO 'EMPLOYEE'
85    INSERT INTO `irctc`.`employee` (`Ename`, `Epostionheld`, `Eage`, `Egender`,
      ↪  `Edaysofduty`, `Ebasesalary`, `Eshift`, `Eyearsofservice`, `Eincentives`, `trainid`)
86    VALUES
87      ('Dalhousie', 'Cleaner', '30', 'Male', 'Mon, Tue, Wed, Thurs, Fri, Sat, Sun', '10000',
        ↪  '10', '5', '500', '1023'),
88      ('Jahangir', 'Cleaner', '43', 'Male', 'Mon, Tue, Wed, Thurs, Fri, Sat, Sun', '10000',
        ↪  '10', '15', '1500', '1024'),
89      ('Roman', 'Cleaner', '29', 'Male', 'Mon, Tue, Wed, Thurs, Fri, Sat, Sun', '2000', '10',
        ↪  '5', '500', '1025'),
90      ('Poojeshwara', 'Cleaner', '50', 'Male', 'Mon, Tue, Wed, Thurs, Fri, Sat, Sun',
        ↪  '10000', '10', '20', '2000', '1026'),
91      ('Ram', 'Cleaner', '34', 'Male', 'Mon, Tue, Wed, Thurs, Fri, Sat, Sun', '8000', '10',
        ↪  '10', '3000', '1027'),
92      ('Krishna', 'Cleaner', '38', 'Male', 'Mon, Tue, Wed, Thurs, Fri, Sat, Sun', '8000',
        ↪  '10', '12', '4000', '1028'),
93      ('Anthony', 'Cleaner', '40', 'Male', 'Mon, Tue, Wed, Thurs, Fri, Sat, Sun', '10000',
        ↪  '10', '20', '6000', '1029'),
94      ('Akbar', 'Cleaner', '42', 'Male', 'Mon, Tue, Wed, Thurs, Fri, Sat, Sun', '19000',
        ↪  '10', '25', '6000', '1030'),
95      ('Amar', 'Cleaner', '45', 'Male', 'Mon, Tue, Wed, Thurs, Fri, Sat, Sun', '10000', '10',
        ↪  '23', '6000', '1031'),
96      ('Purush', 'Cleaner', '50', 'Male', 'Mon, Tue, Wed, Thurs, Fri, Sat, Sun', '10000',
        ↪  '10', '25', '8000', '1032');
97
98  -- VIEWING THE FINAL TABLE 'EMPLOYEE'
99    SELECT * FROM employee;
```

9. The Queries and the Results

Query 1:

```
-- 1. Extracting details of passengers from 'Ticket' table:
  SELECT t.pnrnumber, CONCAT(p.pfirstname, ' ', p.plastname) AS
   ↪  PassengerName, p.p_age, p.pgender, tr.trainname, t.dateofjourney
  FROM passenger p JOIN ticket t JOIN train tr
  WHERE p.pid = t.pid AND t.trainid = tr.trainid;
```



Result Grid | Filter Rows: | Export: | Wrap Cell Content:

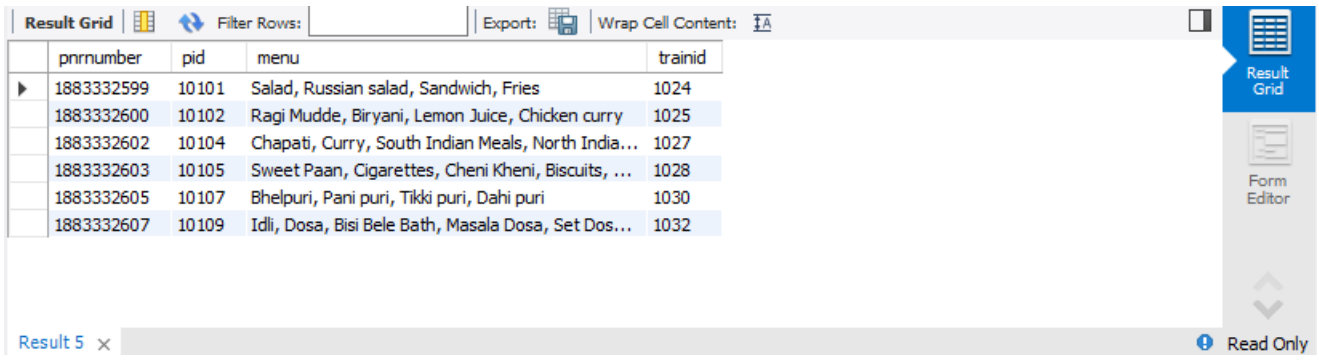
pnrnumber	PassengerName	p_age	pgender	trainname	dateofjourney
1883332599	Mohan Dadvani	60	Male	Bandra Terminus UdaipurExpress	2020-12-13 01:34:01
1883332600	Harshitha Gowda	23	Female	Chamundi Express	2020-12-13 19:23:37
1883332601	Srikar Varma	58	Male	Deccan Express	2020-12-14 03:52:56
1883332602	Anindita Deb	45	Female	Ernakulam-BangaloreExpress	2020-12-14 11:13:45
1883332603	Shiva Anandan	45	Male	Flying Ranee	2020-12-14 23:43:32
1883332604	Pranita Wadhekar	35	Female	Goa Express	2020-12-15 12:29:57
1883332605	Chirag Nair	36	Male	Hyderabad Mumbai Express	2020-12-16 17:17:53
1883332606	Geeta Jaa	50	Female	Indore - Jammu Tawi Weekly Superfast Express	2020-12-18 03:16:13
1883332607	Xiang Chi	50	Male	Jaipur Mysore Superfast Express	2020-12-23 08:39:00

Result 1 | Result Grid | Form Editor | Read Only

Figure 9.1: The result for the first Query.

Query 2:

```
-- 2. Extracting details of passengers who've ordered from caterers:
  SELECT ti.pnrnumber, c.pid, c.menu, t.trainid
  FROM train t JOIN ticket ti JOIN caterer c
  WHERE ti.pid = c.pid AND ti.trainid=t.trainid;
```



Result Grid | Filter Rows: | Export: | Wrap Cell Content:

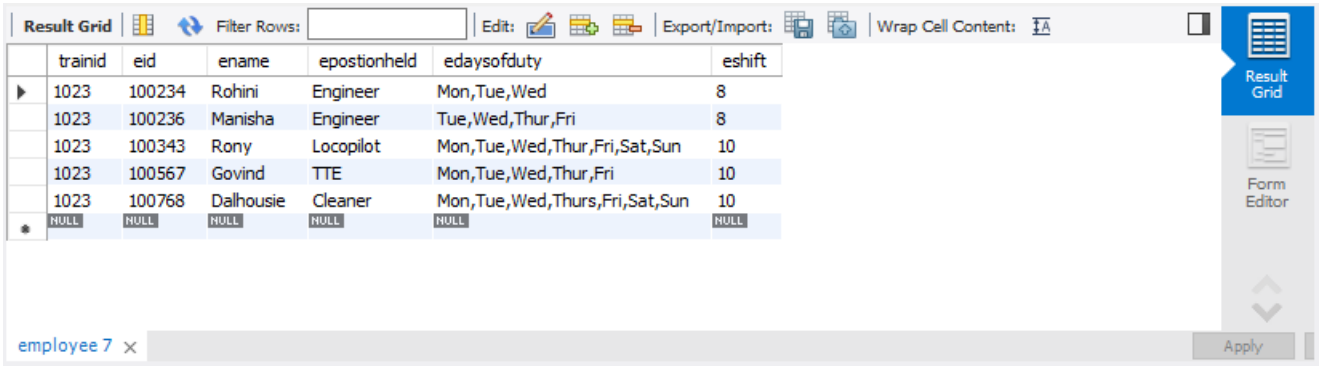
pnrnumber	pid	menu	trainid
1883332599	10101	Salad, Russian salad, Sandwich, Fries	1024
1883332600	10102	Ragi Mudde, Biryani, Lemon Juice, Chicken curry	1025
1883332602	10104	Chapati, Curry, South Indian Meals, North India...	1027
1883332603	10105	Sweet Paan, Cigarettes, Cheni Kheni, Biscuits, ...	1028
1883332605	10107	Bhelpuri, Pani puri, Tikki puri, Dahi puri	1030
1883332607	10109	Idli, Dosa, Bisi Bele Bath, Masala Dosa, Set Dos...	1032

Result 5 | Result Grid | Form Editor | Read Only

Figure 9.2: The result for the second Query.

Query 3:

```
-- 3. Extracting details of employees on train 1023:
    SELECT trainid, eid, ename,epostionheld, edaysofduty, eshift
    FROM employee
    WHERE trainid = 1023;
```

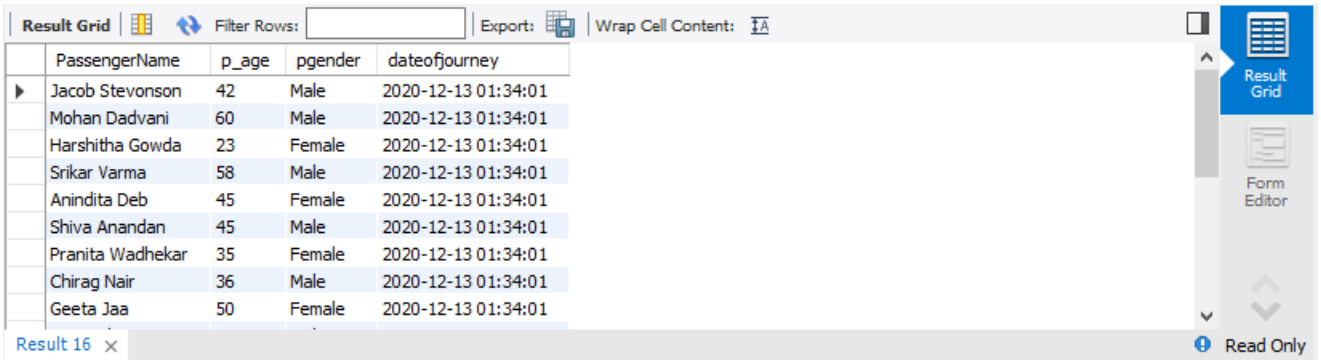


trainid	eid	ename	epostionheld	edaysofduty	eshift
1023	100234	Rohini	Engineer	Mon,Tue,Wed	8
1023	100236	Manisha	Engineer	Tue,Wed,Thur,Fri	8
1023	100343	Rony	Locopilot	Mon,Tue,Wed,Thur,Fri,Sat,Sun	10
1023	100567	Govind	TTE	Mon,Tue,Wed,Thur,Fri	10
1023	100768	Dalhousie	Cleaner	Mon,Tue,Wed,Thurs,Fri,Sat,Sun	10
NULL	NULL	NULL	NULL	NULL	NULL

Figure 9.3: The result for the third Query.

Query 4:

```
-- 4. Extracting details of the train and passengers in train whos origin
 ↪  stations is Bangalore City:
  SELECT concat(p.pfirstname, ' ', p.plastname) AS PassengerName,
      p.p_age, p.pgender, t.dateofjourney
  FROM ticket t join passenger p
  WHERE t.boardingstation like '%Bengaluru';
```

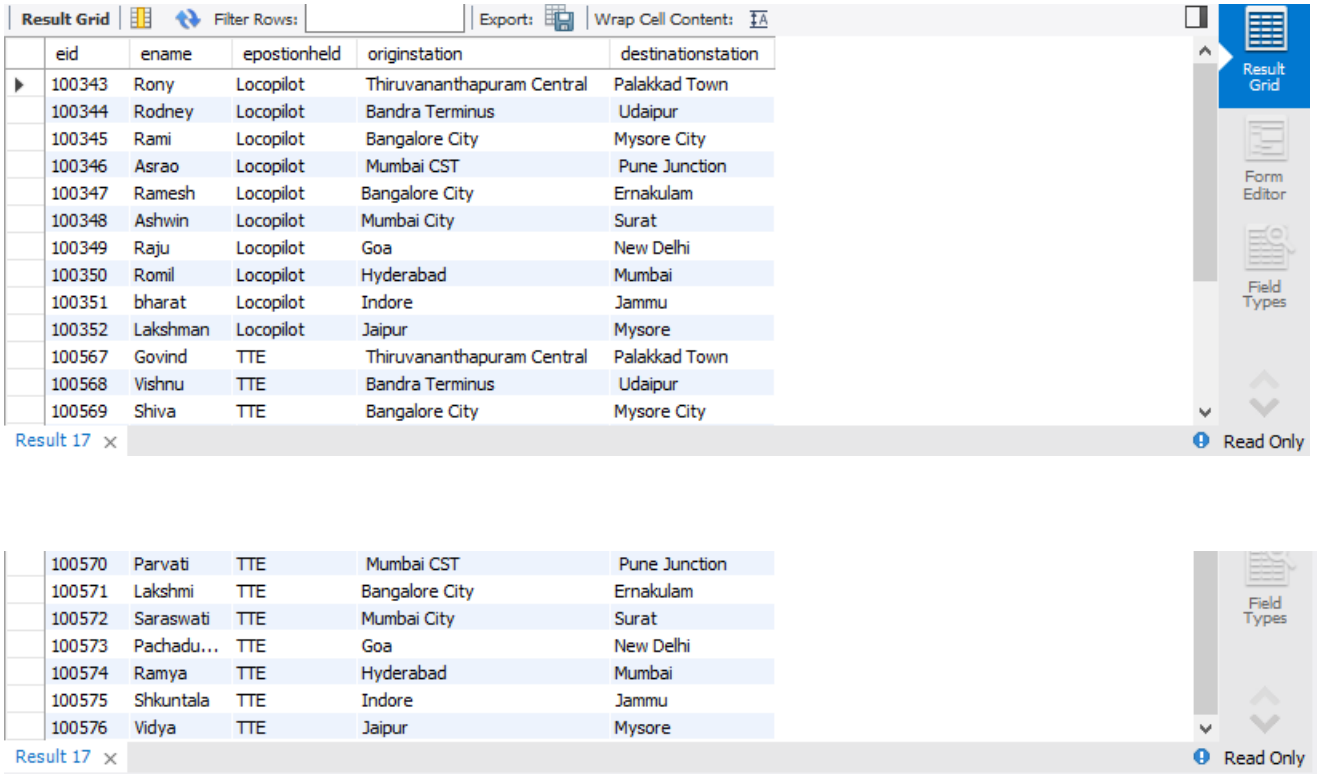


PassengerName	p_age	pgender	dateofjourney
Jacob Stevonson	42	Male	2020-12-13 01:34:01
Mohan Dadvani	60	Male	2020-12-13 01:34:01
Harshitha Gowda	23	Female	2020-12-13 01:34:01
Srikar Varma	58	Male	2020-12-13 01:34:01
Anindita Deb	45	Female	2020-12-13 01:34:01
Shiva Anandan	45	Male	2020-12-13 01:34:01
Pranita Wadhekar	35	Female	2020-12-13 01:34:01
Chirag Nair	36	Male	2020-12-13 01:34:01
Geeta Jaa	50	Female	2020-12-13 01:34:01

Figure 9.4: The result for the fourth Query.

Query 5:

```sql
-- 5. Extracting details of train and employee who are TTEs or Locopilots:
  SELECT e.eid, e.ename, e.epostionheld, t.originstation,
   ↪  t.destinationstation
    FROM employee e JOIN train t
  ON e.trainid = t.trainid
  WHERE e.epostionheld = 'TTE' OR e.epostionheld = 'Locopilot';
```



Result Grid | Filter Rows: | Export: | Wrap Cell Content:

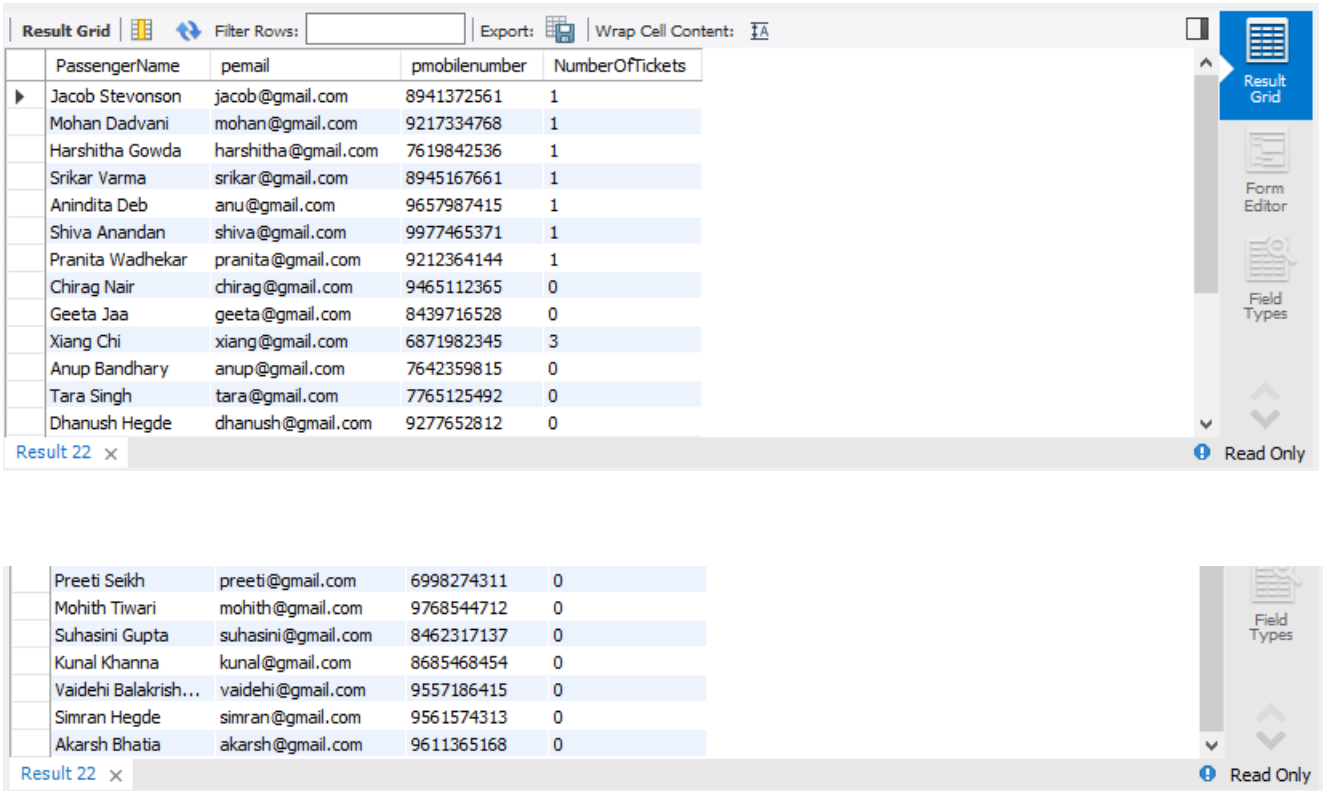
eid	ename	epostionheld	originstation	destinationstation
100343	Rony	Locopilot	Thiruvananthapuram Central	Palakkad Town
100344	Rodney	Locopilot	Bandra Terminus	Udaipur
100345	Rami	Locopilot	Bangalore City	Mysore City
100346	Asrao	Locopilot	Mumbai CST	Pune Junction
100347	Ramesh	Locopilot	Bangalore City	Ernakulam
100348	Ashwin	Locopilot	Mumbai City	Surat
100349	Raju	Locopilot	Goa	New Delhi
100350	Romil	Locopilot	Hyderabad	Mumbai
100351	bharat	Locopilot	Indore	Jammu
100352	Lakshman	Locopilot	Jaipur	Mysore
100567	Govind	TTE	Thiruvananthapuram Central	Palakkad Town
100568	Vishnu	TTE	Bandra Terminus	Udaipur
100569	Shiva	TTE	Bangalore City	Mysore City
100570	Parvati	TTE	Mumbai CST	Pune Junction
100571	Lakshmi	TTE	Bangalore City	Ernakulam
100572	Saraswati	TTE	Mumbai City	Surat
100573	Pachadu...	TTE	Goa	New Delhi
100574	Ramya	TTE	Hyderabad	Mumbai
100575	Shkuntala	TTE	Indore	Jammu
100576	Vidya	TTE	Jaipur	Mysore

Result 17 | Read Only

Figure 9.5: The result for the fifth Query.

Query 6:

```
-- 6. Counting number of tickets each person has:
  SELECT concat(pfirstname, ' ', plastname) AS PassengerName, pemail,
   ↪  pmobilenumber,
    (SELECT COUNT(*) AS numberofpeople
    FROM ticket
    WHERE ticket.pid = passenger.pid) AS NumberOfTickets
  FROM passenger;
```



Result Grid | Filter Rows: | Export: | Wrap Cell Content:

PassengerName	pemail	pmobilenumber	NumberOfTickets
Jacob Stevonson	jacob@gmail.com	8941372561	1
Mohan Dadvani	mohan@gmail.com	9217334768	1
Harshitha Gowda	harshitha@gmail.com	7619842536	1
Srikar Varma	srikar@gmail.com	8945167661	1
Anindita Deb	anu@gmail.com	9657987415	1
Shiva Anandan	shiva@gmail.com	9977465371	1
Pranita Wadhekar	pranita@gmail.com	9212364144	1
Chirag Nair	chirag@gmail.com	9465112365	0
Geeta Jaa	geeta@gmail.com	8439716528	0
Xiang Chi	xiang@gmail.com	6871982345	3
Anup Bandhary	anup@gmail.com	7642359815	0
Tara Singh	tara@gmail.com	7765125492	0
Dhanush Hegde	dhanush@gmail.com	9277652812	0
Preeti Seikh	preeti@gmail.com	6998274311	0
Mohith Tiwari	mohith@gmail.com	9768544712	0
Suhasini Gupta	suhasini@gmail.com	8462317137	0
Kunal Khanna	kunal@gmail.com	8685468454	0
Vaidehi Balakrish...	vaidehi@gmail.com	9557186415	0
Simran Hegde	simran@gmail.com	9561574313	0
Akarsh Bhatia	akarsh@gmail.com	9611365168	0

Result Grid | Form Editor | Field Types | Read Only

Result 22

Figure 9.6: The result for the sixth Query.

Query 7:

```
-- 7. Extracting station name with internet connectivity with food stalls:
  SELECT s.arrivingtrains, s.stationname AS stationswithinternet, c.shopname
   ↪  AS available_shops
  FROM stations s JOIN caterer c
  WHERE s.internet='YES' AND c.sid = s.sid;
```

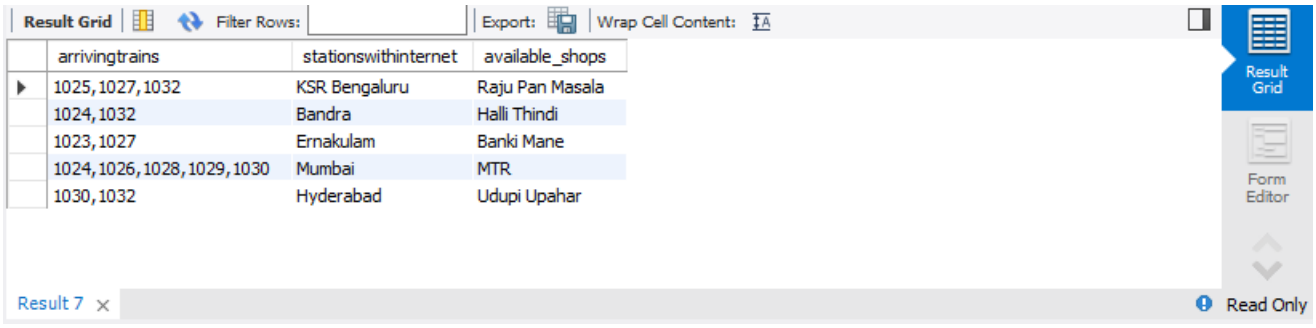


Figure 9.7: The result for the seventh Query.

Query 8:

```
-- 8. Passengers above 40 travelling in a train and have bought food:
  SELECT DISTINCTROW(c.billnumber),
    CONCAT(pfirstname, ' ', plastname) AS PassengerName,
    p.pid,
    p.p_age,
    c.amount
  FROM passenger p JOIN caterer c
    WHERE p.p_age > 40 AND p.pid = c.pid;
```

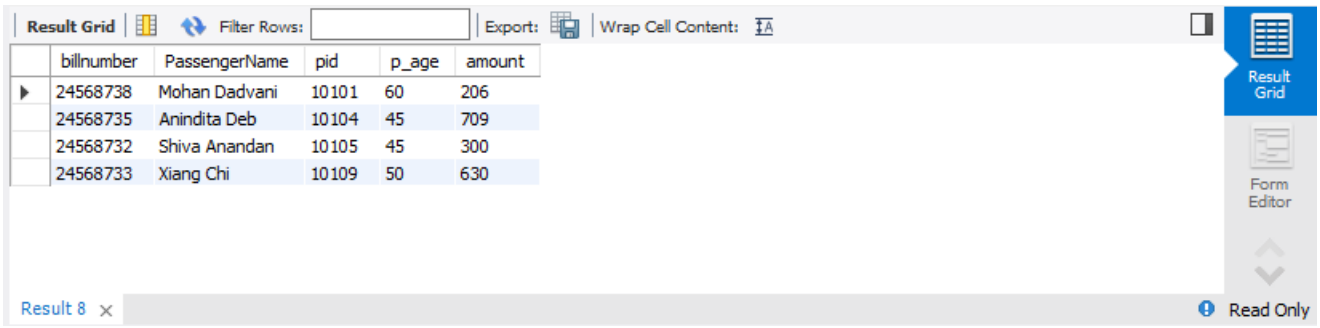


Figure 9.8: The result for the eighth Query.

10. The Workflow

The project has been accomplished with the help of the "MySQL Workbench 8.0 CE" application. The E-R diagram was created using this application, along with the tables, queries being executed in the same. The three of us were able to make the work easier using Git, the version control system, and hosting the project in GitHub with the repository named as "mysql-project-fit".

The abstract and report were written in LaTeX, using Overleaf, the online LaTeX editor. The "Fluidodinamica Computazionale Lab Report", a template by Alberto Guardone and Tommaso Bellosta, which is available on Overleaf was used for the creation of the abstract and the report.

End of report.