

Finance Management System

Case Study

Create following tables in SQL Schema with appropriate class for the Finance Management System

DATABASE SCHEMA

1. Introduction

The **Finance Management System** is designed to help users track their expenses by categorizing them under predefined categories. The system ensures data integrity through proper schema design and relationships between users, expenses, and categories.

2. Schema Design

The database consists of three tables:

- **Users:** Stores information about registered users.
- **Expenses:** Tracks individual expenses made by users.
- **ExpenseCategories:** Defines various categories that expenses can belong to.

2.1 Users Table

Column Name		Data Type	Constraints
user_id	INT		PRIMARY KEY, AUTO_INCREMENT
username	VARCHAR(50)		UNIQUE, NOT NULL
password	VARCHAR(255)		NOT NULL
email	VARCHAR(100)		UNIQUE, NOT NULL

Description: This table holds user authentication and identification details.

2.2 ExpenseCategories Table

Column Name		Data Type	Constraints
category_id	INT		PRIMARY KEY, AUTO_INCREMENT

Column Name	Data Type	Constraints
category_name	VARCHAR(100)	UNIQUE, NOT NULL

Description: This table defines different types of expenses such as food, travel, healthcare, etc.

2.3 Expenses Table

Column Name	Data Type	Constraints
expense_id	INT	PRIMARY KEY, AUTO_INCREMENT
user_id	INT	FOREIGN KEY REFERENCES Users(user_id), NOT NULL
amount	DECIMAL(10,2)	NOT NULL
category_id	INT	FOREIGN KEY REFERENCES ExpenseCategories(category_id), NOT NULL
date	DATE	NOT NULL
description	TEXT	NULL

Description: Stores expense records linked to a user and a category.

3. Data Insertion

3.1 Initial Data Population

I inserted 15 records into each table while ensuring referential integrity. Additionally, I added 10 more records to both Users and Expenses while maintaining consistency with the existing ExpenseCategories.

Sample Data for Users:

```
INSERT INTO Users (username, password, email) VALUES
('john_doe', 'hashedpassword', 'john.doe@email.com'),
('jane_smith', 'secure123', 'jane.smith@email.com'),
('ethan_wright', 'ethanpass', 'ethan.wright@email.com');
```

Sample Data for ExpenseCategories:

```
INSERT INTO ExpenseCategories (category_name) VALUES
('Food & Dining'),
('Transportation'),
('Utilities');
```

Sample Data for Expenses:

```
INSERT INTO Expenses (user_id, amount, category_id, date, description) VALUES
(1, 55.00, 1, '2024-03-25', 'Lunch at a new cafe'),
(2, 30.00, 2, '2024-03-26', 'Bus fare for a week');
```

4. Data Integrity and Validation

To ensure data integrity, the following checks were performed:

1. Foreign Key Constraints:

- Ensured that every user_id in Expenses exists in Users.
- Ensured that every category_id in Expenses exists in ExpenseCategories.

2. Uniqueness Constraints:

- No duplicate usernames or emails in Users.
- No duplicate category names in ExpenseCategories.

3. Verification Queries:

- Checked referential integrity using LEFT JOIN queries.

5. Implementation Output :

USER TABLE

user_id	username	password	email
1	john_doe	password123	john.doe@email.com
2	jane_smith	securepass	jane.smith@email.com
3	mike_jones	mikepass	mike.jones@email.com
4	emma_watson	emma123	emma.watson@email.com
5	david_wilson	dwilson@pass	david.wilson@email.com
6	lucas_brown	lucas456	lucas.brown@email.com
7	olivia_clark	olivia@safe	olivia.clark@email.com
8	sophia_martin	sophiamart	sophia.martin@email.com
9	liam_thomas	liamthomas@12	liam.thomas@email.com
10	charlotte_james	charljames	charlotte.james@email.com
11	daniel_anderson	danielpass	daniel.anderson@email.com
12	amelia_white	amelia@white	amelia.white@email.com
13	jackson_harris	jackson_harris...	jackson.harris@email.com
14	grace_walker	gracewalk	grace.walker@email.com
15	henry_robinson	henryrob	henry.robinson@email.com
16	ethan_wright	ethanpass	ethan.wright@email.com
17	zoe_taylor	zoetaylor123	zoe.taylor@email.com
18	ryan_cooper	ryan1234	ryan.cooper@email.com
19	nora_lee	nora456	nora.lee@email.com
20	mason_scott	mason@secure	mason.scott@email.com
21	stella_baker	stellabake	stella.baker@email.com
22	logan_hall	loganhallpass	logan.hall@email.com
23	harper_evans	harperevans1	harper.evans@email.com
24	lucas_adams	lucasadams	lucas.adams@email.com
25	victoria_green	victoriagreen	victoria.green@email.com
NULL	NULL	NULL	NULL

EXPENSECATEGORIES TABLE

category_id	category_name
6	Education
4	Entertainment
10	Fitness & Sports
1	Food & Dining
7	Groceries
5	Healthcare
11	Insurance
12	Investment
14	Miscellaneous
13	Rent
8	Shopping
15	Subscriptions
2	Transportation
9	Travel
3	Utilities
NULL	NULL

EXPENSES TABLE

expense_id	user_id	amount	category_id	date	description
1	1	120.50	1	2024-03-10	Dinner at a restaurant
2	2	45.00	2	2024-03-11	Taxi fare
3	3	80.75	3	2024-03-12	Electricity bill payment
4	4	200.00	4	2024-03-13	Movie tickets and snacks
5	5	150.00	5	2024-03-14	Doctor consultation fee
6	6	500.00	6	2024-03-15	Online course purchase
7	7	75.00	7	2024-03-16	Grocery shopping
8	8	250.00	8	2024-03-17	New clothing items
9	9	300.00	9	2024-03-18	Flight ticket booking
10	10	100.00	10	2024-03-19	Gym membership renewal
11	11	1200.00	11	2024-03-20	Annual health insurance ...
12	12	350.00	12	2024-03-21	Stock market investment
13	13	800.00	13	2024-03-22	Monthly house rent
14	14	60.00	14	2024-03-23	Miscellaneous expenses
15	15	20.00	15	2024-03-24	Netflix subscription
16	16	55.00	1	2024-03-25	Lunch at a new cafe
17	17	30.00	2	2024-03-26	Bus fare for a week
18	18	95.00	3	2024-03-27	Water and internet bill p...
19	19	180.00	4	2024-03-28	Concert ticket purchase
20	20	90.00	5	2024-03-29	Pharmacy medicine purc...
21	21	700.00	6	2024-03-30	Certification course enro...
22	22	50.00	7	2024-03-31	Supermarket grocery sh...
23	23	400.00	8	2024-04-01	New shoes and handbag
24	24	270.00	9	2024-04-02	Train ticket for a busines...
25	25	150.00	10	2024-04-03	Yoga class subscription

Conclusion

The given constraints were followed, and the database schema was successfully implemented. Tables were created based on the schema design, and data was inserted while maintaining integrity and consistency across relationships.
