NORMALIZATION

Normalization is a process used in database design to eliminate redundancy and ensure data integrity. It involves organizing data into separate tables and establishing relationships between them

First Normal Form (1NF):

First Normal Form requires that each column in a table contains only atomic (indivisible) values. It eliminates duplicate rows by ensuring that each row has a unique identifier, typically a primary key.

Second Normal Form(2NF):

Second Normal Form ensures that the database is in 1NF before applying the rules of 2NF.It eliminates partial dependencies that exist when a non-key attribute depends on only a part of the primary key.It also ensures that all non-key attributes depend on the candidate key.

Third Normal Form (3NF):

3NF takes 2NF further by eliminating transitive dependencies. It ensures that non-key attributes depend only on the primary key and not on other non-key attributes. This helps to avoid data duplication and update anomalies.

1. **Entity:** Branch

    Branch(Branch_id,Name,Address)

    Functional Dependencies:

    branch_id → name,address

    Normal Form:This is in 3NF with branch_id as a primary key

2. **Entity**: Customer

    customer(customer_id,branch_id,loan_id,first_name,last_name,date_of_birth,gender)

    Functional Dependencies:

customer_id→branch_id,loan_id,first_name,last_name,date_of_birth,gender

Normal Form Violation:This violates 1NF

This Entity is divided into 1.customer
2.customer_loan

- **Entity**: customer

customer(customer_id,branch_id,first_name,last_name,date_of_birth,gender)

Functional_Dependencies: Customer_id→branch_id,first_name,last_name,date_of_birth,gender

Normal Form:This is in 3NF with customer_id as a primary key

- **Entity**: customer_loan

customer_loan(customer_id,loan_id)

Functional Dependencies:

customer_id → loan_id, loan_id →customer_id

Normal Form:This is in 3NF with customer_id,loan_id as a composite primary keys

3. **Entity**: Account

Account(account_id,balance,customer_id)

Functional Dependencies:

account_id → balance,customer_id

Normal Form Violation:This violates 1NF

This Entity is divided into 1.account
2.account_customer

- **Entity**: account

account(account_id,balance)

Functional Dependencies:

account_id →balance

Normal Form:This is in 3NF with account_id as a primary key

- **Entity**: account_customer

account(account_id,customer_id)

Functional Dependencies:

account_id →customer_id,customer_id→account_id

Normal Form:This is in 3NF with account_id,customer_id as composite primary keys

4. **Entity**: Loan

loan(loan_id,account_id,amount_paid,start_date,end_date)

Normal Form Violation:This violates 1NF

This Entity is divided into 1.loan
2.loan_account

- **Entity**: loan

loan(loan_id,amount_paid,start_date,end_date)

Functional Dependencies:

loan_id →amount_paid,start_date,end_date

Normal Form:This is in 3NF with loan_id as a primary key

- **Entity**: loan_account

Loan_account(loan_id,account_id)

Functional Dependencies:

loan_id→ account_id, account_id→ loan_id

Normal Form:This is in 3NF with loan_id,account_id as a composite primary keys

5. **Entity**: loan_type

loan_type(loan_type_id,loan_id,type,description,base_amount,base_interest_rate)

Functional Dependencies:

Loan_type_id,loan_id → type,description,base_amount,base_interest_rate

Normal Form Violation:This violates 2NF

This Entity is divided into 1.loan_type
2.loantype_loan

- **Entity**: loan_type

Loan_type(loan_type_id,type,description,base_amount,base_interest_rate)

Functional Dependencies:

Loan_type_id →type,description,base_amount,base_interest_rate

Normal Form:This is in 3NF with loan_type_id as a primary key

- **Entity**:loantype_loan

  loantype_loan(loan_type_id,loan_id)

  Functional Dependencies:

  loan_type_id → loan_id,loan_id→loan_type_id

  Normal Form:This is in 3NF with loan_type_id,loan_id as a composite primary keys

6. **Entity**: card

   card(card_id,account_id,card_number,expiration_date,is_blocked)

   Functional Dependencies:

   card_id → account_id,card_number,expiration_date,is_blocked

   Normal Form Violation:This violates 3NF

   This Entity is divided into 1.card
   2.card_account

- **Entity**: card

  card(card_id,card_number,expiration_date,is_blocked)

  Functional Dependencies:

  Card_id →card_number,expiration_date,is_blocked

  Normal Form:This is in 3NF with card_id as a primary key

- **Entity**:card_account

  Card_account(card_id,account_id)

  Functional Dependencies:

  Card_id →account_id

  Normal Form:This is in 3NF with card_id as a primary key

7. **Entity**: Transaction

   Transaction(transaction_id,account_id,description,amount,tdate)

Functional Dependencies:

transaction_id → account_id,description,amount,tdate

Normal Form: This is in 3NF with transaction_id as a primary key

8. **Entity**: account_loantype

account_loantype(account_id,loan_type_id)

Functional Dependencies:

account_id → loan_type_id, loan_type_id →account_id

Normal Form:This is in 3NF with account_id,loan_type_id as a composite primary keys