



Sardar Patel Institute of Technology

Bhavan's Campus, Munshi Nagar, Andheri (West), Mumbai-400058-India
(Autonomous Institute Affiliated to University of Mumbai)
Academic Year: 2025-2026

Class: B

Experiment No. 1

Subject: DBMS

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Batch: B Div_ Batch C

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Group 3: Postgresql

Ridesharing Application Database Management System

Database Management System Lab Document

Project Title: Smart Ridesharing Platform Database

Aim

To design and develop a comprehensive database management system for a ridesharing application that efficiently manages:

- 1. User Management System**
To design and develop a database that handles passenger and driver registration, profile management, authentication, and user verification processes with proper security measures.
 - 2. Ride Booking & Management System**
To design and develop a database that manages ride requests, driver-passenger matching, route optimization, fare calculation, and real-time ride tracking from booking to completion.
 - 3. Payment & Financial System**
To design and develop a database that processes secure payments, manages multiple payment methods, handles refunds, tracks transaction history, and manages promotional discounts.
 - 4. Feedback & Quality Management System**
To design and develop a database that collects and manages ratings, reviews, and feedback from both passengers and drivers to maintain service quality and user satisfaction.
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Description

The ridesharing platform database is divided into four main interconnected modules:

1. User Management Module

This module stores comprehensive details about passengers and drivers including personal information, verification status, and account management. It handles user authentication, profile updates, and account status management with proper security measures.

2. Ride Operations Module

This module manages the complete ride lifecycle from booking to completion. It tracks routes, vehicles, real-time ride status, location data, and handles ride matching algorithms. The system maintains detailed logs of pickup/drop locations, estimated vs actual distances, and ride duration.

3. Payment Processing Module

This module handles all financial transactions including fare calculations, multiple payment methods (cash, card, UPI, wallet), promotional discounts, refund processing, and transaction history. It ensures secure payment processing with proper



Sardar Patel Institute of Technology

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Academic Year: 2025-2026

audit trails.

4. Quality Assurance Module

This module manages the feedback ecosystem allowing both passengers and drivers to rate and review each other. It tracks service quality metrics, handles complaints, manages incident reports, and maintains overall platform quality standards.

Cross-Module Integration:

All modules share common data points (user IDs, ride IDs, location references) enabling seamless data flow and comprehensive reporting. Administrators can generate analytics on user behavior, ride patterns, revenue trends, and service quality metrics.

Table Structure and Descriptions

Core User Tables

1. PASSENGERS

Purpose: Stores personal details and account information of all registered passengers.

Fields:

- **Passenger_ID:** INT, AUTO_INCREMENT, PRIMARY KEY
- **Full_Name:** VARCHAR(100), NOT NULL
- **Phone:** VARCHAR(15), UNIQUE, NOT NULL
- **Email:** VARCHAR(100), UNIQUE, NOT NULL
- **Avg_Rating:** DECIMAL(2,1), NULL (Cached aggregate)

Constraints:

- Passenger_ID must be unique
- Phone and Email must be unique across the system

2. DRIVERS

Purpose: Stores personal details, licensing information, and verification status of all registered drivers.

Fields:

- **Driver_ID:** INT, AUTO_INCREMENT, PRIMARY KEY
- **Full_Name:** VARCHAR(100), NOT NULL
- **License_No:** VARCHAR(20), UNIQUE, NOT NULL
- **Phone:** VARCHAR(15), UNIQUE, NOT NULL
- **Email:** VARCHAR(100), UNIQUE, NOT NULL
- **Status:** ENUM('Active','Inactive','Suspended'), DEFAULT 'Active'
- **Join_Date:** DATE, DEFAULT CURRENT_DATE
- **Avg_Rating:** DECIMAL(2,1), NULL (Cached aggregate)

Constraints:

- Driver_ID must be unique



Sardar Patel Institute of Technology

Bhavan's Campus, Munshi Nagar, Andheri (West), Mumbai-400058-India
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Academic Year: 2025-2026

- License_No, Phone, and Email must be unique
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Vehicle Management Tables

3. VEHICLES

Purpose: Stores information about all vehicles registered on the platform.

Fields:

- **Vehicle_ID:** INT, AUTO_INCREMENT, PRIMARY KEY
- **Driver_ID:** INT, NOT NULL, FOREIGN KEY → DRIVERS.Driver_ID
- **Model:** VARCHAR(50), NOT NULL
- **Capacity:** INT, CHECK(Capacity > 0)
- **Type:** ENUM('Car', 'Bike', 'Auto', 'SUV', 'Luxury')
- **Created_At:** DATETIME, DEFAULT CURRENT_TIMESTAMP

Constraints:

- Vehicle_ID must be unique
 - Each vehicle must belong to a valid driver
 - Capacity must be greater than 0
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Route and Ride Management Tables

4. ROUTES

Purpose: Stores predefined route information for efficient ride planning and fare calculation.

Fields:

- **Route_ID:** INT, AUTO_INCREMENT, PRIMARY KEY
- **Start_Point:** VARCHAR(100), NOT NULL
- **End_Point:** VARCHAR(100), NOT NULL
- **Distance_km:** DECIMAL(6,2), CHECK(Distance_km > 0)
- **Duration_min:** INT, CHECK(Duration_min > 0)

Constraints:

- Route_ID must be unique
 - Distance and duration must be positive values
 - Start and end points cannot be identical
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5. RIDES

Purpose: Core table managing complete ride lifecycle from request to completion.

Fields:



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Bhavan's Campus, Munshi Nagar, Andheri (West), Mumbai-400058-India
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Academic Year: 2025-2026

- **Ride_ID:** INT, AUTO_INCREMENT, PRIMARY KEY
- **Passenger_ID:** INT, NOT NULL, FOREIGN KEY → PASSENGERS.Passenger_ID
- **Driver_ID:** INT, NOT NULL, FOREIGN KEY → DRIVERS.Driver_ID
- **Route_ID:** INT, NOT NULL, FOREIGN KEY → ROUTES.Route_ID
- **Vehicle_ID:** INT, NULL, FOREIGN KEY → VEHICLES.Vehicle_ID
- **Applied_Promo_ID:** INT, NULL, FOREIGN KEY → PROMOS.Promo_ID
- **Fare:** DECIMAL(10,2), CHECK(Fare >= 0)
- **Status:** ENUM('Requested','Accepted','Ongoing','Completed','Cancelled'), DEFAULT 'Requested'
- **Created_At:** DATETIME, DEFAULT CURRENT_TIMESTAMP

Constraints:

- All foreign keys must reference valid records
- Fare must be non-negative

Financial Management Tables

6. PAYMENTS

Purpose: Manages all payment transactions with support for multiple payment methods.

Fields:

- **Payment_ID:** INT, AUTO_INCREMENT, PRIMARY KEY
- **Ride_ID:** INT, NOT NULL, UNIQUE, FOREIGN KEY → RIDES.Ride_ID
- **Amount:** DECIMAL(10,2), CHECK(Amount >= 0), NOT NULL
- **Mode:** ENUM('Cash','Card','UPI','Wallet'), NOT NULL
- **Status:** ENUM('Pending','Successful','Failed','Refunded'), DEFAULT 'Pending'
- **Payment_Date:** DATETIME, DEFAULT CURRENT_TIMESTAMP

Constraints:

- Each ride can have only one payment record (1:1 relationship)
- Amount must be non-negative
- Transaction references must be unique when present

7. PROMOS

Purpose: Manages promotional codes and discount campaigns.

Fields:

- **Promo_ID:** INT, AUTO_INCREMENT, PRIMARY KEY
- **Code:** VARCHAR(20), UNIQUE, NOT NULL
- **Description:** TEXT, NULL



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Academic Year: 2025-2026

- **Expiry_Date:** DATE, NOT NULL
- **Discount_Percent:** DECIMAL(5,2), CHECK(Discount_Percent BETWEEN 0 AND 100)
- **Min_Fare:** DECIMAL(10,2), NULL
- **Created_At:** DATETIME, DEFAULT CURRENT_TIMESTAMP
- **Payment_ID:** INT, AUTO_INCREMENT, FOREIGN KEY
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Constraints:

- Promo codes must be unique
- Discount percentage must be between 0 and 100
- Expiry date must be in the future
- Usage limits must be positive when specified

Quality Assurance Tables

8. FEEDBACK

Purpose: Stores ratings and reviews from both passengers and drivers for quality management.

Fields:

- **Feedback_ID:** INT, AUTO_INCREMENT, PRIMARY KEY
- **Ride_ID:** INT, NOT NULL, FOREIGN KEY → RIDES.Ride_ID
- **Passenger_ID:** INT, NOT NULL, FOREIGN KEY → PASSENGERS.Passenger_ID
- **Driver_ID:** INT, NOT NULL, FOREIGN KEY → DRIVERS.Driver_ID
- **Rating:** DECIMAL(2,1), CHECK(Rating BETWEEN 0 AND 5)

Constraints:

- Passenger_ID and Driver_ID must match the corresponding ride participants
- Exactly one of Author_Passenger_ID or Author_Driver_ID must be NOT NULL
- Rating must be between 0 and 5

Safety and Incident Management Tables

9. ACCIDENTS

Purpose: Records and tracks accident reports and incidents during rides.

Fields:

- **Accident_ID:** INT, AUTO_INCREMENT, PRIMARY KEY
- **Ride_ID:** INT, NOT NULL, FOREIGN KEY → RIDES.Ride_ID
- **Occurred_At:** DATETIME, NOT NULL
- **Description:** TEXT, NOT NULL



Sardar Patel Institute of Technology

Bhavan's Campus, Munshi Nagar, Andheri (West), Mumbai-400058-India
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Academic Year: 2025-2026

- **Claim_Status:** ENUM('Open','InProgress','Closed'), DEFAULT 'Open'
- **Severity:** ENUM('Minor','Major','Critical'), DEFAULT 'Minor'

Constraints:

- Must be associated with a valid ride
- Severity classification is mandatory

10. INSURANCE

Purpose: Manages vehicle insurance information and policy details.

Fields:

- **Insurance_ID:** INT, AUTO_INCREMENT, PRIMARY KEY
- **Vehicle_ID:** INT, NOT NULL, UNIQUE, FOREIGN KEY → VEHICLES.Vehicle_ID
- **Provider:** VARCHAR(100), NOT NULL
- **Issued_On:** DATE, NOT NULL
- **Valid_Until:** DATE, NOT NULL
- **Coverage_Details:** TEXT, NULL

Constraints:

- Each vehicle can have only one active insurance policy
- Policy numbers must be unique
- Valid_Until must be after Issued_On date
- Insurance must be valid for vehicle to be active

Notes: Ensures all vehicles have valid insurance coverage.

Traffic and Location Management Tables

11. TRAFFIC_REPORTS

Purpose: Stores real-time traffic conditions and route advisories.

Fields:

- **Report_ID:** INT, AUTO_INCREMENT, PRIMARY KEY
- **Route_ID:** INT, NOT NULL, FOREIGN KEY → ROUTES.Route_ID
- **Reported_At:** DATETIME, NOT NULL
- **Severity:** ENUM('Low','Medium','High'), DEFAULT 'Low'

Constraints:

- Must be associated with a valid route
- Report timestamp must be current or recent
- Severity levels help in route optimization



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Notes: Supports dynamic route optimization based on traffic conditions.

12. ADMINS

Purpose: Manages platform administrators with role-based access control.

Fields:

- **Admin_ID:** INT, AUTO_INCREMENT, PRIMARY KEY
- **Name:** VARCHAR(100), NOT NULL
- **Email:** VARCHAR(100), UNIQUE, NOT NULL
- **Role:** ENUM('SuperAdmin','Support','Manager'), NOT NULL
- **Phone:** VARCHAR(15), UNIQUE, NULL

Constraints:

- Admin emails must be unique
 - Role-based permissions strictly enforced
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Database Relationships Summary

One-to-Many Relationships:

- **DRIVERS** → **VEHICLES** (One driver can own multiple vehicles)
- **ROUTES** → **RIDES** (One route used by multiple rides)
- **PASSENGERS** → **RIDES** (One passenger can book multiple rides)
- **DRIVERS** → **RIDES** (One driver can serve multiple rides)
- **RIDES** → **FEEDBACK** (One ride can have multiple feedback entries)

One-to-One Relationships:

- **RIDES** → **PAYMENTS** (Each ride has exactly one payment)
- **VEHICLES** → **INSURANCE** (Each vehicle has one active insurance policy)

Many-to-Many Relationships:

- Handled through junction tables and foreign key relationships
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Key Features and Benefits

1. **Scalable Architecture:** Designed to handle millions of users and rides
2. **Security First:** Proper authentication, authorization, and data protection
3. **Real-time Tracking:** Comprehensive ride and location management
4. **Financial Integrity:** Secure payment processing with audit trails
5. **Quality Assurance:** Bilateral rating system for service quality
6. **Safety Management:** Incident reporting and insurance tracking



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7. **Analytics Ready:** Structure supports comprehensive business intelligence
 8. **Multi-platform Support:** Database design supports mobile and web applications
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Conclusion

This database design provides a robust foundation for a modern ridesharing platform, ensuring data integrity, security, and scalability while supporting all critical business operations from user management to payment processing and quality assurance.
