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Department of Computer Science and Engineering
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UE23CS351A
DATABASE MANAGEMENT SYSTEMS (DBMS)

PROJECT REPORT on

DriveSence

Submitted by: Team: DriveSence

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Introduction

1. **Problem Statement**
   Most vehicle service histories are scattered across workshops and manual logs, causing missed maintenance schedules, warranty disputes, and reduced resale value. This lack of centralized service history also creates inefficiencies for fleet managers, dealerships, and insurance providers.

2. **Short Description**
   DriveSense is a centralized **Vehicle Service & Maintenance Management System** designed for the automobile industry. It maintains complete digital service histories, tracks replaced parts and accident logs, identifies patterns in part failures, and supports predictive analytics. This helps improve trust between customers, workshops, and manufacturers while reducing operational inefficiencies.

User Requirements Specification

1. *Purpose of the Project*

The purpose of this project is to develop a centralized, digital solution for managing vehicle service and maintenance records. Currently, service histories are fragmented across different workshops, paper logs, or isolated systems, leading to missed scheduled services, warranty disputes, higher maintenance costs, and reduced resale value.
DriveSense eliminates these inefficiencies by creating a transparent, secure, and easily retrievable database of vehicle history. It will benefit individual vehicle owners, fleet operators, workshops, and manufacturers by improving operational efficiency, enabling predictive insights, and ensuring long-term vehicle reliability.

2. *Project Description*

This application simulates the operations of a centralized vehicle maintenance system:

1. **Vehicle & Owner Registration**
    - Register owner details (name, type: individual/fleet/dealership, contact, address).
    - Register vehicle details (VIN, make, model, year, purchase date, mileage).
2. **Service & Maintenance Records**
    - Workshops and technicians log service records (date, service type, odometer reading, remarks, cost).
    - Each service generates entries for replaced parts, tasks performed, and warranty usage.
3. **Part Replacement & Warranty Management**
    - Each part replacement is recorded with cost, warranty coverage, and frequency.
    - Supports warranty claim requests, approvals, and fraud detection.
4. **Accident & Insurance Tracking**
    - Accident reports are logged with cause, severity, and any part failures linked.
    - Vehicle insurance details (provider, policy number, expiry) are stored and linked.
5. **Fleet & Workshop Management**
    - Fleet owners can track maintenance schedules, costs, downtime, and part usage.
    - Managers can oversee technicians, workshop operations, and generate reports.
6. **Analytics & Reports**
    - Predictive analytics on part failures and service frequency.
    - Accident correlation analysis (e.g., whether failures in certain parts lead to accidents).
    - Vehicle Health Certificates for resale value enhancement.

3. *Scope of the Project*

Development of a web application with a relational SQL database.
Complete CRUD operations for all entities (owners, vehicles, service records, parts, warranty claims, accidents).
Role-based dashboards for:

- Vehicle Owners
- Workshop Technicians
- Managers (Fleet/Dealership)
- Insurance/Manufacturer stakeholders

Predictive analytics for part demand forecasting and maintenance alerts.
Secure storage and retrieval of vehicle history for resale & warranty validation.
Integration of reporting & analytics dashboards for insights.

4. *Functional Requirements*

Feature	Description
Owner & Vehicle Management	Register, view, and update vehicle/owner details.
Service Record Management	Add, track, and update service visits, odometer, and tasks performed.
Part Replacement Tracking	Record replaced parts, frequency, and warranty coverage.
Warranty Claim Handling	Submit, process, and validate warranty claims.
Accident Reporting	Record accident details, causes, severity, and related part failures.
Fleet Management	Track costs, downtime, and performance of multiple vehicles.
Workshop & Technician Management	Assign technicians to service tasks and monitor efficiency.
Resale Certificate Generation	Provide vehicle health reports for resale or verification.
Analytics & Forecasting	Predict part demand, detect service patterns, accident-part correlations.

5. *Non-Functional Requirements*

Category	Requirement
Performance	Fast retrieval and update of vehicle service data using optimized SQL queries.
Scalability	Support for thousands of vehicles, owners, and multiple workshops/fleets.
Security	Encrypted credentials, secure login, and role-based access control.
Availability	24/7 uptime with database backup and recovery features.
Usability	Intuitive dashboards requiring minimal training for workshops and owners.
Reliability	Accurate service and inventory updates to avoid mismatches or fraud.
Maintainability	Easy extension for new features such as IoT integration or mobile app.

6. *Key Entities & Attributes*

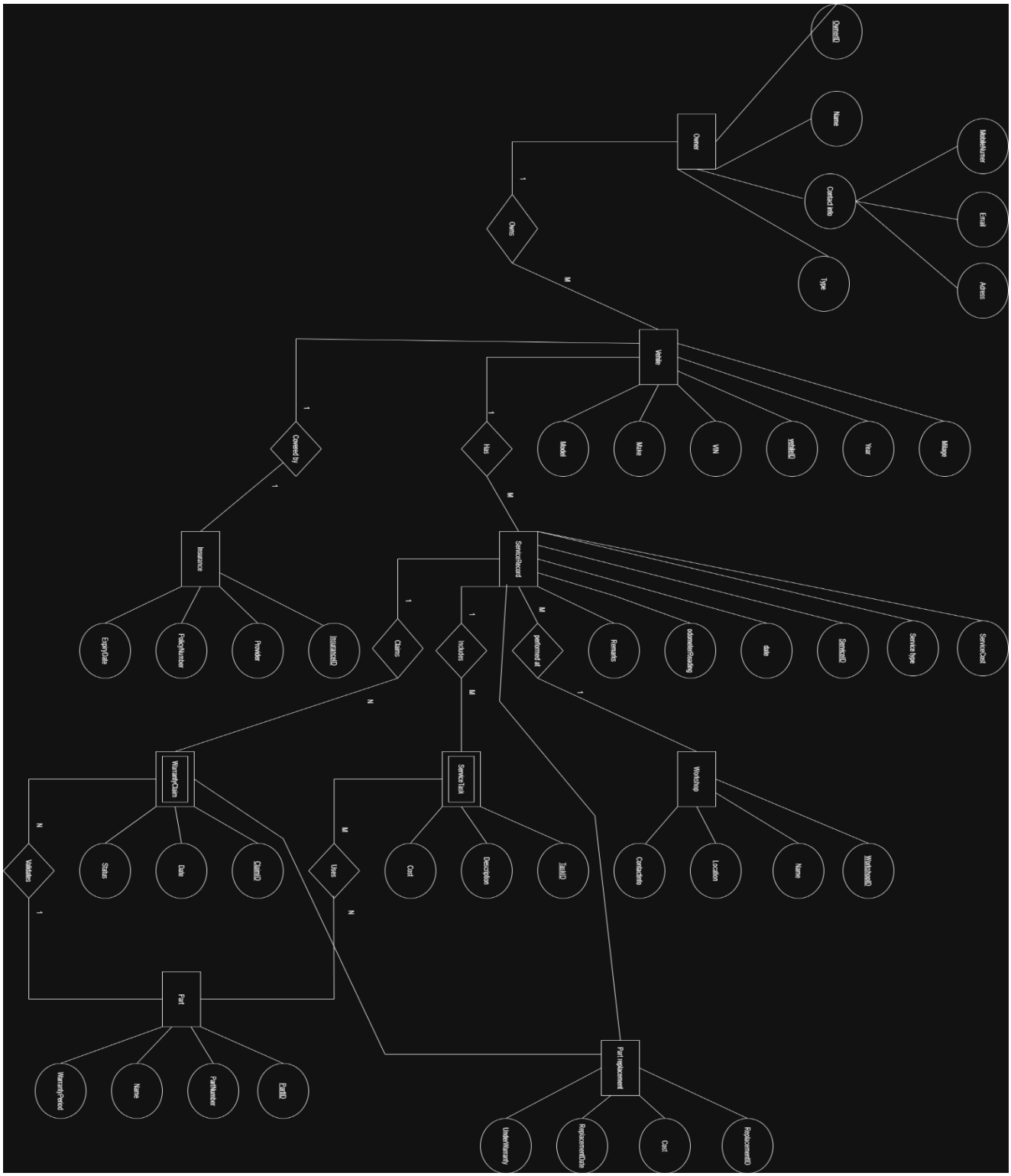
Entity	Key Attributes
Owner	OwnerID, Name, Type, Contact, Address
Vehicle	VehicleID, VIN, Make, Model, Year, Mileage, OwnerID
ServiceRecord	ServiceID, VehicleID, WorkshopID, TechnicianID, Date, Odometer, ServiceType, Cost
Part	PartID, Name, PartNumber, Manufacturer, WarrantyPeriod
PartReplacement	ReplacementID, ServiceID, PartID, Date, Cost, UnderWarranty
AccidentReport	AccidentID, VehicleID, Date, Cause, Severity, LinkedPartID

Entity	Key Attributes
WarrantyClaim	ClaimID, VehicleID, PartID, Date, Status, ValidatedBy
Workshop	WorkshopID, Name, Location, Contact
Technician	TechnicianID, Name, SkillSpecialization, WorkshopID
Insurance	InsuranceID, Provider, PolicyNumber, ExpiryDate, VehicleID

7. Technology Stack

- **Frontend:** HTML, CSS, JavaScript, React.js
- **Backend:** Node.js / Express.js
- **Database:** MySQL / PostgreSQL
- **Authentication:** JWT or OAuth2 for secure role-based access
- **Hosting:** Local server / Cloud (AWS, Azure)
- **Reports & Analytics:** Power BI, Tableau, or built-in dashboard charts

E-R Model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Part replacement
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- **Schema Diagram**