FAST-NUCES KARACHI CAMPUS

(FALL-2025)

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AI-generated content may be incorrect.

(CS-3004) SOFTWARE DESIGN & ANALYSIS

COURSE PROJECT:

[CAR DEALERSHIP MANAGEMENT SYSTEM]

SECTION:

BS-CS-5A

INSTRUCTORS:

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[DESCRIPTION]

A web-based system that helps car dealerships manage their daily operations. Built with PHP for the backend and HTML/CSS/JavaScript for the frontend, it uses MySQL through phpMyAdmin for data storage. The system lets dealers manage car brands and models, track customer information, handle orders and test drive bookings, and collect customer reviews. Staff can add new vehicles with images and specifications, update inventory levels, process customer orders, and schedule test drives - all through simple web forms that connect to a central database for organized record keeping.

[OVERVIEW]

The Car Warehousing Management System is a comprehensive web-based solution designed to streamline operations for automotive dealerships and vehicle warehousing facilities. This system provides centralized management of vehicle inventory, customer relationships, sales operations, and administrative functions through an intuitive web interface.

[FUNCTIONAL SPECIFICATIONS]

*INVENTORY MANAGEMENT*

1. **Vehicle Brand Management:** Complete CRUD operations for car brands with logo upload and detailed manufacturer information
2. **Model Management:** Comprehensive vehicle model tracking with dual-image support (front/rear views)
3. **Specification Management:** Detailed technical specifications for each vehicle model (engine, fuel type, transmission, etc.)
4. **Stock Control:** Real-time inventory tracking with quantity management and availability status
5. **Categorization:** Vehicle type classification system for organizing models
6. **Brand Affiliations:** Management of brand partnerships and relationships between manufacturers
7. **Manufacturer Details:** Extended company information (headquarters, subsidiaries, financial data)

*SALES & ORDER MANAGEMENT*

1. **Order Processing:** Complete order lifecycle management from creation to fulfillment with multiple status options
2. **Automated Pricing:** Dynamic price calculation based on vehicle models and quantities
3. **Inventory Integration:** Real-time stock level updates with automatic quantity adjustment
4. **Order History:** Comprehensive tracking of all customer transactions with date and status
5. **Stock Validation:** Automatic prevention of orders exceeding available inventory
6. **Trending Analytics:** Automatic identification of popular models based on recent orders

*CUSTOMER RELATIONSHIP*

1. **User Management:** Complete customer database with profile management and image uploads
2. **Test Drive Scheduling:** Booking system for vehicle test drives with date and time preferences
3. **Review System:** Customer feedback and rating management for vehicle models
4. **Customer Profiles:** Detailed customer information including contact details and addresses
5. **User Experience:** Personalized interfaces with user-specific data and preferences

*ADMINISTRATIVE FUNCTIONS*

1. **Role-based Access Control:** Secure authentication and authorization system
2. **Data Management:** Complete CRUD operations across all system entities (brands, models, users, orders, reviews)
3. **Image Management:** Upload and handling of vehicle and user images with preview functionality
4. **Search Functionality:** Advanced vehicle search with multiple filtering options (brand, type, price, year)
5. **Featured Content Management:** Trending vehicle display based on order activity
6. **Database Operations:** Comprehensive data management through web interfaces

*USER MANAGEMENT*

1. **Registration & Login System:** Secure user authentication with password protection
2. **User Profile Management:** Complete profile editing with image uploads and personal information
3. **Session Management:** Secure login sessions with logout functionality
4. **Password Security:** Encrypted password storage for user protection

[TARGETED AUDIENCE]

*PRIMARY USERS*

1. **Car Dealership Management -** Owners and managers overseeing inventory, sales, and operations
2. **Sales Representatives -** Staff handling customer orders, test drives, and vehicle demonstrations
3. **Inventory Managers -** Personnel responsible for stock management and vehicle procurement
4. **Customer Service Teams -** Staff managing customer reviews, bookings, and support
5. **Marketing Teams -** Professionals analyzing trending vehicles and customer preferences
6. **System Administrators -** Technical staff managing user accounts and system maintenance

*SECONDARY USERS*

1. **Potential Customers** - Users browsing vehicle inventory and specifications
2. **Business Partners** - Suppliers and affiliates accessing brand information
3. **Administrative Staff** - Personnel handling user accounts and system maintenance

[PROJECT SCOPE]

*DOMAIN FEATURES*

1. **Complete Vehicle Inventory Management -** Tracking of car brands, models, specifications, and stock levels
2. **Customer Relationship Management -** User registration, profile management, and interaction tracking
3. **Order Processing System -** End-to-end order management from placement to delivery with status tracking
4. **Test Drive Scheduling -** Booking system for customer vehicle demonstrations with calendar functionality
5. **Review and Rating System -** Customer feedback collection and management with star ratings
6. **Advanced Search and Filtering -** Vehicle discovery based on multiple criteria (brand, type, price range, model year)
7. **Trending Vehicle Analytics -** Automated identification of popular models based on order frequency
8. **Multi-image Vehicle Galleries -** Comprehensive visual documentation with front and rear views
9. **Stock Level Monitoring -** Real-time inventory tracking with automatic updates on sales
10. **Brand Relationship Management -** Tracking of manufacturer partnerships and affiliations
11. **Detailed Specifications Database -** Comprehensive technical data storage for each vehicle model
12. **User-friendly Web Interface -** Responsive design accessible from desktop devices
13. **Automated Price Calculation -** Dynamic pricing based on model rates and quantities
14. **Image Upload and Management -** Support for product and user profile images

[DBMS ANALYSIS]

*NORMALIZATION LEVEL*

The database follows **Third Normal Form (3NF)** with:

1. **Elimination of repeating groups**- Separate tables for different entity types
2. **Removal of partial dependencies** - All non-key attributes depend on primary keys
3. **Elimination of transitive dependencies** - No attributes depend on other non-key attributes
4. **Proper foreign key relationships** - Clear relationships between related tables
5. **Data integrity enforcement** - Foreign key constraints maintain relationship consistency

[DATABASE TRIGGERS]

*BUSINESS LOGIC IMPLEMENTATION*

*TRIGGER 1: PREVENT OVERBOOKING*

1. **Purpose:** Ensures order quantity doesn't exceed available stock
2. **Business Rule:** Prevents negative inventory scenarios
3. **Error Handling:** Custom SQL error message for application handling
4. **Real-time Validation:** Checks stock before allowing order creation
5. **User Experience:** Prevents customer disappointment from unavailable vehicles

*TRIGGER 2: AUTOMATED TRENDING STATUS*

1. **Purpose:** Automatically identifies popular vehicles
2. **Business Intelligence:** Real-time trending analysis based on order activity
3. **Time-based:** 30-day rolling window for relevance
4. **Automatic Updates:** Updates trending flag without manual intervention
5. **Marketing Support:** Helps identify models for promotional activities

[DATABASE TRANSACTIONS]

*ORDER CREATION:*

1. Insert order record into orderhistory table
2. Update vehicle quantity in carmodel table
3. Automatic trending status update via trigger
4. Transaction rollback on failure to maintain data consistency

*VEHICLE ADDITION:*

1. Insert car model record into carmodel table
2. Upload multiple images to server
3. Create technical specifications if provided
4. Update related brand and type associations

*BRAND MANAGEMENT PROCESS:*

1. Create brand record in carbrand table
2. Add manufacturer details if provided
3. Set up brand affiliations with other manufacturers
4. Upload brand logo image

[DATABASE INDEXING]

*PRIMARY KEY INDEXES*

1. All tables use auto-incrementing primary keys
2. Optimized for rapid record retrieval and foreign key relationships

*FOREIGN KEY INDEXES*

1. **Purpose:** JOIN operations between related tables
2. **Performance:** For response times for complex queries

KEY `idx\_orderhistory\_user` (`UserID`),

KEY `idx\_orderhistory\_model` (`ModelID`),

KEY `idx\_carmodel\_brand` (`BrandID`),

KEY `idx\_carmodel\_type` (`TypeID`)

*OTHER INDEXES*

KEY `idx\_orderhistory\_date` (`OrderDate`),

KEY `idx\_carmodel\_trending` (`Trending`),

KEY `idx\_reviews\_rating` (`Rating`),

KEY `idx\_users\_email` (`Email`),

KEY `idx\_testdrive\_date` (`PreferredDate`)

1. **Analytics Support:** Enable efficient reporting and trend analysis
2. **Search Optimization:** Improve user search and filtering performance
3. **Data Retrieval:** Faster access to frequently queried data
4. **Performance Enhancement:** Reduced query execution time for better user experience

[DATABASE RELATIONSHIPS]

1. *ONE-TO-MANY RELATIONSHIPS:*
   1. One brand has many car models
   2. One vehicle type has many car models
   3. One user has many orders, reviews, and test drive bookings
   4. One car model has many orders, reviews, and test drive bookings
2. *ONE-TO-ONE RELATIONSHIPS:*
   1. One car model has one set of technical specifications
   2. One brand has one set of manufacturer details
3. *MANY-TO-MANY RELATIONSHIPS:*
   1. Brands can have multiple affiliations with other brands
   2. Implemented through junction table (brand\_affiliations)
4. *CASCADE OPERATIONS:*
   1. Delete operations cascade to related records
   2. Maintains data integrity across related tables

[MERMAID SYNTAX BASED DIAGRAM]

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**MERMAID ERD** diagram is a visual map of your car dealership **DATABASE**.

A mermaid diagram is like a map of your database. It shows all your data tables as boxes. Each box lists what information the table stores.

The lines between boxes show how data connects. For example: "one customer can place many orders." Different line styles mean different relationships.

The diagram makes it easy to see how all parts of your system work together. You can quickly understand where data comes from and where it goes. It's a visual guide to your entire data structure.

[ENTITY RELATIONSHIP DIAGRAM]

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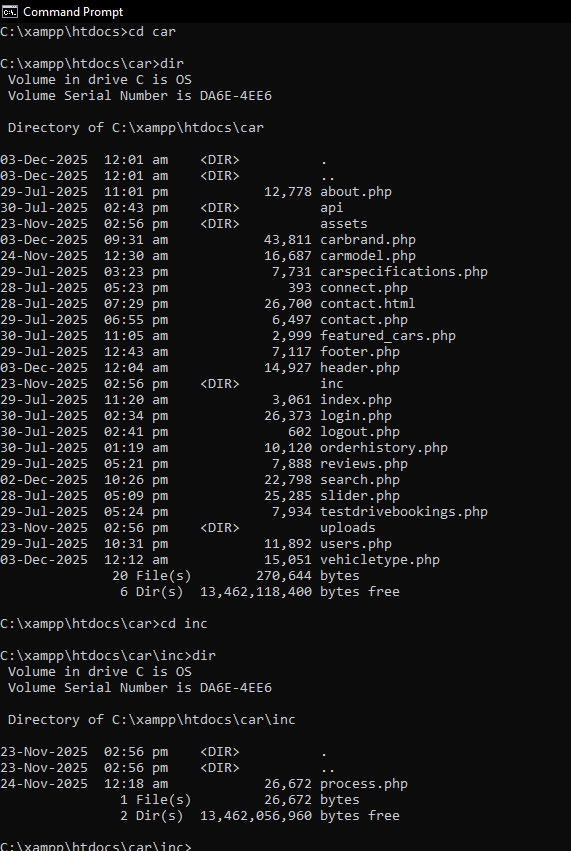
[DATABASE - *phpMyAdmin*]

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[INTERFACE-FRONTEND]

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| LOGIN ENTRY PAGE |
| HEADER |
| FOOTER |
| VEHICLE SEARCH ENGINE |
| USERS |
| BRANDS |
| CARMODELS |
| CARSPECIFICATIONS |
| ORDERHISTORY |
| REVIEWS |
| TESTDRIVEBOOKINGS |
| VEHICLETYPE |

[PROJECT FILE STRUCTURE]



[DATABASE *(XAMPP CONTROL PANEL)*]

SQL FILE(s) (*phpMyAdmin*)

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[SOFTWARE DESIGN & ANALYSIS]

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| *ACTIVITY DIAGRAM 1* ***(VEHICLE SEARCH ENGINE)*** |
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| *ACTIVITY DIAGRAM 2* ***(TEST DRIVE APPOINTMENT BOOKING)*** |
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| *ACTIVITY DIAGRAM 3* ***(TWO-PHASE ORDER & INVENTORY)*** |
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| *ACTIVITY DIAGRAM 4* ***(ORDERHISTORY TRIGGER)*** |
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| *COLLABORATION DIAGRAM 1* ***(SEARCH VEHICLES WITH FILTERS)*** |
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| *COLLABORATION DIAGRAM 2* ***(VIEW VEHICLE DETAILS)*** |
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| *COLLABORATION DIAGRAM 3* ***(BOOK TEST DRIVE)*** |
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| *COLLABORATION DIAGRAM 4* ***(MANAGE FEATURE VECHICLE)*** |
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| *COLLABORATION DIAGRAM 5* ***(SUBMIT REVIEW)*** |
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| *COLLABORATION DIAGRAM 6* ***(UPDATE INVENTORY)*** |
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| *COLLABORATION DIAGRAM 7* ***(VIEW ORDER HISTORY)*** |
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| *COLLABORATION DIAGRAM 8* ***(MANAGE BRAND & MANUFACTURER)*** |
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| *DEPLOYMENT DIAGRAM 1* ***(HIGH AVAILABITIY DEPLOYMENT)*** |
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| *DEPLOYMENT DIAGRAM 2 (VEHICLE MANAGEMENT PLATFORM)* |
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| *COMPONENT DIAGRAM 1* ***(SYSTEM ARCHITECTURE)*** |
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| *COMPONENT DIAGRAM 2* ***(MICROSERVICES & GATEWAYS)*** |
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| *SEQUENCE DIAGRAM 1* ***(AUTHENTICATION + LOGIN/LOGOUT)*** |
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| *SEQUENCE DIAGRAM 2* ***(BACKEND APPLICATION)*** |
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| *SEQUENCE DIAGRAM 3* ***(BACKEND LOGIC)*** |
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| *SEQUENCE DIAGRAM 4* ***(BACKEND SYSTEM)*** |
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| *SEQUENCE DIAGRAM 5* ***(BACKEND SYSTEM – EXTENDED)*** |
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| *SEQUENCE DIAGRAM 6* ***(STAFF MODERATION)*** |
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| *SEQUENCE DIAGRAM 7* ***(FEATURES - TRENDING VEHICLE)*** |
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| *STATE MACHINE DIAGRAM 1* ***(CHARACTER CAPABILITIES)*** |
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| *STATE MACHINE DIAGRAM 2* ***(STAFF CAPABILITIES)*** |
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| *TIMING DIAGRAM 1* ***(ORDER PROCESS & INVENTORY UPDATE)*** |
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| *TIMING DIAGRAM 2* ***(ORDER FLOW WITH PAYMENT RETRIES)*** |
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| *USE CASE DIAGRAM 1* ***(ACTORS & THEIR RESPONSIBILITIES)*** |
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| *USE CASE DIAGRAM 2* ***(EXTENSION OF U.C.D-1)*** |
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| *CLASS DIAGRAM 1* ***(TABLES IN OUR DATABASE)*** |
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| *CLASS DIAGRAM 2* |
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| *CLASS DIAGRAM 3* |
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| *CLASS DIAGRAM 4* |
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| *CLASS DIAGRAM 5* |
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| *CLASS DIAGRAM 6* |
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| *CLASS DIAGRAM 7* |
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| *CLASS DIAGRAM 8* |
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| *CLASS DIAGRAM 9* |
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*[STEPS - GENERATION OF JAVA CODE USING VISUAL PARADIGM (VP)]*

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| *1: FIRST WE MADE CLASS DIAGRAM OF OUR MAIN PROJECT BELOW ARE THE PICS OF CLASS DIAGRAM* |
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| *2: CONVERT THE DIAGRAM INTO CODE FOR THIS*  *GO TO TOOLS -> CODE -> INSTANT GENERATOR* |
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| *SELECT CLASS DIAGRAM FILES THEN SELECT OUTPUT PATH THEN GENERATE* |
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| *GENERATION COMPLETE* |
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| *CODE GENERATED AT 21:47* |
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| *CODE:* |
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*[FILE OF CODE PROVIDED IN UML PROJECT MAIN CODE PROJECT FOLDER]*

[TECH STACK]

**Frontend:** HTML + CSS + JavaScript with Bootstrap for layout  
**Backend:** PHP for business logic  
**Database:** MySQL for data storage + phpMyAdmin  
**Server:** Apache + MySQL web server

[CONCLUSION]

In conclusion, this Car Warehousing Management System successfully creates a complete and professional solution for managing car dealership operations. The system efficiently handles everything from vehicle inventory and customer orders to test drive bookings and reviews, using a well-organized database that automatically enforces business rules and maintains data accuracy. With its user-friendly interface, secure architecture, and comprehensive features, this project demonstrates a fully functional web application that meets real-world business needs while being built on solid, modern web development principles.