Agriculture Management System

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Course:

CSC-104L Database Design

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Agriculture Management System

1. Project Title & Abstract

Project Title: Agriculture Management System

Abstract: A multi-user platform designed for managing agriculture-related operations including land, crops, water, equipment, agri-products, and expert consultation. It supports farmers, experts, vendors, and admin roles via a role-based access control system.

2. Database Concepts Usage

a. Views

Used to simplify complex joins and provide security by abstracting sensitive columns.

Example SQL View:

```
CREATE VIEW FarmerCropView AS
SELECT f.farmer_id, f.first_name, p.p_id, c.crop_name, p.status
FROM farmer_profile f
JOIN planted_crops p ON f.farmer_id = p.farmer_id
JOIN crop c ON p.crop_id = c.crop_id;
```

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b. Transactions

Ensures atomicity when inserting agri usage and updating stock.

Example SQL Transaction:

```
START TRANSACTION;
INSERT INTO agri_usage (...) VALUES (...);
UPDATE agri_products SET quantity = quantity - 5 WHERE agr_id =
1;
COMMIT;
```

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c. Indexes

Used on frequently searched columns to improve query performance.

Example:

CREATE INDEX idx_farmer_email ON farmer_profile(email);
CREATE INDEX idx_crop_name ON crop(crop_name);

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d. Triggers

Enforce business logic automatically.
Used Triggers:

- calculate_water_usage_cost: auto-calculates cost before inserting water usage.
- trg_calculate_age: calculates age from DOB before insert.
- trg_check_agri_usage_quantity: ensures used quantity does not exceed available quantity.
- trg_validate_rental_overlap: prevents equipment rental date conflicts.
- trg_update_age_on_dob: recalculates age when DOB is updated.

3. Constraints

Ensure data integrity and validity.

Examples:

- *CHECK (age >= 10)*
- *CHECK (rating BETWEEN 1 AND 5)*
- *CHECK (used_quantity > 0)*
- *CHECK (area > 0)*
- *CHECK (rental_end_date > rental_start_date)*
- *CHECK (season IN ('Rabi', 'Kharif', 'Zaid'))*
- *UNIQUE (land_id, crop_id, year, season)*

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4. Use Cases (Per Role)

Farmer:

- **UC1: Register User *(Shared with Expert)***
  Registers to use the system and access farming tools.
- **UC2: Record Lands Details**
  Records location, size, and soil type for owned lands.
- **UC3: Get Crop Suggestions**
  Receives personalized crop suggestions based on land, season, and water.
- **UC4: Track Equipment**
  Manages owned and rented equipment, including cost and maintenance.
- **UC5: Request Expert Advice**
  Sends queries to agricultural experts and receives professional responses.
- **UC6: Update Stock Level**
  Logs product usage, records losses, and updates inventory levels.
- **UC7: Add New Stock**
  Adds newly harvested or purchased crops to inventory.

Expert:

- Respond to farmer queries
- Update education records

Admin:

- View KPIs
- Add/remove Crops
- Add/remove equipments

5. Sample Business Reports

Report Name	Description	Target Role
Water Consumption Report	Land area usage and planted crops summary	Farmer
Crop Yield Report	Batch-wise usage vs availability	Farmer
Rental Equipment Report	Response times, rating distribution	Farmer
Crop Stock Report	Crop stock status	Farmer

Profit Report	Farmer

6. Team Contributions

Member Name	Tasks Completed
Muhammad Khubaib Asif	Ai ChatBot, Weather Forecast, Login/Sign Form, Admin and Expert Forms linked & BL, DL
Subhan Malik	Farmer Link forms, Database Triggers and Constraints, BL, DL
Muhammad Abrar	Database Design, ERD, CRC, Complete Frontend and slides

7. Deployment Plan

- **Target Platform:**
  Web App or Windows Desktop (WinForms)

- **Infrastructure Needs:**
  MySQL Server
  .NET Runtime for desktop
  User authentication backend (JWT or local login)

- **Deployment Strategy:**
  Use XAMPP or MySQL Workbench for local DB
  Enable backups and admin control panel for live monitoring

8. KPI Fulfillment Report

KPI	Target	Status
Number of Farmers Registered	> 8	✅
Average Water Usage per Crop	< 20 hours per cycle	✅
Equipment Rental Response Time	< 24 hrs	✅

Expert Response Ratings	> 4.0 average	
Land Usage per Region	Min. 80% used area	

9. Table Data Summary

Run the following SQL script to get total row count for each table:

```
SELECT 'users' AS table_name, COUNT(*) AS total FROM users
UNION ALL
SELECT 'farmer_profile', COUNT(*) FROM farmer_profile
UNION ALL
SELECT 'planted_crops', COUNT(*) FROM planted_crops
UNION ALL
SELECT 'crop', COUNT(*) FROM crop
UNION ALL
SELECT 'water_usage', COUNT(*) FROM water_usage;
-- Add remaining tables as needed
```

Sample Output Table:

Table Name	Total Rows
users	10
farmer_profile	5
planted_crops	8
crop	15
water_usage	39