Password Manager

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Certificate

Date: 24-April-2024

This is to certify that the work present in this Project entitled "**Password Manager**" has been carried out by **Nammina Dattatreya** under my/our supervision. The work is genuine, original, and suitable for submission to the SRM University – AP for the award of Bachelor of Technology/Master of Technology in **School of Engineering and Sciences**.

Supervisor

(Signature)

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Designation: Coding Trainer

Affiliation: CSC

Acknowledgements

Technology is moving fast, and hackers are keeping up. Surprisingly, though, human customs aren't changing quickly. The same tricks that have fooled people for ages are still wired into our brains. Those same methods are still being used to hack individuals and businesses today. But the good news is, it doesn't have to be that way!

Our project revolves around password manager and the technicalities of how data is created, stored, retrieved and deleted in a database management system.

I would like to thank my faculty mentor, my team members and everyone who was involved in their contributions in this project.

Special thanks to Apna College for teaching us how ER Model works in DBMS.

Thanks to various online articles and forms which are available on the internet to know in depth related topics of database management and their use cases.

In this project report you will be able to understand how changes are made to a password manager database through ER-Model.

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Project Background

In the fast-paced digital era, where our lives are revolving with multiple online activities, the need to prioritize our cybersecurity has never been more critical, especially for young engineering students aged 17-20. This report addresses the common oversight of online security among this demographic, drawing attention to the pervasive threats posed by cybercriminals exploiting our hectic online lifestyles. It tells us the busy digital landscape we navigate daily, highlighting how hackers can manipulate our sense of urgency, pushing us into quick decisions and making us fall to their scams.

The heart of the report explains the importance of generating unique passwords and the transformative role of password managers. By resonating with the students' daily experiences, it shows the risks associated with password reuse and the potential threat across personal and professional domains. Introducing LastPass as an example, the report explains how password managers simplify the creation and management of secure passwords, freeing from the burden of memorization.

Project Description

The Password Manager System is a software solution designed to address the growing need for secure password management in today's digital world. With the proliferation of online accounts across various platforms, users often struggle to manage their passwords securely and efficiently. The Password Manager System aims to alleviate this challenge by providing users with a centralized platform to store, organize, and retrieve their passwords for different online accounts.

Key Features:

1. **User Registration and Authentication:** Users can create an account by providing a username, password, and email address. They can then log in securely using their credentials.
2. **Secure Storage of Passwords:** The system securely stores passwords for various online accounts, encrypting them to ensure confidentiality.
3. **Multi-Platform Access:** Users can access their stored passwords from any device with internet access, providing convenience and flexibility.
4. **Password Generation:** The system offers a password generation feature to create strong, random passwords for new accounts, enhancing security.
5. **Category-based Organization:** Users can categorize their accounts based on type (e.g., email, social media, banking) for easier management and retrieval.

6. **Password Expiry Management:** The system notifies users when passwords are due for renewal or have expired, helping them maintain account security.
7. **Security Questions:** Users can set up security questions and answers to further enhance account security and facilitate password recovery if needed.
8. **User-Friendly Interface:** The system provides an intuitive and user-friendly interface for easy navigation and usage.

Project Goals:

1. Develop a robust and secure password management system that prioritizes data integrity and user privacy.
2. Ensure seamless user experience through an intuitive and responsive user interface.
3. Implement encryption and other security measures to protect sensitive user information.
4. Facilitate efficient organization and retrieval of passwords through categorization and search functionalities.
5. Provide timely notifications and reminders to users to maintain strong password hygiene.

Target Audience:

The Password Manager System targets individuals and organizations seeking a reliable solution to manage their passwords securely. It caters to users of all technical backgrounds, offering a simple yet powerful tool to safeguard their online accounts and sensitive information. This System also includes features such as enhanced security, authentication, auto filling passwords, Multi factor authentication support, etc.

Project Implementation:

The Password Manager System will be implemented using a database management system (DBMS) to store and manage user data securely. The system will be developed using modern web development technologies, ensuring compatibility across various devices and platforms. Strong encryption algorithms will be employed to protect user passwords and sensitive information.

Statement of Contributions

Below are the responsibilities and contributions of each candidate in this paper.

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Description of ER Diagram

In an Entity-Relationship (ER) model, symbols are graphical representations used to represent various components of the model. These symbols help visualize the structure of the data model and the relationships between different entities. Here are some common symbols used in ER diagrams:

1. **Entity:** An entity is represented by a rectangle. It represents a real-world object or concept, such as a person, place, thing, or event. The entity's name is written inside the rectangle.

2. **Attribute:** An attribute is represented by an oval or ellipse connected to its respective entity. It represents a property or characteristic of an entity. The attribute's name is written inside the oval.

3. **Primary Key**: The primary key is an attribute (or combination of attributes) that uniquely identifies each record in an entity. It is underlined within the attribute oval.

4. **Relationship**: A relationship is represented by a diamond shape connecting two or more entities. It indicates how entities are related to each other. The type of relationship (such as one-to-one, one-to-many, or many-to-many) is often labeled near the diamond.

5. **Cardinality**: Cardinality describes the numerical relationship between entities in a relationship. It is represented using symbols near the relationship lines, such as "1" (for one), "M" (for many), or a range (e.g., "1..N").

6. **Weak Entity**: A weak entity is an entity that depends on another entity (called the owner entity) for its existence. It is represented by a double-bordered rectangle.

7. **Derived Attribute**: A derived attribute is an attribute whose value can be calculated from other attributes. It is represented by a dashed oval connected to its derived-from attributes.

8. **Recursive Relationship:** A recursive relationship occurs when an entity is related to itself. It is represented similarly to other relationships but with the same entity on both ends of the relationship line.

These symbols provide a standardized way to represent the structure and relationships within an ER model, making it easier for stakeholders to understand the data model's design and constraints.

The ER Diagram illustrates the relationships between entities such as Users, Accounts, Passwords, Categories, and Security Questions. It shows how these entities are connected through primary and foreign keys.

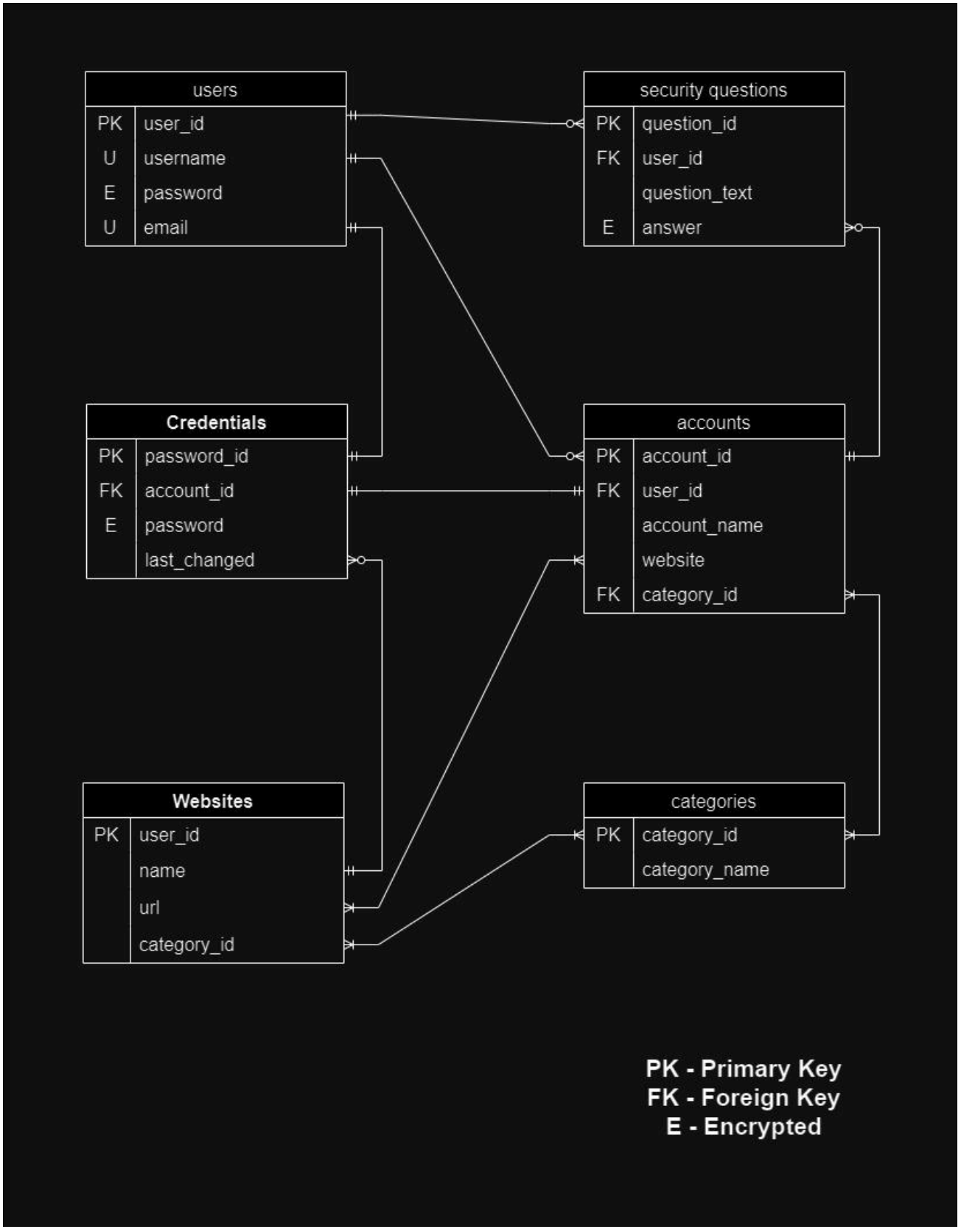
For instance, a User can have multiple Accounts, where each Account is associated with a unique Password. Categories classify Accounts and each User is linked to Security Questions for password recovery.

Furthermore, the diagram indicates that Accounts are sorted into Categories, helping to organize and manage them more effectively. For instance, one might have categories such as personal, work, or social media accounts.

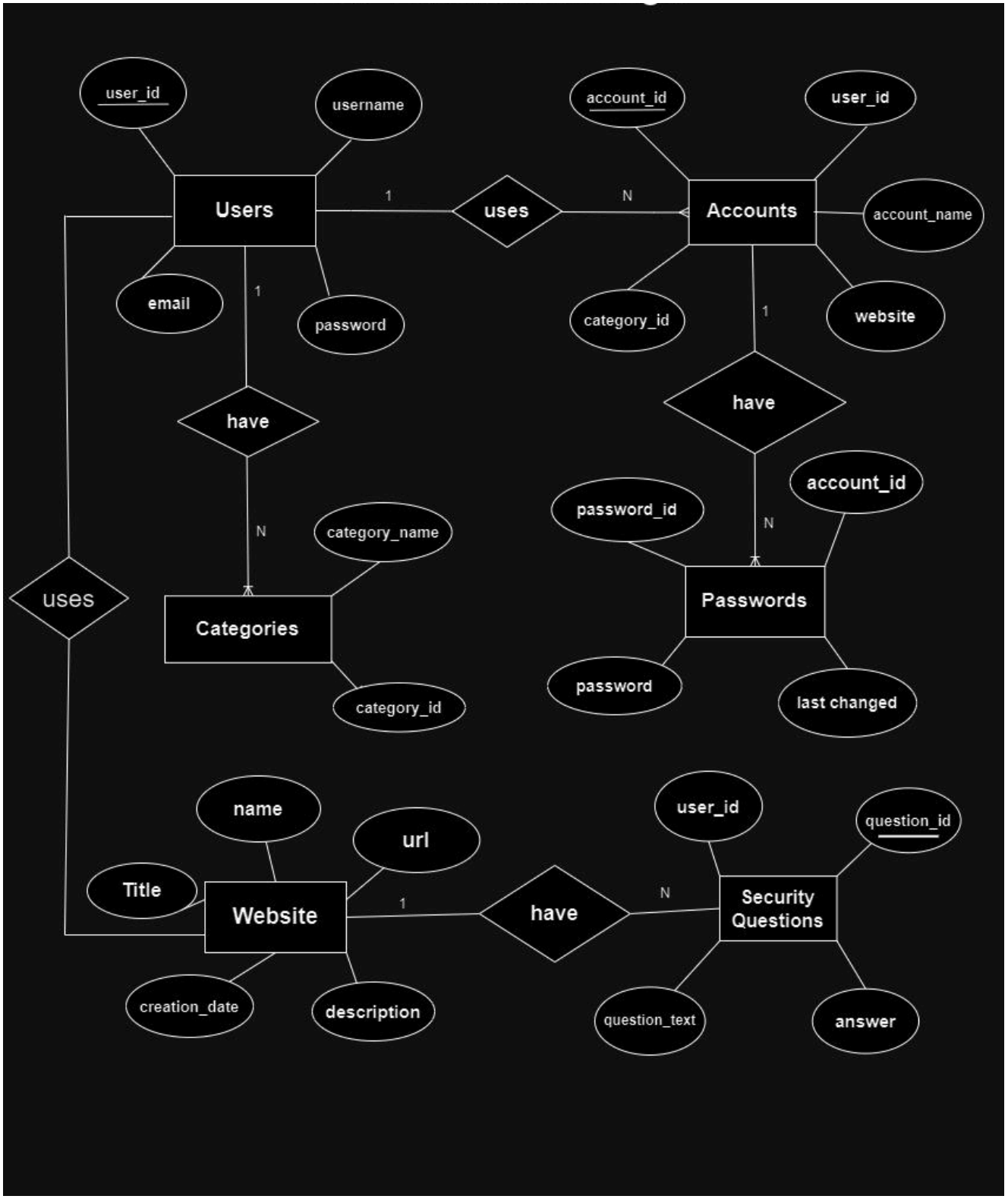
Also, the Security Questions play a crucial role in maintaining the security of the user's account. They serve as an additional layer of authentication when recovering a lost or forgotten password. The user is required to answer these questions correctly to verify their identity and gain access to their account.

The ER diagram essentially serves as a roadmap for the design and structure of the database, ensuring that data is stored in an organized and efficient manner.

Schemas Visual Diagram



Entity Relationship Visual Diagram



Conversion of ER Diagrams into Tables

User Table:

Column Name	Data Type	Description
user_id	INT	Primary Key
username	VARCHAR 50)	Unique
password	VARCHAR(50)	Encrypted
email	VARCHAR(100)	Unique

Password Table:

Column Name	Data Type	Description
password_id	INT	Primary Key
account_id	INT	Foreign Key (Accounts)
password	VARCHAR(50)	Encrypted
last_changed	DATE	

Categories Table:

Column Name	Data Type	Description
category_id	INT	Primary Key
category_name	VARCHAR(50)	

Security Questions Table:

Column Name	Data Type	Description
question_id	INT	Primary Key
user_id	INT	Foreign Key (Accounts)
question_text	VARCHAR(255)	

answer	VARCHAR(255)	Encrypted

Description of Tables

Each table will have specific columns representing attributes related to the entity it represents. For example:

The Users table will have columns like user_id, username, password, and email.

The Accounts table will have columns like account_id, user_id, account_name, website, and category_id.

The Passwords table will have columns like password_id, account_id, password, and last_changed.

Normalization of tables in the Database

The tables are normalized to minimize data redundancy and maintain data integrity. This may involve breaking down tables further and establishing relationships between them.

First Normal Form (1NF)

A relation will be 1NF if it contains an atomic value.

It states that an attribute of a table cannot hold multiple values. It must hold only single-valued attributes.

First normal form disallows the multi-valued attribute, composite attribute, and their combinations.

Second Normal Form (2NF)

In the 2NF, relation must be in 1NF.

In the second normal form, all non-key attributes are fully functional dependent on the primary key

Third Normal Form (3NF)

A relation will be in 3NF if it is in 2NF and does not contain any transitive partial dependency.

3NF is used to reduce data duplication. It is also used to achieve data integrity.

If there is no transitive dependency for non-prime attributes, then the relation must be in the third normal form.

Boyce Codd normal form (BCNF)

BCNF is the advanced version of 3NF. It is stricter than 3NF.

A table is in BCNF if every functional dependency X → Y, X is the super key of the table.

For BCNF, the table should be in 3NF, and for every FD, LHS is a super key.

Fourth Normal Form (4NF)

A relation will be in 4NF if it is in Boyce Codd normal form and has no multivalued dependency.

For a dependency A → B, if for a single value of A, multiple values of B exists, then the relation will be a multivalued dependency.

Fifth Normal Form (5NF)

A relation is in 5NF if it is in 4NF and does not contain any join dependency and joining should be lossless.

5NF is satisfied when all the tables are broken into as many tables as possible in order to avoid redundancy.

5NF is also known as Project-join normal form (PJ/NF).

- **USERS**

UserID	Email	Username	Password

1NF: The table satisfies 1NF as each cell contains atomic values.

2NF: Since there are no partial dependencies, the table automatically satisfies 2NF.

3NF: There are no transitive dependencies, so it also satisfies 3NF.

4NF: There are no multivalued dependencies, so it satisfies 4NF.

5NF: There are no join dependencies, so it satisfies 5NF.

- **Accounts**

AccountID	UserID	AccountName	CategoryID	Website

1NF: The table satisfies 1NF.

2NF: AccountName depends only on AccountID, so it satisfies 2NF.

3NF: Website depends on UserID, CategoryID, and AccountName. It needs to be decomposed into a separate table to satisfy 3NF.

4NF: There are no multivalued dependencies after normalization, so it satisfies 4NF.

5NF: There are no join dependencies, so it satisfies 5NF.

- **Categories**

CategoryID	CategoryName

1NF: The table satisfies 1NF.

2NF: It has only one attribute, so it trivially satisfies 2NF.

3NF: It has no transitive dependencies, so it satisfies 3NF.

4NF: There are no multivalued dependencies, so it satisfies 4NF.

5NF: There are no join dependencies, so it satisfies 5NF.

- **Security Questions**

UserID	QuestionID	QuestionText	Answer

1NF: The table satisfies 1NF.

2NF: It has only one attribute, so it trivially satisfies 2NF.

3NF: There are no transitive dependencies, so it satisfies 3NF.

4NF: There are no multivalued dependencies, so it satisfies 4NF.

5NF: There are no join dependencies, so it satisfies 5NF.

- **Websites**

WebsiteID	Title	Name	URL	CreationDate	Description

1NF: The table satisfies 1NF.

2NF: It has only one attribute, so it trivially satisfies 2NF.

3NF: There are no transitive dependencies, so it satisfies 3NF.

4NF: There are no multivalued dependencies, so it satisfies 4NF.

5NF: There are no join dependencies, so it satisfies 5NF.

Creation of Data in the tables

We will populate the table with sample data to demonstrate how the system works. This will include at least 5 records for each table, representing different users, accounts, passwords, categories, and security questions .

Users Table:

user_id	username	password	email
1	User 1	**********	user1@gmail.com
2	User 2	**********	user2@gmail.com

Accounts Table:

account_id	user_id	account_name	website	category_id
1	1	Gmail	www.gmail.com	1
2	1	Facebook	www.facebook.com	2
3	2	Linkedin	www.linkedln.com	2

Passwords Table:

password_id	account_id	password	last_changed
1	1	**********	01-04-2024

2	2	**********	28-03-2024
3	3	**********	25-03-2024

Categories Table:

category_id	category_name
1	Email
2	Social Media

Security Questions Table:

question_id	user_id	question_text	answer
1	1	What is your pet’s name?	01-04-2024
2	1	What is your mother's maiden name?	28-03-2024
3	2	What is the name of your first school?	25-03-2024

Websites:

name	url	description	Title	Creation Date
google	www.google.com	google browser	GOOGLE	01-04-2024
facebook	www.facebook.com	social media platform	FACEBOOK	28-03-2024
naukri	www.naukri.com	job search	NAUKRI	25-03-2024

SQL Queries

- **Creating relations using SQL:**

  Users:

```
CREATE TABLE Users (
    UserID INT AUTO_INCREMENT PRIMARY KEY,
    Email VARCHAR(255) UNIQUE NOT NULL,
    Username VARCHAR(100) UNIQUE NOT NULL,
    Password VARCHAR(255) NOT NULL
);
```

Accounts:

```
CREATE TABLE Accounts (
    AccountID INT PRIMARY KEY AUTO_INCREMENT,
    UserID INT,
    AccountName VARCHAR(255),
    CategoryID INT,
    Website VARCHAR(255),
    FOREIGN KEY (UserID) REFERENCES Users(UserID),
    FOREIGN KEY (CategoryID) REFERENCES Categories(CategoryID)
);
```

Categories:

```
CREATE TABLE Categories (
    category_id INT AUTO_INCREMENT PRIMARY KEY,
    category_name VARCHAR(255) NOT NULL
);
```

Passwords:

```
CREATE TABLE Passwords (
    PasswordID INT PRIMARY KEY AUTO_INCREMENT,
    AccountID INT,
    Password VARCHAR(255),
    LastChanges TIMESTAMP DEFAULT CURRENT_TIMESTAMP ON UPDATE
CURRENT_TIMESTAMP
);
```

Security Questions:

```
CREATE TABLE SecurityQuestions (
    UserID INT,
    QuestionID INT PRIMARY KEY,
    QuestionText VARCHAR(255),
    Answer VARCHAR(255)
);
```

Websites:

```
CREATE TABLE Websites (
    WebsiteID INT PRIMARY KEY AUTO_INCREMENT,
    Title VARCHAR(255),
    Name VARCHAR(255),
```

```
    URL VARCHAR(255),
    CreationDate DATE,
    Description TEXT
);
```

- **Storing data in relations using SQL:**

Users:

```
INSERT INTO Users (UserID, Email, Username, Password)
VALUES (1, 'example@example.com', 'example_username',
'example_password');
```

Accounts:

```
INSERT INTO Accounts (AccountID, UserID, AccountName,
CategoryID, Website)
VALUES (1, 101, 'Savings', 1, 'www.example.com');
```

Categories:

```
INSERT INTO Categories (CategoryName, CategoryID)
VALUES ('CategoryNameValue', CategoryIDValue);
```

Passwords:

```
INSERT INTO passwords (password_id, account_id, password,
last_changes)
VALUES (1, 1, 'example_password', '2024-05-01 12:00:00');
```

Security Questions:

```
INSERT INTO SecurityQuestions (UserID, QuestionID,
QuestionText, Answer)
VALUES
(1, 1, 'What is your mother''s maiden name?', 'Smith'),
(1, 2, 'What is the name of your first pet?', 'Fluffy'),
(2, 1, 'What city were you born in?', 'New York');
```

Websites:

```
INSERT INTO Websites (Title, Name, URL, CreationDate,
Description)
VALUES ('Example Website', 'Example',
'http://www.example.com', '2024-05-01', 'This is an example
website.');
```

1. Retrieve all accounts of a specific user

```
SELECT * FROM Accounts WHERE user_id = 1;
```

2. Find the account with strongest password

```
SELECT * FROM Passwords ORDER BY LENGTH(password) DESC LIMIT 1;
```

3. Update the password for a particular account

```
UPDATE Passwords SET password = 'new_password' WHERE account_id = 1;
```

4. Identify accounts with passwords expiring soon

```
SELECT * FROM Passwords WHERE DATEDIFF(CURDATE(), last_changed) > 90;
```

5. Counts the number of accounts in each category

```
SELECT c.category_name, COUNT(*) AS account_count
FROM Accounts a
JOIN Categories c ON a.category_id = c.category_id
GROUP BY c.category_name;
```

Creation of 5 view using the tables

1. Display all accounts and their passwords

```
CREATE VIEW AccountPasswords AS
SELECT a.account_name, p.password
FROM Accounts a
JOIN Passwords p ON a.account_id = p.account_id;
```

2. Show users and their security questions

```
CREATE VIEW UserSecurityQuestions AS
SELECT u.username, sq.question_text
FROM Users u
JOIN SecurityQuestions sq ON u.user_id = sq.user_id;
```

3. List accounts sorted by password strength

```
CREATE VIEW StrongPasswords AS
SELECT a.account_name, p.password
FROM Accounts a
JOIN Passwords p ON a.account_id = p.account_id
ORDER BY LENGTH(p.password) DESC;
```

4. Display accounts expiring with a specified period

```
CREATE VIEW ExpiringPasswords AS
SELECT a.account_name, p.last_changed
FROM Accounts a
JOIN Passwords p ON a.account_id = p.account_id
WHERE DATEDIFF(CURDATE(), p.last_changed) > 90;
```

5. Show accounts grouped by category

```
CREATE VIEW AccountsByCategory AS
SELECT c.category_name, a.account_name
FROM Accounts a
JOIN Categories c ON a.category_id = c.category_id;
```